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THE FUTURE OF AIR TRAFFIC CONTROL MODERNIZATION

(110–40)

HEARING

BEFORE THE

SUBCOMMITTEE ON AVIATION

OF THE

COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

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May 4, 2007

SUMMARY OF SUBJECT MATTER

TO: Members of the Subcommittee on Aviation

FROM: Subcommittee on Aviation Staff

SUBJECT: Hearing on, "The Future Air Traffic Control (ATC) Modernization"

PURPOSE OF HEARING

At 10:00 a.m. on Wednesday, May 9, 2007, in Room 2167 Rayburn House Office Building, the Subcommittee on Aviation will hold a hearing to consider the Future of ATC Modernization.

BACKGROUND

The present-day national airspace system (NAS) consists of a network of en route[1] airways, much like an interstate highway grid in the sky, interconnected by ground-based navigation facilities that emit directional signals that aircraft track. Limits on the transmission distances of these signals prevent aircraft from flying direct routes on long distance flights and limit the utilization of airspace to predefined routes where aircraft can reliably transition from one navigational signal to the next.

In the terminal environment, near busy airports and metropolitan areas, aircraft follow arrival and departure routes by tracking ground-based navigational signals, much like navigation during the en route phase of flight, or by following the instructions of air traffic controllers, often referred to as receiving radar vectors.

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[1] The FAA uses three types of facilities to control traffic: *Airport towers* direct traffic to the ground before landing and after takeoff within 5 nautical miles of the airport and about 3,000 feet above the airport. *Terminal Radar Approach Control Facilities (TRACONs)* sequence and separate aircraft in terminal airspace – i.e., as they approach and leave airports, beginning about 5 nautical miles and ending about 50 nautical miles from the airport and generally up to 10,000 feet above the ground. *En route centers* control aircraft in high-altitude en route airspace – i.e., in transit and during approaches to some airports, generally controlling air space that extends above 18,000 feet for commercial aircraft.

Surveillance and separation of aircraft, both en route and in terminal airspace, is largely provided by an extensive network of radar sites, and air traffic controllers who are directly responsible for ensuring adequate separation between aircraft receiving radar services. Maintaining this separation is achieved through extensive use of voice communications between controllers and pilots over open two-way radio frequencies.

Under the current system, controller workload, radio frequency voice-communication congestion, and the coverage and accuracy of ground-based navigational signals impose practical limitations on the capacity and throughput of aircraft in the system, particularly in busy terminal areas near major airports and around certain choke-points in the en route airway infrastructure where many flight paths converge.

The Federal Aviation Administration (FAA) forecasts that airlines are expected to carry more than 1 billion passengers by 2015, increasing from approximately 740 million in 2006. The Department of Transportation (DOT) predicts up to a tripling of passengers, operations, and cargo by 2025. At the same time, the proliferation of regional jets, the emergence of low cost and new entrant carriers, more point-to-point service, and the anticipated influx of Very Light Jets (VLJs), as well as other new users such as unmanned aerial systems and commercial space vehicles, are placing new and different types of stresses on the system.

Both the FAA and independent experts have noted that tripling NAS capacity by 2025 would be extremely difficult, if not impossible, using existing infrastructure, technologies and operational procedures. According to the FAA, a MITRE-CAASD[2] ("MITRE") study done for the FAA concludes that the current system cannot handle the projected traffic demands expected by as early as 2015. Therefore, Congress created the Joint Planning and Development Office (JPDO) in Vision 100 – the Century of Aviation Reauthorization Act (P.L. 108-176), and tasked it with developing a Next Generation Air Transportation System (NextGen) that will meet anticipated traffic demands.

The NextGen plan that is under development will consist of new concepts and capabilities for air traffic management and communications, navigations and surveillance that rely on satellite-based capabilities; data communications; shared and distributed information technology architectures that will support strategic decisions;[3] and enhanced automation.

I. The FAA's Current Air Traffic Control (ATC) Modernization Effort

In 1981, the FAA initiated an ambitious effort to modernize the ATC system. According to the Government Accountability Office (GAO), the FAA initially estimated ATC modernization would cost $12 billion and could be completed over 10 years. At the time, the FAA viewed its ATC modernization effort as an end state with certain set capabilities that could be delivered in a finite period of time. Over the years, projects within this modernization program experienced cost

[2] MITRE is a non-profit organization and the Center for Advanced Aviation System Development (CAASD) was established in 1990 within MITRE. MITRE-CAASD is sponsored by the FAA as a Federally Funded Research and Development Center (FFRDC). An FFRDC meets certain special long-term research or development needs that cannot be met as effectively by existing in-house or contractor resources.
[3] Strategic decisions are generally associated with larger scale movement of aircraft traffic flows, as opposed to tactical control and separation of individual aircraft.

overruns, schedule delays and performance shortfalls. Likewise, the FAA's conception of its ATC modernization evolved into that of an ongoing process in which new capabilities will be developed in perpetuity. Since 1995, the GAO has listed the ATC modernization program as "high risk," and noted that while progress has been made, it remains "high risk" today. In June 2005, the GAO reported that to date the FAA has spent $43.5 billion for ATC modernization.

In May 2005, the Department of Transportation Inspector General (DOT IG) reported that 11 major FAA acquisitions experienced cost growth totaling $5.6 billion, and 9 had schedule slips ranging from 2 to 12 years. Looking toward NextGen, the DOT IG has stated that the FAA needs to articulate a strategy for how it will mitigate past problems that led to massive cost growth.

At the same time, the GAO has also reported that the FAA has made efforts to control or reduce costs. For example, each FAA line of business – such as the FAA's Air Traffic Organization (ATO), which is responsible for managing and modernizing the ATC system - is annually required to propose at least one cost control initiative, and the FAA Administrator tracks and reviews progress on these initiatives monthly. These initiatives have reportedly yielded a total of $99.1 million in cost savings and $81.9 million in cost avoidance for FY 2005 and FY 2006.

Additional cost control efforts include outsourcing flight service stations, which the FAA estimates will save $2.2 billion over 10 years,[4] and restructuring of the FAA's administrative service areas from 9 separate offices to 3, which the FAA estimates will save up to $460 million over 10 years. Further, section 409 of the FAA's reauthorization proposal would allow the Secretary of Transportation to establish a "Realignment and Consolidation of Aviation Facilities and Services Commission" to conduct an independent review and analysis of the FAA's recommendations for realignment and consolidation of facilities or services (e.g., air traffic control towers, en route centers, TRACONS, etc).

FAA officials have also noted the agency's recent success at meeting its acquisition cost and schedule performance targets, stating that 2006 was the third straight year that the FAA has delivered at least 90 percent of its programs on time and within budget. However, some of the FAA's recent success may be due to the rebaselining of certain major modernization programs. "Baselining" refers to movement from research and development to deployment of a system. The FAA's Joint Resources Council (JRC)[5] makes a formal decision to invest in a technology and approves cost, schedule and/or performance targets. Rebaselining readjusts the cost and schedule milestones for a program, effectively resetting cost and schedule variances to zero. The FAA uses the current baseline schedule and costs for its performance measurement, rather than the baseline set at an acquisition's inception.

In addition, the FAA has cancelled or deferred decisions on a number of modernization programs that will need to be reevaluated or revived as part of the NextGen effort. In the last few years, the FAA cancelled its data communications effort, called Controller Pilot Datalink Communications (CPDLC), an email-like means for two-way exchange between controllers and flight crews. Data communications will be a core NextGen capability, and it will be a key FAA near-

[4] In May 2006, the DOT IG commenced a self-initiated audit to assess whether FAA has implemented effective plans and controls to: 1) transition flight service stations to contract operations; 2) achieve anticipated savings; and 3) ensure that the operational needs of users continue to be met.
[5] The FAA's senior decision making body for major acquisitions.

term NextGen investment. Further, the FAA's terminal automation modernization program, initially called Standard Terminal Automation Replacement System (STARS), has had a long history of cost overruns and delays. The FAA has broken down this acquisition into phases, renamed it the Terminal Automation Modernization and Replacement (TAMR) program, and deferred its decision whether to fully deploy the system it originally intended to deploy. Some amount of additional investment in terminal automation modernization will be necessary during the transition to NextGen.

The FAA's budget request states that 30 existing capital programs serve as "platforms" for NextGen. The DOT IG has stated that the FAA needs to review ongoing modernization projects and make necessary cost, schedule, and performance adjustments. The DOT IG states that this is critical because NextGen planning documents suggest that billions of dollars will be needed to adjust ongoing programs, like En Route Automation Modernization (ERAM), the FAA's effort to modernize its en route airspace automation systems, and Traffic Flow Management – Modernization (TFM-M), the FAA's modernization of the Enhanced Traffic Management System (ETMS), which depicts traffic flows across the NAS and supports strategic decisions.

II. The JPDO

Pursuant to Vision 100, the JPDO was created within the FAA to leverage the expertise and resources of the DOT, Department of Defense (DOD), Department of Commerce (DOC), and Department of Homeland Security (DHS), as well as the National Aeronautics and Space Administration (NASA) and the White House Office of Science and Technology Policy, for the purpose of completely transforming the NAS by the year 2025 and developing NextGen. The JPDO organizational structure includes:

- A Director, who reports to the FAA Administrator and the FAA ATO's Chief Operating Officer;
- A federal interagency Senior Policy Committee headed by the Secretary of Transportation that includes senior-level officials from the JPDO's partner agencies;
- The NextGen Institute ("Institute"), which incorporates the expertise and views of stakeholders from private industry, state and local governments, and academia. The Institute's governing body is the Institute Management Council (IMC), composed of top officials and representatives from the aviation community;
- Eight integrated product teams (IPT), which is where the federal and nonfederal experts come together to plan for and coordinate the development of technologies for NextGen. The IPTs are headed by representatives of JPDO's partner agencies and include more than 200 nonfederal stakeholders from over 100 organizations.

Vision 100 requires the JPDO to produce an integrated NextGen plan. To fulfill this requirement, the JPDO is developing several key planning documents, which include a Concept of Operations, an Enterprise Architecture and an Integrated Work Plan.

The Concept of Operations provides written descriptions of how the NextGen system is envisioned to operate in 2025 and beyond. The Concept of Operations is posted on the JPDO website for review and comment. The JPDO plans to address the public comments it receives and issue a revised version of the Concept of Operations in June 2007.

The Enterprise Architecture is a technical blueprint for NextGen. When complete, it will provide a means for coordinating among the partner agencies the private sector, aligning relevant research and development activities, and integrating equipment. The JPDO plans to issue the Enterprise Architecture in June 2007, although, according to the GAO, it was originally scheduled for release in September 2006.

Finally, the JPDO is developing an Integrated Work Plan that will provide the research, policy and regulation, and schedules necessary to achieve NextGen by 2025. Whereas the Enterprise Architecture serves as a blueprint for NextGen, the Integrated Work Plan will outline specific steps required to achieve the blueprint. The JPDO intends to issue its initial draft of the Integrated Work Plan in July 2007.

Since August of 2005, the JPDO has been working on establishing a memorandum of understanding (MOU) with its partner agencies to broadly define those agencies' roles and responsibilities. FAA, DOT, NASA and DOC have signed the MOU. According to JPDO officials, DOD and DHS are in the final stages of reviewing the MOU.

According to the GAO, questions remain over which entities will fund and conduct some of the necessary research and development (R&D) and demonstration projects that will be key to achieving certain NextGen capabilities. In the past, a significant portion of aeronautics R&D, including intermediate technology development, has been performed by NASA. However, when President Bush announced his vision for space exploration, NASA shifted its focus toward space. Aeronautics R&D budgets declined and in January 2006, NASA reconfigured its Aeronautics Mission Directorate, focusing on fundamental aeronautics research. Though NASA still plans to perform JPDO research, it will perform only fundamental research and not developmental work and demonstration projects. NASA's focus on fundamental research leaves other agencies the job of transitional and applied research. The FAA's Research, Engineering, and Development Advisory Committee (REDAC) points out that placing a greater reliance on the FAA to perform R&D of this type would require FAA to establish additional infrastructure and that NASA's restructuring has the potential to delay NextGen implementation by five years. The JPDO Concept of Operations lists 167 research issues that need to be investigated.

III. The FAA

While the JPDO's ability to coordinate with its partner agencies is critical, coordination between the FAA and the JPDO is particularly important. The JPDO's planning must build upon the FAA's existing ATC modernization program, and the FAA's near-term planning horizon and investments must be aligned with the JPDO's longer-term mission to transform the NAS. Moreover, the implementation of the ATC component of NextGen will be financed primarily by the FAA's capital budget, and the JPDO needs to draw heavily upon the FAA's expertise to support its mission.

The FAA is making efforts to improve its coordination with the JPDO. For example, the FAA is aligning key planning documents with the JPDO's NextGen plans. Specifically, the FAA has expanded and revamped its Operational Evolution Plan – renamed the Operational Evolution Partnership (OEP) – to become FAA's implementation plan for NextGen. The OEP will be a comprehensive description of how the FAA will implement NextGen, including the required technologies, procedures, and resources. The FAA plans to publish a new OEP in June 2007. The FAA is also creating a NextGen Review Board to oversee the OEP. This Board will be co-chaired by JPDO's Director and ATO's Vice President of Operations Planning.

In addition, section 415 of the FAA reauthorization proposal calls for the JPDO Director to be a voting member of FAA's JRC and ATO's Executive Council. It would also require the FAA to develop and publish each year a consolidated OEP that gives a detailed description of how the FAA is implementing NextGen and also include in the annual report to Congress how the JPDO agencies respective budgets support specific operational improvements for NextGen.

Over the next 5 years, the FAA plans to spend $4.6 billion on NextGen capital and research, engineering and development programs. Some key near-term NextGen investments include:

- **Automatic Dependant Surveillance – Broadcast (ADS-B):** ADS-B is the FAA's flagship program to transition to satellite-based surveillance. Equipped aircraft receive Global Positioning System (GPS) signals and use them to transmit the aircraft's precise position (along with identification and other information) to automation systems, air traffic controllers and other pilots with properly equipped aircraft. For the last few years, the FAA has piloted ADS-B in Alaska (the "Capstone Program") and the Ohio River Valley ("Safe Flight 21"). The "Segment One" rollout currently underway will include key sites in Juneau (AK), Louisville (KY), Philadelphia (PA), and in the Gulf of Mexico for testing both airplane and helicopter capabilities. The FAA will award a contract for nationwide service in September 2007. The FAA plans to spend approximately $564 million on ADS-B between FY 2008 and FY 2012.

- **System Wide Information Management (SWIM):** The FAA has described SWIM as "an internet-like network, making information accessible, secure and usable in real time for all stakeholders. . . ." SWIM is an information technology platform that will provide common situational awareness between the FAA, other agencies and NAS users regarding weather, traffic flows and other information to support strategic decision making. The FAA plans to spend $173 million on SWIM between FY 2008 and FY 2012.

- **NextGen Networked Enabled Weather (NNEW):** According to the FAA, approximately 70 percent of annual NAS delays are attributed to weather. The FAA believes that NNEW will help it cut weather-related delays at least in half. FAA officials have stated that the weather problem is about total weather information management, and not just the state of the scientific art in weather forecasting. In addition, FAA officials state that weather dissemination system today is inefficient to operate and maintain, and information gathered by one system is not easily shared with other systems.

  If SWIM will function as an internet-like network for NAS users, the FAA and other agencies, then NNEW will manage the weather information content of that network. In

other words, NNEW will integrate weather information from multiple weather sources and package that information for dissemination on the SWIM network to meet the specific needs of individual NAS users. The FAA plans to spend $102 million on NNEW between FY 2008 and FY 2012.

- **Data Communications:** Initially, data communications will provide an email-like means for two-way exchange between controllers and flight crews for air traffic control clearances, instructions, advisories, flight crew requests and reports. This will alleviate air-to-ground voice frequency congestion and reduce communications errors. The FAA estimates that with 70 percent of aircraft data-link equipped, exchanging routine controller-pilot messages and clearances via data will enable controllers to safely handle approximately 30 percent more traffic.

  In the future, data communications will facilitate exchanges directly between aircraft and ground-based automation systems. In other words, aircraft flight management computers will communicate intent data (i.e., route and flight trajectory information) directly to ground-based automation systems, and in turn ground-based automation will communicate aircraft reroutes, clearances and other necessary information back to aircraft computers. The FAA plans to spend $126 million on data communications between FY 2008 and FY 2012.

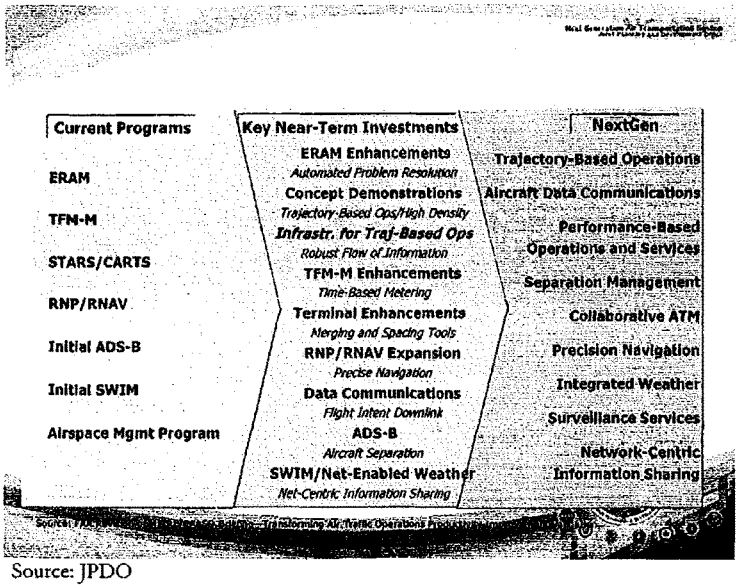
- **NAS Voice Switch (NVS):** In the NAS, the voice communication architecture consists of ground telecommunication lines that connect facilities, radios that allow for conversations with aircraft providing the air-to-ground connection, and voice switches that direct the controller's voice either across the ground lines to other facilities, or across the ground lines to the radios for talking to the planes. The connections between the voice switches and the radios and between voice switches in adjacent facilities are all "hard-wired" and cannot be easily changed.

  The existing FAA voice switches are aging and a number are over 20 years old and in need of replacement. However, a simple replacement of the existing switches will not meet the future NextGen requirements. In the future, controllers in one facility will need to talk with aircraft that can only be reached today by another facility. Therefore, the NVS must be able to let each controller utilize a wide array of radio and communications equipment to talk to airplanes outside their current facility's area of control. The FAA plans to spend $157 million on NVS between FY 2008 and FY 2012.

In addition, FAA officials recently testified that NextGen funding requirements for the first ten years range from $8 billion to $10 billion, and that preliminary estimates suggest that the investments necessary to achieve the end state NextGen system range from $15 billion to $22 billion. However, in February 2007, the DOT IG reported that there are still considerable unknowns, and costs will depend on, among other things, performance requirements for new automation, weather initiatives, and the extent to which FAA intends to consolidate facilities.

IV. NextGen

The chart below depicts current NextGen-related FAA programs, key near-term investments and NextGen capabilities.



Source: JPDO

While more details about the specific NextGen technologies and capabilities will be forthcoming in the JPDO's Enterprise Architecture and Integrated Work Plan, it is expected that major NextGen capabilities will include:

- **Trajectory-based Operations/Data Communications/Enhanced Automation**: In the future, NAS users will be able to select their own more direct flight paths, rather than following the existing interstate-like grid in the sky. Trajectory-based operations will enable this by providing shared situational awareness about the current location and predicted path of each aircraft in the NAS in three dimensions and at specific points in time. Each aircraft will transmit and receive precise information about the time at which it and others will cross key points along their paths.

  Pilots, controllers, aircraft and ground-based automation systems will have the same precise intent data (and other information), transmitted via data communications. This direct exchange of information via data communications will increase the precision of flight trajectory management.

In addition, in certain domains of flight, such as en route, tactical control and separation of aircraft will increasingly become the function of computer automation, not air traffic controllers. This will reduce both controller workload and FAA costs.

When complete, these capabilities will allow for NAS-wide coordination and tactical de-confliction of each aircraft flight path trajectory from takeoff to landing, resulting in less aircraft maneuvering and more direct and fuel efficient routing for NAS users. It will also provide assurance of conflict free aircraft flight profiles, increasing capacity and safety.

Some current or near-term related FAA investments include: ERAM, STARS/TAMR, Area Navigation/Required Navigation Performance (RNAV/RNP) procedures, ADS-B, SWIM and Data Communications.

- **Collaborative Traffic Flow Management/Net-Centric Information Sharing/Integrated Weather:** These are strategic decision support tools that will provide NAS-wide common situational awareness regarding traffic flow, weather, etc. between the FAA, other agencies and NAS users. This will enable the FAA to work with NAS users to strategically coordinate traffic flows throughout the NAS, enabling users to avoid weather and mitigate delays. In addition, weather information will be integrated into a common picture available to all NAS users and air traffic controllers. Some current or near-term related FAA investments include: SWIM, TFM-M and NNEW.

- **Performance-based Operations and Services:** To fly certain beneficial procedures and routes (e.g., narrow and precise RNAV/RNP approach and departure paths that save airlines fuel), NAS users will be able to demonstrate to the FAA that they have aircraft, avionics (including flight management systems and software that will enable aircraft to self-pilot certain procedures) and training that will meet required performance tolerances, as opposed to FAA prescribing specific equipment and training. This approach will theoretically enhance innovation and international harmonization. Some current or near-term related FAA investments include: RNAV/RNP procedures and airspace redesign efforts to support those procedures.

- **Satellite-based Surveillance/Reduced Aircraft Separation:** Satellite-based surveillance will result in cost savings for the FAA because it requires less ground-based infrastructure for the FAA to acquire and maintain. It will also enhance surveillance coverage in areas that are not radar accessible. Moreover, satellite-based navigation may offer greater precision and accuracy than radar, which could contribute to reduced aircraft separation. Reduced aircraft separation will provide greater system capacity and fuel savings for NAS users. At some point in the future, satellite-based surveillance and aircraft equipage may also enable aircraft and pilots to self-separate, which could further contribute to reduced aircraft separation. Some current or near-term related FAA investments include: ADS-B and RNAV/RNP.

V. User Costs and Benefits

To take advantage of NextGen capabilities and services, NAS users will need to acquire or upgrade aircraft avionics and other equipment. In many instances, the FAA will need to mandate certain aircraft equipage. MITRE, working with FAA, has developed a preliminary estimate of the

NextGen avionics costs, which concludes that the most probable range of total avionics costs to system users is $14 billion to $20 billion. The FAA estimates that the equipage costs for general aviation users will range from $7,000 - $30,000, whereas equipage costs for commercial users will range from $32,000 - $670,000, depending on the type and age of the aircraft, and desired level of capability. These ranges in cost account for the various vintage aircraft that would be retrofitted.

While NextGen will require considerable investment by NAS users, it should also provide substantial benefits in terms of reduced costs. For example, airlines stand to benefit from greater reliability of block times,[6] reduced time in each phase of flight and associated fuel savings, and better information about weather, traffic and other factors for improved decision making. JPDO preliminary analysis indicates that NextGen annual user cost savings and benefits could range from $12.3 billion to $32.1 billion.

VI. Human Factors and Stakeholder Involvement

NextGen contemplates an increased reliance on automation, which raises questions about the role of the air traffic controllers in such an automated environment. More specifically, the controller's role is expected to change from direct, tactical control of aircraft to one of overall traffic management. Therefore, the DOT IG has stated that need for focused human factors research extends well beyond the traditional computer-machine interface (such as new controller displays) and has important workforce and safety implications.

Similarly, NextGen envisions that at some point in the future pilots will take on a greater share of the responsibility for maintaining aircraft separation and will rely more on data communications. This raises human factors questions about whether pilots can safely perform these additional duties.

According to the GAO, the evolving roles of pilots and controllers is the NextGen initiative's most important human factors issue, but will be difficult to research because data on pilot behavior is not readily available for use in creating models. Moreover, the GAO reports that the JPDO has not yet studied the training implications of various systems or solutions proposed for NextGen. For example, new air traffic controllers may need to be trained to operate both the old and the new equipment as NextGen technologies mature.

In addition to safety implications, the GAO has reported that the lack of stakeholder or expert involvement early and throughout the development and implementation of ATC modernization projects has been a key factor leading to cost overruns and delays. In November 2006, GAO reported that active air traffic controllers were not currently involved in the NextGen planning effort and recommended that JPDO determine whether any key stakeholders and expertise were not represented on its IPT's, divisions, or elsewhere within the office. According to the GAO, in July 2005, the FAA terminated the controller liaison program, wherein active controllers were assigned to, among other things, provide input on modernization projects. The FAA determined that the program was not providing sufficient benefit compared to the program's cost. GAO also reports that, at that time, the controllers union disengaged from participating on all FAA

[6] The total time it takes to taxi, take off, fly, land, and taxi to the gate at the destination airport. The more reliable the block times, the more efficiently airlines can schedule their crews and other resources.

workgroups and technological projects, including the JPDO. Since then, the head of the controllers' union has resumed participation on the IMC. However, according to the GAO, no active controllers are yet participating at the IPT planning level.

The GAO also states that aviation technicians do not participate in NextGen efforts. The GAO further states that input from current air traffic controllers who have recent experience controlling aircraft and current technicians who will maintain NextGen equipment is important when considering human factors and safety issues.

VII. SESAR: The European Air Traffic Modernization Initiative

The Single European Sky Air Traffic Research Project, commonly known as SESAR, is essentially the European equivalent of the NextGen. The SESAR Consortium, consisting of representatives from a wide-range of industry groups, is the organization tasked by the European Commission (EC) and Eurocontrol with planning the future European air traffic management system.

The Consortium, which began work in March 2006, is currently developing a technological road map for the future European air traffic management system. This road map is part of the project definition phase - the first of SESAR's 15-year, three-phase air traffic management modernization program. The two-year project definition phase will conclude in March 2008. The EC and Eurocontrol have provided 60 million euros (approximately $81 million) for research and study on the project definition phase, which is being conducted by Consortium members.

The second phase of SESAR will be the development phase (2008-2013), which will focus on research, development and prototyping of the key system components. The EC has agreed to a proposal to use a Joint Undertaking (JU), a legal instrument that allows public-private partnership, to govern the development phase. The JU will have an estimated budget of 300 million euros (approximately $407million) annually, committed evenly by the EC, Eurocontrol and industry.

The third and final phase is the deployment phase, lasting from 2014 to 2020. This will be executed by industry.

SESAR faces somewhat different implementation challenges than NextGen, most notably, forging a consensus between air navigation service providers representing nearly 40 countries, as opposed to working with a single government. The SESAR Consortium has also adopted a different governance structure than the JPDO. For the definition phase, the SESAR Consortium is a bottom-up organization, meaning that the aviation industry is essentially developing the air traffic management road map for final approval by Eurocontrol and the EC. In the U.S., the Federal government is developing the NextGen plans, with input from the aviation industry via the Institute. U.S. members of the SESAR Consortium include Boeing, Honeywell, and Rockwell Collins.

VIII. The Role of Private Industry

Some of the FAA's recent actions, combined with provisions in the FAA's reauthorization proposal, indicate that the FAA may look increasingly at private industry to play a major role in the development and implementation of NextGen. For example, the FAA intends to structure its ADS-B acquisition, which the agency has described as the "backbone of NextGen," as a service contract

or lease. Specifically, the FAA plans to let vendors install, own and maintain the ground-based infrastructure (which could include as many as 400 ground-based ADS-B transceivers), while the FAA will own the design specifications, surveillance and flight data transmitted and received between aircraft and ground-based equipment.

FAA officials believe that a service contract approach for ADS-B will reduce FAA costs by allowing the FAA to forego the expense of acquiring or leasing the land (and to forego associated environmental due diligence requirements) necessary to deploy the ADS-B ground-based infrastructure, as well as potentially foregoing other acquisition, operating and maintenance costs. However, given the large scale of the acquisition – ADS-B will be the primary ATC surveillance system for the entire NAS - this approach may also raise management and oversight challenges. For example, ensuring adequate safeguards are in place if the vendor is acquired by another firm, a foreign firm, enters bankruptcy, or experiences performance problems.

In addition, while Congress debates the FAA's hybrid cost-based user fee financing proposal, FAA officials believe that the agency currently has the authority to enter into agreements with private vendors to provide both the FAA and NAS users with communications, navigation and surveillance services, and to allow those vendors to charge fees to users for those services. For example, FAA officials have suggested that once the ADS-B infrastructure is in place, the vendor might provide the same service it provides the FAA, or additional services, to NAS users and other customers for a fee. The FAA plans for a portion of the vendor's profits from the secondary sale of the air traffic data will act as a rebate against the FAA's subscription fee, thus offering the potential for cost savings for the agency. However, this approach may raise management and oversight issues; for example, establishing the appropriate role for the FAA and Congress in controlling fee rates. Section 402 of the FAA reauthorization proposal enumerates some broad guidelines for the FAA to consider when using this authority, including: the effect on the safety and efficiency of the NAS; competition; the role of general aviation; and the widespread use of such services at affordable rates.

Similarly, it has been reported that the FAA recently approved the first third-party provider to design RNP procedures.[7] FAA officials state that NAS users have expressed concern that the FAA will not be able to quickly satisfy the demand for new fuel saving RNP procedures, and that users might be willing to pay private vendors to get faster development of these procedures rather than wait for the FAA. Therefore, the FAA will enter into agreements with vendors capable of developing these procedures, which the FAA will publish if they are correctly done. NAS users would pay select vendors directly. Section 410 of the FAA's reauthorization proposal would expand the FAA's authority to delegate to non-government third-parties the ability to develop aircraft operating procedures.

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[7] "In a move expected to speed the adoption of Required Navigation Performance approaches and departures by U.S. airlines, the FAA has approved the first third-party provider to design these custom procedures. . . While the FAA is publishing RNP procedures on its own for "public use" at the rate of 25 a year, Naverus will now be able to contract with U.S. airlines and airports (as it already does with Asia-Pacific carriers) to develop customized procedures. This could cost a few hundred thousand dollars or more for procedures at one airport, depending on the complexity." David Hughes, FAA OKs Outsourcing of RNP Design, *Aviation Week*, Apr 15, 2007.

FAA officials believe that there may also be other instances when, as new technologies are developed, it might be more efficient for communication, navigation or surveillance service to be provided directly to users. The FAA would retain its regulatory and inspection authority to assure the continued safe operation of the NAS, as opposed to inserting itself as a middleman in the procurement of these services. However, last month, the president of the union representing technicians and specialists that certify and maintain FAA equipment and procedures expressed doubts about the FAA's ability to adequately supervise third-party design initiatives.

WITNESSES

PANEL I

Robert Sturgell
Deputy Administrator and Interim Chief Operating Officer
Air Traffic Organization
Federal Aviation Administration

Charles A. Leader
Director, Joint Planning and Development Office
Next Generation Air Transportation System

Dr. Gerald Dillingham
Director, Physical Infrastructure Issues
U.S. Government Accountability Office

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

Dr. Agam N. Sinha
Senior Vice President and General Manager
Center for Advanced Aviation System Development
MITRE

PANEL II

Peter J. Bunce
President and CEO
General Aviation Manufacturers Association

Christina Frederick-Recascino, Ph.D.
Interim Provost and Director of Research
Embry-Riddle Aeronautical University

Thomas Brantley
President
Professional Airways Systems Specialists

Dr. Michael Romanowski
Vice President of Civil Aviation
Aerospace Industries Association

HEARING ON THE FUTURE OF AIR TRAFFIC CONTROL MODERNIZATION

Wednesday, May 9, 2007,

HOUSE OF REPRESENTATIVES,
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE,
SUBCOMMITTEE ON AVIATION,
Washington, DC.

The subcommittee met, pursuant to call, at 10:00 a.m., in Room 2167, Rayburn House Office Building, the Honorable Jerry F. Costello [chairman of the subcommittee] presiding.

Mr. COSTELLO. The Subcommittee hearing will come to order. The Chair would ask all members, staff, and everyone in the room to turn off their electronic devices or put them on vibrate.

The Subcommittee is meeting today to hear testimony on the future of the air traffic control modernization program. I will give my opening statement, recognize the Ranking Member, Mr. Petri, for his opening statement, call on other members for comments and remarks, and then we will get to our witnesses.

I welcome everyone here this morning to our hearing on the future of the air traffic control modernization. A major part of the Administration's FAA reauthorization proposal is to overhaul and transform our ATC system.

Some have suggested that the Administration's proposal puts the cart before the horse by emphasizing financing without fully explaining the Next Generation Air Transportation System. Today, the Administration will have the opportunity to explain its vision for the future.

While I have differences with the Administration regarding financing, I agree that the ATC system must be modernized. The FAA's forecast that airlines are expected to carry more than 1 billion passengers by 2015, increasing from approximately 740 million in 2006. The Department of Transportation predicts up to a tripling of passengers, operations, and cargo by the year 2025.

At the same time, the increased use of regional jets, the emergence of low-cost and new carriers, more point-to-point service, and the anticipated influx of very light jets, as well as other new users such as unmanned aerial systems and commercial space vehicles, are placing a new and different type of stress on the system.

Under the current system, controller workload, radio frequency, voice congestion, and the coverage and accuracy of ground-based navigational signals impose limitations on capacity. The NextGen plan that is under development will consist of new concepts that rely on satellite-based capabilities, data communication, informa-

tion, and weather capabilities that will support strategic decisions and enhanced automation.

While it is imperative that Congress provide the funding to make NextGen happen, NextGen is not just about financing. We have learned from the past that the NextGen system must evolve incrementally through sound contract management by the FAA, coupled with vigorous congressional oversight.

Further, everyone should know that the major capital requirements for NextGen will not entirely happen during this reauthorization cycle. As I have stated in the past, the FAA is requesting less capital funding during the three years of its new proposal than the FAA requested in the first three years of its last proposal.

Moreover, the Administration must get a better grasp on long-term NextGen cost. Earlier this year, the Department of Transportation's Inspector General reported that there are still unknowns regarding NextGen's costs which will depend on, among other things, performance requirements for new automation, weather initiatives, and the extent to which the FAA intends to consolidate facilities.

The IG has reported that in the past the FAA's major acquisitions have experienced billions of dollars of cost growth and years of schedule delays directly due to overly ambitious plans, complex software development, changing requirements, and poor contract management. The IG has also stated that the FAA must articulate a strategy for how it will mitigate past problems that have led to massive cost growth.

For many years, the Government Accountability Office has consistently reported that failing to involve air traffic controllers in the technology development process to resolve tricky human factor issues has led to costly rework and delays. The IG has noted that the need for focused human factors research has important safety implications. Common sense would suggest that the people that will be using and maintaining this new technology should be involved in its development. Therefore, I am concerned that the GAO is now reporting that no current controllers or technicians are involved at the more detailed planning levels for NextGen. I look forward to hearing from our witnesses on this issue this morning.

In addition, it is clear that the Administration envisions a major role for the private sector in the development and implementation of NextGen. For example, the FAA intends to structure its automated dependent surveillance broadcast acquisition, which will be the primary ATC surveillance system for the entire National Airspace System as a service contract or lease. Further, while Congress debates whether to allow the FAA to charge user fees, the FAA is considering allowing its ADS-B vendor to charge fees for services. I think this approach has serious implications, and it is time for Congress to engage in this decision.

With that, I want to welcome all of our witnesses here today, and before I recognize Mr. Petri, our Ranking Member, for his opening statement or comments, I ask unanimous consent to allow two weeks for all members to revise and extend their remarks and to permit the submission of additional statements and materials by members and witnesses.

Without objection, so ordered.

At this time, the Chair recognizes our Ranking Member, Mr. Petri, for his opening statement or any comments that he may have.

Mr. PETRI. Thank you very much, Mr. Chairman.

This Subcommittee first addressed the topic of today's hearing, air traffic control modernization, nearly a quarter century ago, during the first term of the Reagan Administration. Since then, the Federal Government has spent nearly $44 billion in taxpayer money on the quest to upgrade the Nation's air traffic control system.

Until recently, the air traffic control modernization effort has been plagued by cost overruns, scheduling delays, and mismanagement. However, the FAA has vastly improved its track record over the last few years. I would like to commend the FAA Administrator Marion Blakey for her leadership and efforts to get the bulk of our air traffic control modernization programs back on time and on budget.

Under the leadership of Administrator Blakey and the former Chief Operating Officer, Mr. Russell Chou, the air traffic organization has started to resemble the performance-based, value-driven organization that Congress envisaged. Both the GAO and the DOT Inspector General found that air traffic organization has made significant progress in meeting cost, schedule, and performance targets for its major air traffic control acquisition programs.

However, if we fail to sustain this progress and make significant strides in modernizing our air traffic control system over the next decade, then I fear a meltdown of our Nation's air traffic control system is inevitable. Such a meltdown would cripple our Nation's economy, which stands to lose $30 billion annually due to people and products not reaching their destinations within the time periods that we expect currently.

The need for air traffic control modernization is overwhelming. The FAA's recent forecast conference could not have made it any clearer: air transportation demand is growing and soon will be greater than today's system can handle.

According to the FAA, domestic air passenger traffic will nearly double to 1 billion passengers annually by 2015 and swell to 1.5 billion passengers by 2025. It is a testament to the FAA's 50,000 employees that our air traffic control system has and continues to be the largest and the safest in the world. We must ensure that the system is modernized so that this record is continued.

As we modernize, part of the benefit we expect will be the cost savings and cost avoidance associated with the closure of already outdated and redundant facilities. In light of political opposition to such closures, as evidenced by the reaction following FAA's proposal to consolidate certain radar stations, or TRACONs, I am interested in looking at the benefits of establishing a commission similar to the BRAC type process at the Department of Defense—which was set up by our colleague, Dick Armey, or at his suggestion some years ago—to evaluate and recommend closures based on the best efficiency and cost savings for the NAS.

I look forward to hearing from today's witnesses on the current progress of the NextGen effort, as well as the plans for the future. Over the past six years, there were 11 Subcommittee oversight

hearings related to the FAA's NextGen effort. As this effort moves forward, we must continue this oversight on what is a very complicated but very necessary effort.

So I look forward to working with you, Mr. Chairman, as modernization advances in the months and the years ahead, and, with that, I yield back my time.

Mr. COSTELLO. The Chair thanks the gentleman and recognizes the gentleman from Iowa, Mr. Boswell.

Mr. BOSWELL. Thank you, Mr. Chairman. I would like to associate myself with what both you and Mr. Petri said. I don't have a prepared statement, but I would like to say this to our people sharing with us at the table. Talk to us straight about what we really need. I hear all this talk about NextGen, but I haven't seen anything that would make me think that we have actually something that is moving, except we are talking about it. Everybody would agree that we have to modernize and upgrade and have more capacity. I think that is understandable, but I don't hear any proposal that would make it sound like we are actually at some step level of what we are going to put on the table.

Also, I would hope that as you differentiate your responsibilities, do we have adequate funding; is it working? Is the trust fund in that bad a shape and is it adequate to do the things that we are talking about at this point based on what we know, or is there a shortfall? Are we trying to use all of this or are some people are advocating for doing everything they seem to be able to think of doing to advocate for the user fee. I think it is pretty clever what happened over in the Senate. Pretty clever, trying to separate the general aviation community, and I just don't want you to think that some of us haven't noticed that. I would hope we don't go down that slope, that we try to work out some feasible, reasonable, working together to maintain the safety and to keep the economy of our general aviation going, and not see situations where we just turn that major source of our economy in this Country down like we have seen it happen in other places around the world. So I hope you include that in some of your remarks.

Thank you, Mr. Chairman.

Mr. COSTELLO. We thank you.

The Chair, at this time, recognizes Dr. Ehlers.

Mr. EHLERS. Thank you, Mr. Chairman. I will be brief, but I just want to go back some time. It is one of the few advantages of being older, you know.

Back to 1956, when I was graduating from the University of California at Berkeley, I was elected to the Sigma Psi Honors Society. At the induction we had a speaker, a professor of transportation, who outlined why this Nation needed an air traffic control system to handle the transcontinental flights or the intercontinental flights. He pointed out very clearly and mathematically that, very likely, two heavily loaded airliners would collide in midair somewhere over this Country at some point in the next year, and in fact it happened. We all remember the crash over the Grand Canyon. Two major airliners went down with the loss of all lives. That was the beginning of our good national air traffic control system.

I don't know why people tend not to react until the crisis has occurred, but this is a good example why we have to have an improved air traffic control system now, to avoid the tragedies of the future.

I applaud the FAA for tackling this problem. I hope to give them all the support possible. I hope they can develop a good system that is workable for all classes of airplanes, at all times, at reasonable cost, and I hope we can achieve those objectives.

With that, I will yield back.

Mr. COSTELLO. The Chair thanks the gentleman and recognizes the gentleman from Colorado, Mr. Salazar.

Mr. SALAZAR. Thank you, Mr. Chairman.

Over the past several months, we have had multiple hearings on FAA reauthorization. I would like to associate myself with Congressman Boswell's comments on the importance of general aviation and I believe the impact user fees would have on general aviation. I appreciate that we are holding this hearing today on the issue of future air traffic control modernization and transformation of the NextGen.

Our Nation's air traffic management system must be sufficiently updated to meet future needs, and I believe the Administration has yet to provide concrete details on how exactly it proposes to get there. While we wait, we continue to have problems. Problems continue to arise and demand, I think, immediate attention.

In Colorado, there has been a need to solve airspace surveillance issues now because we didn't have time to wait for the ADS to be implemented. The result was that the Colorado-wide area multilateration system, which is funded by the State of Colorado, will be maintained by the FAA after installation. It solves our current problems for today, but it will be upgraded to solve the problems of tomorrow when ADS is functional and the aircraft are equipped to use this technology.

The FAA should provide Congress with a comprehensive plan to determine what specifically the NextGen system will entail. Another instance of the FAA coming across as being, I believe, a little less than forthcoming, is with their poorly defined plan to realign, consolidate, co-locate, and close some of their facilities and services. I do appreciate the FAA looking to improve its cost control efforts, but I am concerned with some of their proposed changes and whether it would do more harm than good.

I have had numerous conversations with the FAA on the matter of consolidating TRACONs. There have been rumors that the FAA intends to co-locate or consolidate the public TRACON either to Colorado Springs or Denver. I have also been informed that the FAA is considering decommissioning the VOR at Steamboat Springs. That is a very mountainous airport and I have used the VOR to land there several times. Not only would this reduce the approach options provided to pilots, but it prematurely removes VOR without first having a suitable GPS replacement.

I can understand the desire to cut costs, but I have serious concerns, and I would hope that the panel today would address those issues. I look forward to the testimony today.

Thank you, Mr. Chairman. I yield back.

Mr. COSTELLO. I thank you.

The Chair now recognizes the gentlelady from California, Ms. Matsui.

Ms. MATSUI. Thank you, Chairman Costello and Ranking Member Petri, for holding this important hearing on the future of the Nation's air traffic control system, and thank you to today's witnesses for providing testimony.

Everyone seems to agree that the current technology and infrastructure that makes up the air traffic control system will not be able to handle the surging growth that we are expecting the next decade and beyond. So modernization needs to happen and there is much at stake.

If we don't get this right, our constituents are going to be waiting in more lines and sitting through more delays than they have ever had to before, and the aviation system will not be able to meet the Nation's demand. So this is a big challenge with very significant consequences. That is why we are talking about NextGen.

There is significant reason to be wary of this effort, as I am sure will be discussed extensively today. The FAA has an unimpressive history of cost overruns, schedule slips, and program cancellations. We need to modernize the Nation's aviation system, but we need to do it in a smart and cost-effective manner. We are in a tightly constrained fiscal environment, so we only get one shot at doing this right.

The FAA and its partners have put forth some intriguing concepts that hold great potential to increase capacity and efficiency. I am excited about these ideas, but we must determine what is realistically achievable given the time line and fiscal constraints that we are facing.

We are not going to be able to execute every great idea that our scientists and engineers come up with. We need to filter out what is pragmatic and realistic. We have certainty about the need to increase capacity and to modernize. We have much less certainty about how to do it.

I understand that with an enterprise of this scale and magnitude, you are going to have setbacks and adjustments are going to be made. That is why it is important that we are pragmatic in planning this effort so we are not sitting here in five or ten years talking about how much money we wasted or how far behind schedule we are. This modernization is just too important for that to happen.

I look forward to working with all my colleagues and all the agencies involved to make this modernization effort a success that transforms the Nation's aviation system for the 21st century.

With that, I would like to thank the witnesses for taking the time to be with us today. I look forward to your testimony.

I yield back my time.

Mr. COSTELLO. Thank you.

For final opening statement or remarks, and then we will go to our first panel of witnesses, the Chair recognizes the gentleman from Missouri, Mr. Carnahan.

Mr. CARNAHAN. Thank you, Mr. Chairman. I appreciate your and the Ranking Member holding this hearing.

I am really very proud of our Nation's long history in aviation innovation. After completing his first pilot training class in 1924,

Charles Lindbergh began flying a mail delivery route from Lambert-St. Louis Field, the airport that Chairman Costello and I use to go home on weekends still today. His famed aircraft, the Spirit of St. Louis, was named after the city that I represent.

While I am proud of our Nation's aviation history, I recognize that significant changes to the National Airspace System are necessary to accommodate the increased demands from the system. NextGen, which the Joint Planning and Development Office is producing, will allow our aviation community to continue to grow and maintain its economic strength. However, it is important for JPDO to recognize that the multi-billion price tag on NextGen will require intense oversight and cost controls. I don't believe this Committee, or anyone in this Congress, will allow billions of taxpayer dollars to be improperly spent.

The JPDO does not have a flawless track record. Though progress has been made, the GAO still classifies NextGen as high-risk. I assure you this Committee will be watching closely over NextGen. I look forward to hearing from you today and working with the Chairman and Ranking Member as we go forward. Thank you.

I yield back.

Mr. COSTELLO. The Chair thanks the gentleman.

At this time, we will hear from our first panel. I will do very brief introductions. Our first witness will be Mr. Robert "Bobby" Sturgell, the Deputy Administrator and Interim Chief Operating Officer, Air Traffic Organization, Federal Aviation Administration; Mr. Charles Leader, the Director of the Joint Planning and Development Office, Next Generation Air Transportation System; Dr. Gerald Dillingham, the Director of Physical Infrastructure Issues, U.S. Government Accountability Office; the Honorable Calvin Scovel, the Inspector General for the U.S. Department of Transportation; and Dr. Agam Sinha, who is the Senior Vice President and General Manager for the Center for Advanced Aviation System Development.

We would now ask all of our witnesses to summarize their statement in five minutes, if they possibly can. We will have your entire statement submitted and it will appear in the record.

At this time, the Chair recognizes Mr. Sturgell.

TESTIMONY OF ROBERT STURGELL, DEPUTY ADMINISTRATOR AND INTERIM CHIEF OPERATING OFFICER, AIR TRAFFIC ORGANIZATION, FEDERAL AVIATION ADMINISTRATION; CHARLES A. LEADER, DIRECTOR, JOINT PLANNING AND DEVELOPMENT OFFICE, NEXT GENERATION AIR TRANSPORTATION SYSTEM; GERALD DILLINGHAM, PH.D., DIRECTOR, PHYSICAL INFRASTRUCTURE ISSUES, U.S. GOVERNMENT ACCOUNTABILITY OFFICE; THE HONORABLE CALVIN L. SCOVEL, III, INSPECTOR GENERAL, U.S. DEPARTMENT OF TRANSPORTATION; AGAM N. SINHA, SENIOR VICE PRESIDENT AND GENERAL MANAGER, CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT, MITRE

Mr. STURGELL. Good morning, Chairman Costello, Congressman Petri, members of the Subcommittee. I am Bobby Sturgell, the Deputy Administrator of the Federal Aviation Administration and the

Interim Chief Operating Officer for the Air Traffic Organization. I appreciate including our written statement into the record and I am glad to be with you here today to discuss the topic that many have recognized is of utmost importance and urgency, that is, the FAA's plans to modernize and transform our air transportation system so that we are prepared to meet the significant traffic demands expected in the future.

Mr. Chairman, our case for change is compelling. I know you know that civil aviation accounts for nearly $690 billion in direct and indirect contributions to the U.S. economy and is responsible for 10 million jobs and $343 billion in wages. No doubt, we all want these benefits to continue and improve, but our air transportation system is, in many ways, a victim of its own success.

Even as we have created the safest, most efficient system in the world, our system is hitting the wall. Flight delays have increased each of the last three years and, as the summer travel season gets underway, we expect the problems to get worse; and these problems won't go away in the future.

We are forecasting a billion passengers by the year 2015 and we expect a doubling or possibly tripling of air traffic by the year 2025. Moreover, we have to anticipate the unique challenges that come with a new generation of air traffic vehicles, such as very light jets, unmanned aerial systems, and commercial space launches. The exact quantity and composition of these vehicles are not, however, fully predictable at this point.

While all of this growth is exciting and good, it brings with it the problem of congestion. Congestion robs the family of precious time, it limits the freedom of our citizens, and it puts a drag on our increasingly global economy.

The delay in dollars? We are estimating that commercial aviation could see an annual loss of $500 million for every minute of scheduled block time, the time which refers to that from gate-to-gate for the airlines.

The cost to the whole country? Today's tab stands at $9.4 billion a year due to commercial passenger delays, and that number could climb as high as $22 billion by the year 2022.

Our current system simply isn't scalable to handle these challenges, this kind of growth. Research done by the FAA has shown that our current air traffic system, using that system, controllers could not handle a 25 percent increase in air traffic, which is the amount that we expect in the 2015 to 2017 time frame. That is why we need the Next Generation Air Transportation System, a full-scale transformation that takes into account every phase of the process: air traffic control, airports, the environment, the military, and homeland security requirements.

The NextGen system will be a much more automated and flexible system than the one of today. Navigation and surveillance will be more precise. Pilots and operators will know the location of other aircraft operating in the system. Air traffic control of individual airplanes will evolve into air traffic management and control by exception and aircraft flight paths will be trajectory-based to provide optimal routing.

To implement this transformation, we are already moving forward with Automatic Dependent Surveillance-Broadcast (ADS-B)

and System Wide Information Management (SWIM), two of NextGen's core backbone technologies.

Of course, we recognize that these programs are only part of the process. NextGen encompasses many programs and components, all of which need to be properly integrated and aligned. That is why we are turning to a proven management vehicle, the Operational Evolution Partnership, the OEP, which we have been using for many years.

In the past, the OEP successfully provided a midterm strategic road map for capacity increases that extended 10 years into the future. The new OEP has an expanded scope, beyond just capacity, and will include strategic milestones through 2025 as we go forward with NextGen. The FAA will use the OEP to plan, integrate, and implement NextGen in partnership with the private industry.

Charles Leader will discuss more about our efforts towards NextGen, so let me just close by saying that we are at a crossroads today. The system is at capacity and it must be transformed. If we fail to act, we will be left with gridlock in the skies. The world recognizes the problem. Europe is already moving ahead with SESAR, their version of NextGen, and they have the funding to do it. If we fail to act, the world will look to someone else for leadership, not us. Someone else's technologies and standards will pave the way if we don't. By funding and building NextGen, we can keep America at the forefront and avoid gridlock.

Thank you, Mr. Chairman. I look forward to answering questions from the Committee.

Mr. COSTELLO. Thank you.

The Chair now recognizes Mr. Leader.

Mr. LEADER. Good morning, Chairman Costello, Congressman Petri, and members of the Subcommittee. My name is Charles Leader, and I am the Director of the multi-agency Joint Planning and Development Office. I appreciate accepting the written comments into the record.

I think you will agree that the United States has the safest and most efficient air traffic control system in the world. It handles a staggering amount of traffic each day that includes passenger flights, air cargo, military operations, unmanned aerial vehicles, and space launches.

But as capable as it is, we are already seeing the limits of the current system. Delays and cancellations are growing, and unless we begin to transform the system now, the problems are only going to get worse. The issues concerning the future capacity and flexibility of the national air transportation system are matters that the House and this Committee understand very well.

In 2003, Vision 100, the FAA reauthorization, chartered the Next Generation Air Transportation System Initiative and established the Joint Planning and Development Office. NextGen, as envisioned by Congress, is a steady, deliberate, and highly collaborative undertaking aimed at the long-term transformation of our national air transportation system. It is a transformation which I am pleased to say is already underway.

NextGen, while representing a continuum of research, investment, and implementation activities, can be more easily explained

if it is broken out into its three major phases. Each one represents a key period in NextGen's development.

The first phase focuses on the development and implementation of certain key NextGen foundational technologies and capabilities. These initiatives represent our current programs; they are the foundation. This phase also includes the essential research and development needed to support the future development of NextGen.

The second phase builds on this foundation to begin critical implementation of NextGen capabilities. This is where many aircraft in the fleet will begin to operate using onboard NextGen tools. This will allow greater expansion of the RNP/Area Nav capabilities, net-enabled weather, advanced data communications, and the development of the critical infrastructure to support Trajectory-Based Operations.

The third phase will be a maturation of our core NextGen capabilities into an operational nationwide system. This is where the aviation services are managed and operated in a way that achieves the NextGen transformation across the entire system.

Implementation of NextGen has already begin. Two programs, both foundational technologies, are critical in this first phase of NextGen and were mentioned by the Deputy Administrator. They are the Automatic Dependent Surveillance-Broadcast and System Wide Information Management Systems. Both of these programs are funded and already underway. ADS-B relies on GPS and is critical in developing NextGen's satellite-based navigation and control capabilities. SWIM is developing our key networking capabilities and will establish the critical networking infrastructure.

I want to make a point about SWIM and network enabled operations. The Department of Defense, Homeland Security, and the FAA have each contributed $5 million this year to fund the real-time demonstration of this capability. Each of these programs and the capabilities they represent are essential in beginning the transformation of our current air traffic control system from one that relies on voice communication and ground-based surveillance to one that is satellite-based, network-enabled, and uses advanced digital capabilities.

By its very nature, this kind of initiative needs to use a portfolio-based approach. In other words, the approach has to be one that allows the JPDO to integrate a wide range of research initiatives and investments. That is why some of the most important products of the Joint Planning and Development Office have been its three key planning documents: the Concept of Operations, which went out for final review last month; the Enterprise Architecture, which will be released next month; and the Integrated Work Plan, which will be released for comment in July.

I have copies with me of these documents to demonstrate that they are real and substantial in the detail in which they approach the future.

The JPDO was developing NextGen by carefully developing data and using the appropriate models to evaluate the benefits resulting from this investment. If carefully managed, the NextGen program will bring tremendous benefit to our Nation.

I look forward to answering the Subcommittee's questions. Thank you.

Mr. COSTELLO. Thank you.

The Chair now recognizes Dr. Dillingham.

Mr. DILLINGHAM. Thank you, Chairman Costello, Mr. Petri, members of the Subcommittee.

My statement today discusses the studies that we have underway for this Subcommittee on FAA's modernization program for the current air traffic control system and JPDO's efforts that are aimed at transformation to the future air traffic control system.

With regard to the current modernization program, during the last few years FAA has made significant progress in implementing business management practices in acquiring ATC systems. Our work has shown that FAA has also improved the management and operational efficiency of the current system through cost savings, outsourcing, and consolidation. When compared to the years before the establishment of the ATO, these are significant achievements for the FAA.

We view these accomplishments as positive, but not necessarily sufficient for the agency to effectively manage the transformation to NextGen. We continue to keep the modernization program on our list of high-risk programs. We believe that additional work needs to be done to fully address past cost, schedule, and performance problems that FAA previously experienced in acquiring systems, as well as to institutionalize those processes that caused the recent turnaround in the program.

FAA's immediate challenge is filling two key leadership positions. The Administrator's term ends in September and the Chief Operating Office of the ATO left in February. This means that, within the next six months, FAA could have vacancies or acting officials in positions that for the last five years were occupied by its most significant change agents.

With regard to the future ATC systems, a near-term challenge is to determine whether FAA has the technical and contract management expertise that will be required to implement the numerous complex systems that will be a part of the transformation to NextGen. To the extent necessary, personnel and skill sets that are not available within the agency must be acquired in a relatively short time, since the acquisition of NextGen technologies has already begun.

Another near-term challenge is to identify which organizations will fund and conduct the R&D and demonstration work that, prior to restructuring of its aeronautical research portfolio, had been conducted by NASA. FAA's R&D Advisory Committee has estimated that it will cost nearly $100 million annually in additional funding and delay NextGen by five years for FAA to develop the necessary infrastructure and assume the previous NASA R&D.

During the course of our reviews, we also heard a considerable number of concerns from stakeholders about the productivity and pace of JPDO efforts. To its credit, JPDO officials are currently implementing changes in structure and operations at the JPDO that are intended to improve the effectiveness of the organization.

Although JPDO has made some progress in developing its key planning documents, including the Concept of Operations, Enterprise Architecture, and an Integrated Work Plan, some of these documents are nearly a year behind schedule. If this kind of sched-

ule slippage continues, it will become increasingly difficult for JPDO to maintain its credibility and the participation of the aviation community.

Our work has also identified some organizational issues that, if not addressed, could seriously jeopardize JPDO's chances of success. As we told this Committee last year, we believe that, because JPDO lacks authority over the key human and technological resources of its partner agencies, institutionalizing the collaborative process would be critical to JPDO's success. JPDO has been working for two years to establish a Memorandum of Understanding which would define the roles and responsibilities of the partner agencies. To date, the Memorandum has been signed by only three of the partner agencies.

The frequency of leadership turnover at JPDO and the NGATS Institute has also raised concerns about the stability of the organization and the future of the initiative. During its three years of existence, JPDO has had three directors, and there have been two directors of the NGATS Institute. I believe that JPDO must immediately identify and address the factors that have contributed to the frequent turnover its senior management.

Additionally, the Senior Policy Committee, which was established to provide high level advice and policy guidance to JPDO, has met just three times over the last three years, and not at all during the past year. JPDO also has a continuing challenge in ensuring involvement of all key stakeholders. As we testified last year, active air traffic controllers and technicians are not currently involved in NextGen planning.

Mr. Chairman and members of the Subcommittee, in closing, I want to emphasize that ATO and JPDO have both achieved much in their short existence, but both organizations are facing some very serious challenges. Meeting these challenges is time critical and will require the joint efforts of the Congress, the partner agencies, and the private sector.

Thank you.

Mr. COSTELLO. We thank you, Dr. Dillingham.

Mr. Scovel.

Mr. SCOVEL. Mr. Chairman, Ranking Member Petri, Members of the Subcommittee, we appreciate the opportunity to testify on progress to date with the JPDO and efforts to develop NextGen.

While there is considerable controversy about how best to finance FAA, there is almost universal agreement on the need to modernize the NAS to meet the forecasted demand for air travel.

Mr. Chairman, our work shows that the transition to NextGen is a complex, high-risk effort. Much work remains to align agency budgets to make the JPDO an effective multi-agency vehicle, and actions are needed to help FAA successfully deliver new capabilities.

Today I will cover three major areas; the first is progress and problems with ongoing modernization projects.

At the request of this Subcommittee, we are tracking 18 projects with a combined cost of $17 billion. We do not see the massive cost growth seen in the past. This is due to FAA's effort to re-baseline efforts and segment investment decisions. However, there are

projects, such as FAA's Telecommunications Infrastructure Program, that are at risk of not achieving expected benefits.

Second, JPDO's progress to date in coordinating and aligning research. In our recent report, we found that there was considerable coordination among JPDO participating agencies, but little or no alignment of R&D plans, and this is still the case today. We also found that the JPDO's integrated product team leaders had no authority to commit parent agency resources. We concluded that a more product-driven approach was needed.

To its credit, the JPDO has announced a number of changes to be more product-driven. This includes revamping its integrated product teams as working groups. There are four key mechanisms for alignment that are in progress, but they need to be completed.

First, NextGen's enterprise architecture. The JPDO's efforts to develop an overall blueprint for NextGen will help set goals and support investment decisions. However, the architecture documents we have reviewed to date lack sufficient detail to support investment decisions. This is very much a work in progress.

Second, NextGen's R&D plan. The JPDO does not yet have an R&D plan that can guide various agency research efforts over the next several years. It expected to publish such a plan this summer.

Third, NextGen's memorandum of understanding, or MOU. For more than a year, the JPDO has been working to reach agreement on an MOU. To date, this agreement has not been signed by all participating agencies.

Fourth, NextGen's Integrated Budget document. The JPDO is working with OMB to develop an integrated budget that provides a single business case for NextGen efforts. This is expected to be complete in time for the fiscal year 2009 budget cycle.

Finally, there are actions needed to reduce risk and help shift from planning to actual implementation.

Action item one: FAA needs to develop realistic NextGen cost estimates and quantify expected benefits. FAA's current estimates suggest that the Agency will require $15.4 billion for capital projects from fiscal year 2008 to fiscal year 2012. This includes $4.6 billion for NextGen initiatives.

There are considerable unknowns with respect to performance requirements for new automation systems and data link communications, to key cost drivers. Also, work remains to set transition benchmarks for when new procedures, new ground systems, and aircraft need to be equipped to realize benefits. Industry has asked FAA for a service road map that specifies when aircraft need to be equipped and what benefits will be obtained.

Action item two: FAA and the JPDO need to develop approaches for risk mitigation and systems integration. The central issue focuses on what will be done differently from past modernization efforts with NextGen initiatives.

Action item three: FAA needs to review ongoing modernization projects and make necessary cost, schedule, and performance adjustments. This is critical because NextGen planning documents suggest that billions of dollars will be needed to adjust ongoing programs like ERAM.

Action item four: FAA needs to develop a strategy for technology transfer. This is important for the JPDO because the law envisions

new capabilities developed by other Federal agencies or the private sector being transitioned into NAS. We recommended that the JPDO use technology readiness levels to help assess maturity of systems and reduce development times and costs.

Action item five: FAA needs to conduct sufficient human factors research to safely support anticipated NextGen changes. History has shown that insufficient attention to human factors can increase the cost of acquisition and delay much needed benefits. FAA understands the importance of these items and is in the process of developing a plan that identifies roles and responsibilities for human factors work. Given the scope of changes envisioned, this remains an important watch item for the Committee.

Mr. Chairman, this concludes my testimony. I would be pleased to answer any questions you may have.

Mr. COSTELLO. Thank you.

The Chair recognizes Dr. Sinha.

Mr. SINHA. Good morning, Chairman Costello, Congressman Petri and Members of the Subcommittee. Thank you for inviting me to participate in today's hearing on the future of air traffic control modernization. I appreciate the inclusion of the full testimony in the record.

We all remember the summer of 2000, when delays in the system were at a very high level and were the subject of frequent stories in the popular press and on the evening news.

The impact of unfortunate events of September 11, 2001 led to lower demand levels, and during the next few years there was a significant reduction in delays. However, demand has returned; it is at or above where it was in 2000 in many locations, and so are delays. Total delays in the National Airspace System, the NAS, were 9 percent higher in 2006 than in 2000, and 2007 is worse. Through April, total delays system-wide are 12 percent higher than in the corresponding period in 2006, and nearly 75 percent of all airport delays occur at just 7 airports: Chicago O'Hare, Newark, Atlanta Hartsfield, New York LaGuardia, New York JFK, Philadelphia, and Houston.

There have been significant improvements in the National Airspace System since 2000. In addition to several new runways, I will point to new procedures such as Area Navigation, or RNAV, departures at Atlanta that are saving users $30 million to $40 million annually today. These RNAV procedures are based on the ability of the aircraft to navigate prescribed paths accurately and reliably.

The next level in this process is called Required Navigation Performance, or RNP, procedures, which is one of the key elements of the future system. RNP allows aircraft to fly even more precise paths with assurance. In Alaska, RNP procedures are used today to fly instrument approaches safely in some of the most challenging geographical terrains. These just illustrate some of the improvements since 2000.

A MITRE study for the FAA showed that the growth in air traffic demand is projected to lead to a doubling of delays at the Nation's busiest airports by 2015, compared to 2000, if none of the planned improvements are made to the NAS. Currently planned improvements, however, are projected to maintain average delays nationwide at 2000 levels. However, delays at many key congested loca-

tions across the NAS will continue to be a challenge, such as in the northeast corridor, the New York area, Philadelphia area, San Francisco, and Los Angeles.

The JPDO has identified the NextGen capabilities beyond those in current FAA plans and budgets and the research required to help them. While some of the operational capabilities needed for NextGen require research, the good news is that the fundamental technologies and procedures—for example, satellite navigation, Automatic Dependent Surveillance-Broadcast, air-to-ground data link, and RNP procedures—are known and are available to build a scalable system that can help mitigate congestion in the mid-term (circa 2015) and be a stepping stone to achieve NextGen capabilities.

FAA and MITRE have developed and conducted human-in-the-loop experiments of a portfolio of NAS improvements of particular note, targeted around the middle of the next decade and termed Performance-based Air Traffic Management. The idea behind this concept is to start changing the roles of flow managers, controllers, aircraft operators, flight planners, and dispatchers. It will require additional automation capabilities in the ground system, new avionics capabilities in the aircraft, air-ground data communications, and common situational awareness such as that provided by System Wide Information Management.

A key element of the challenges of implementing operational improvements on the road to NextGen is that the implementation must be done from a portfolio perspective (i.e., all the necessary components must be in place). For example, air-ground communications is a key element of using the automation capabilities of the aircraft and the ground system.

The evolution of the NAS must not focus exclusively on FAA ground system capabilities. The future NAS needs to consider and capitalize on the role that the aircraft can play and the capabilities it can provide. Air-ground data communications capabilities can permit ground automation systems to communicate with onboard flight management systems and can reduce controller and pilot workload. Improved navigation and flight management systems can enable aircraft to fly with greater precision and can increase airport, terminal area, and en route airspace capacity. Advanced cockpit displays and automation aids may permit aircraft to separate themselves from one another safely and efficiently, possibly at closer separations.

As the JPDO and FAA, together with their government partners, continue to develop the necessary details of the 2025 NextGen concept of operations, it is important for the aviation community to move ahead now with the implementation of the known fundamental technologies and procedures. This needs to be truly a community effort because it requires changes in aircraft and air traffic systems together with procedures and airspace changes. Only through moving ahead now can we meet the challenges of the mid-term and be well on our way to having the full capabilities of NextGen by 2025.

Mr. Chairman, this concludes my summary. I would be happy to answer any questions that the Committee may have.

Mr. COSTELLO. We thank you for your testimony.

I am going to ask a few questions and then call on other members as well.

Mr. Leader, in your testimony you indicate that the Enterprise Architecture will be completed and released next month. Is that correct?

Mr. LEADER. Yes, sir, that is correct.

Mr. COSTELLO. You have heard Dr. Dillingham testify, both in his written testimony and what he testified to today, that many of the reports that JPDO promised to deliver were at least a year behind in many cases. That, of course, is a concern, but my concern is more not so much with delay, but it is how comprehensive will the Enterprise Architecture be. In other words, you heard the IG's testimony. I have his written testimony in front of me where he says the architecture documents we have reviewed to date are lacking sufficient detail to support capital investment decisions and that the JPDO expects to complete another version this month.

So my first question is what Mr. Scovel testified to, what he has seen so far it would not justify or support capital investment decisions. What we are going to receive next month, will that change his opinion and, in fact, will it be in detail to the point where we will know what we are getting and where we are going?

Mr. LEADER. We believe that it will, sir, that it will be of sufficient detail.

Mr. COSTELLO. What do we expect to receive in this Enterprise Architecture report that Mr. Scovel has not seen up to this point?

Mr. LEADER. I am not aware at this time, sir, exactly what version of the Enterprise Architecture he has most recently reviewed.

Mr. COSTELLO. Mr. Scovel, would you answer that, please?

Mr. SCOVEL. We have reviewed several versions of the Enterprise Architecture Plan, sir, and it is our conclusion that, as our statement indicates, it does lack sufficient detail. It is very much a template, a plug-in-the-box matrix. What we would prefer to see is a linking of the Enterprise Architecture Plan with the R&D plan. Once the R&D plan is made known as well, I think then the Congress will have a better idea of what some of the cost factors may be, and I know that is of ultimate concern to this Committee.

Mr. COSTELLO. And the R&D that Mr. Scovel refers to, is that the road map that you have talked about?

Mr. LEADER. Yes, sir. We call it the Integrated Work Plan, and I believe that it more accurately serves the purpose that the Inspector General is seeking than does the Enterprise Architecture.

Mr. COSTELLO. And we are going to get the Enterprise Architecture next month and we are going to get this other document when?

Mr. LEADER. Well, sir, to review the time line, the Enterprise Architecture will be released on June 23rd, the updated Concept of Operations will be released on June 1st, and the initial baseline draft of the Integrated Work Place will be released on July 31st for review within the community.

Mr. COSTELLO. So by the end of July, both the industry, the Congress, and everyone should have a clearly defined plan of what the FAA intends to build and how they intend to build it?

Mr. LEADER. Yes, sir, what constitutes the Next Generation system.

Mr. COSTELLO. And will it in fact define both time requirements, cost, and other scenarios concerning implementation?

Mr. LEADER. Yes, sir, to the extent that we can do that now. The fidelity is obviously much greater in the first three to five years than it is in the twentieth year.

Mr. COSTELLO. You have heard Dr. Dillingham testify today, and also has testified before this Subcommittee in the past, and he has made points about the air traffic controllers and technicians not being involved in the working groups. You have heard me mention in my opening statement that it is common sense to involve those who are going to be running the system and working the system in making decisions at the early stage, before you lay out the plan. Tell me why the controllers and the technicians have not been at the table in working groups to review as we are going along and to give their input, as opposed to, what I understand, they are called in from time to time to give their opinion.

Mr. LEADER. We believe, sir, that controller input has been sufficient to——

Mr. COSTELLO. That wasn't my question. My question was why are they not at the table like everyone else, in the working group. I understand they are called in from to time and "consulted." If they are going to run the system and work on the system, why aren't they a part of designing the system?

Mr. Sturgell?

Mr. STURGELL. Sure. Mr. Chairman, I just want to talk about this broadly. We do value——

Mr. COSTELLO. And I want to talk about it specifically.

Mr. STURGELL. And I will get specific. Yes, sir. Yes, sir.

We do routinely involve controllers and technicians as subject matter experts on projects and we know that user involvement is critical to the air traffic system today and as well as to the NextGen efforts. NATCA, the air traffic controllers union, currently has a seat on both our ATMAC and ATPAC advisory committees, which are air traffic management and air traffic procedures advisory committees. We are very pleased that the new president has indicated that he would like to participate as a member of the Institute Management Council with the JPDO, and he has also indicated an interest for controllers to potentially be co-leads on these working groups, and Charlie can talk more about how the industry plans to select co-leads.

I would also say, you know, specifically, there are some examples at headquarters. We have 15 certified professional controllers on three working groups for the en route automation program. Places like Houston Center we have three certified professional controllers on the Houston airport airspace design project. Salt Lake City, we have got one full-time, four part-time, again on ERAM and four on TMA. So there is active involvement with the controllers, both controllers and NATCA itself.

As far as the OEP, NATCA does have a seat on the OEP. They have not been at it in recent meetings. I would welcome them back and I would welcome adding PASS to the OEP associates team in a similar capacity, as having a representative seat, because we do

intend to use that as the implementation process as we go forward, just the way we have used it in the past for capacity projects.

Mr. COSTELLO. The other issue that I want to touch on as well—I have several other questions, but I will go to other members and then come back.

For Mr. Leader and for you, maybe Mr. Sturgell, Dr. Dillingham again—and you heard Mr. Scovel point out about the partnerships trying to bring agencies that are involved, and you have been working on this for two years and only have, I guess, a commitment out of three agencies. Can you tell me is that ongoing, is it progressing? Where are we involving other agencies?

Mr. LEADER. Well, sir, it is my understanding that within Department of Homeland Security, that earlier this week the Memorandum of Agreement was forwarded from the General Counsel's Office to the Deputy Secretary's Office for signature. It is my understanding that in the Department of Defense is it likely to be signed this month, upon official appointment of the Air Force as the executive agent to handle NextGen issues within the Department of Defense.

Mr. COSTELLO. Mr. Scovel, you indicate in your testimony that the FAA needs to articulate a strategy as to how to mitigate past problems that led to massive cost overruns and unanticipated costs. I would like you to explain and elaborate a little bit more on that, if you will.

Mr. SCOVEL. Thank you, Mr. Chairman. I think our view here rests on the fundamental necessity for FAA and the JPDO to determine what skill set mix will best position the JPDO in the NextGen effort in order to solve problems that have been identified with past modernization programs. Our exhibit in this regard would be the WAAS program, I think, where the program was conceived and laid out initially in 1998 for a cost of roughly $824 million. Due to problems with identifying what level of skill sets and the degree of technical proficiency would be needed in order to certify that system as safe, FAA reached that conclusion late and decided it needed to resort to academic and industry experts because it didn't have those skills in-house.

As a result, we now face a situation with WAAS, which was supposed to be completed in 2001, where the program is still ongoing. It may be completed next year. The total cost has now risen to $3.3 billion. That is a program, sir, where FAA wasn't able initially to determine what skill set would actually be needed, and it was a critical one when it came to certification for safety.

There will be similar situations, perhaps not specifying certification, but where JPDO and FAA will need to identify from the beginning what skill sets will be needed to see a program through to completion. That would be our fundamental take-away point on that one, sir.

Mr. COSTELLO. It looks to me like you want to respond, Mr. Sturgell.

Mr. STURGELL. Yes, sir, Mr. Chairman. We are in the process now of contracting with the NAPA to have them provide us an assessment of the appropriate skill set and mix we need as we go forward with NextGen.

I would also like to point out that we have made significant progress in controlling our capital programs. I think one of the things we are trying to do as we go forward with NextGen is to really settle on the development issues, do the proper amount of demonstrations, and mature a program to a much greater degree than we had done in the past when we started programs before development, etc., determine how much it was going to be, and then ran into problems early on which escalated costs.

So I think that will help. I think segmenting programs has helped. We are doing a lot on the training side with our program managers and, you know, we still have work to do to keep improving this process.

Mr. COSTELLO. The Chair recognizes the Ranking Member, Mr. Petri.

Mr. PETRI. Thank you.

I have a couple questions. First, Mr. Sturgell, could you describe how the implementation of NextGen will affect service and the accessibility of the system to small communities and airports?

Mr. STURGELL. I think the NextGen system is going to be a great value to small community airports and to the general aviation community as a whole. One of the current technologies that we see as part of NextGen is WAAS, the Wide Area Augmentation System. I mean, there are, I believe, over 4,000 airplanes now equipped with that system. We are putting 300 approaches a year, and all of those, or the majority of those approaches are going after airports that generally serve smaller areas and that don't have precision landing capability today.

Mr. PETRI. Thank you.

In his testimony,—I think I would like both Mr. Dillingham and you to respond—Mr. Dillingham expressed concern about turnover of personnel in the past and how that could affect the progress going forward. Could you comment on that and what, if anything, can be done to minimize that problem?

Mr. STURGELL. Well, turnover is always a concern. I have worked with the Administrator now for five years. I think she has done a tremendous job at the agency. Russ Chew is a good friend and did a great job as well, and I think has actually helped us attract a lot of interest into the position and the ability for great candidates to come and want to be part of the FAA, want to be part of this transformation. We also have very, very capable leaders throughout the organization, one of them sitting to my left today, the vice presidents of the Air Traffic Organization, all very capable, senior executives, seasoned, know the business well.

So our focus has been to integrate the processes and improvements into the culture at the FAA so that, regardless of where we are in the leadership at the top ranks, things like cost-effectiveness, benefit-cost analysis, proper planning are all ingrained at the agency.

Mr. DILLINGHAM. Mr. Petri, I agree with what Mr. Sturgell said, but clearly when you have had a situation where you have been in existence three years and you have had three different directors, as in the JPDO, and when the NGATS Institute has been formed for about three to four years and you have had two directors at this point, our concern is credibility, as well as leadership. If you expect

the industry to send the best and the brightest to work on this very complicated and important initiative, I think they would be interested in the stability of the leadership and the organization.

We think that, in addition to that, it is true that there is leadership below the senior management level, but at the same time directions do come from the top. The point that we made is that we have a situation that is developing where the leaders of the change that we are pointing to in terms of progress for FAA—Mr. Chew, Administrator Blakey—those people will be gone and, because of the calendar, we may have even a different Secretary of Transportation. All the leaders in this area are going to possibly be changing, and we are at a critical point. This is the point where we move from sort of planning to implementation. So we think that, one, as far as the Institute is concerned, where private sector people are being involved, we need to find out why the turnover. We need to find out why the turnover at JPDO so that we can prevent that from just continuing and having a revolving door.

Mr. PETRI. Thank you. That is an area that obviously requires further work.

One last question during my time to both Mr. Dillingham and Mr. Scovel. It may have been covered a little bit by some other testimony, and it is having to do with the wide range of estimates of cost of the program. I think they vary between $15 billion and $22 billion for the infrastructure and $14 billion to $20 billion for the avionics equipment. I guess we are going to get a more precise road map shortly, but could you comment on that? Is that an unusual range or should that be a red flag?

Mr. DILLINGHAM. Mr. Petri, from our perspective, we think that when you are talking about a total range of $13 billion, that is a pretty wide range. We think that when the planning documents are final, we would hope that there would be a better idea of what the actual costs would be, and particularly, as Mr. Leader has said, in the near term a much finer point would be put on the cost of NextGen.

Mr. SCOVEL. Mr. Petri, we think NextGen expenses between this year and 2012 are fairly well defined. With the need to fund ADS-B and SWIM and the $4.6 billion total for these fiscal years that FAA intends to request, we think those are fairly certain. Beyond 2012, however, we see considerable murkiness both in terms of the cost to industry in order to equip to take advantage of NextGen and also the cost to FAA and the Government on its side of the equation.

As we have seen in past modernizations with FAA, costs can escalate; certainly, schedules can slip. We think for those reasons, as well as the rest of the financing picture, that a wide range, as has been suggested by FAA, is probably the best we can do at this point, and until we are closer to 2012 and get a better feel for how JPDO's research and development plan is progressing, we probably can't do any better than what we have.

Mr. COSTELLO. Thank you.

The Chair recognizes the gentleman from Missouri, Mr. Carnahan.

Mr. CARNAHAN. Thank you, Mr. Chairman, and thank you to the panel here today. I had a couple of questions, and I will try to get through these quickly.

One of the cornerstones of NextGen appears to be data communications, and this technology would replace much of the voice communication system between controllers and pilots, but it appears likely to decrease the controllers' workload. But at our March 13th hearing, FAA Administrator Blakey told me, in response to a question, that the controller workforce would not be decreased after implementation of NextGen. My question for Mr. Sturgell is how can the FAA take a position that the controller workforce would not be reduced if their workload appears that it would be reduced?

Mr. STURGELL. I would just say two things. First, we have a 10-year controller workforce plan that we have just recently released a month or two ago; it is our third update, I think, at this point. We are going to be hiring and increasing this workforce over the next 10 years, and that plan does take into account the modernization programs as we see them.

The second thing is the goal, I think, from our perspective at the end of the day is that, with traffic growing the way it is, what we are looking to do is, as the Administrator said, increase the productivity of the workforce to be able to handle more flights. You know, the growth is essentially going to require this workforce to continue as we have laid it out in the 10-year plan.

Mr. CARNAHAN. Thank you.

I also wanted to ask about the multi-agency transition to NextGen that may potentially leave some users in the dust. FAA estimates on equipment cost to convert to new technology range anywhere from $7,000 to $30,000 for general aviation aircraft. Does FAA plan on exempting some general aviation users from mandated conversions, for example, turbo prop aircraft? And do you feel these costs are reasonable for general aviation? Again, back to Mr. Sturgell.

Mr. STURGELL. I think that does account for why we have a broad range and the user costs at the moment. It is going to depend on equipage as we go forward, and a lot of that will be addressed in the rulemaking process in terms of the proposals laid out and the comments we get back from the community.

I also think, though, that to the extent that equipage is going to be required, a lot of these costs should decreased just based on a volume perspective. As more avionics are produced for specific systems, the market tends to drive the price down.

Mr. CARNAHAN. And, finally, I wanted to direct this question to Mr. Leader or any others that wanted to jump in on this, and that is with regard to human factors involved in the transition. The planning for NextGen should not just involve installing computers and launching satellites; it really impacts hundreds of thousands of people whose jobs involve the National Airspace System. The GAO and the DOT IG have reported that JPDO has not done enough to evaluate how pilots and controllers will be affected. What will the JPDO do to address this deficiency and how is your agency addressing human factors in this transition?

Mr. LEADER. Human factors, sir, is of critical importance to the system. As you are aware, with the increase in situational aware-

ness, both the flight crews and the controllers will have access to more information than they have today, and the human factors research to ensure that they are able to productively use that while maintaining the safe operation of the system is very important to us. It is one of the priorities we have established with NASA in our collaborative R&D planning.

Mr. CARNAHAN. All right.

Thank you, Mr. Chairman. I yield back.

Mr. COSTELLO. Thank you.

The Chair recognizes the gentleman from North Carolina, Mr. Coble.

Mr. COBLE. Thank you, Mr. Chairman. Additionally, I want to associate my remarks with yours and the distinguished Ranking Member's opening comments.

Good to have the panel with us.

Dr. Dillingham, I think you are one of the most frequent visitors we have had. It is good to have you back on the Hill. If we keep inviting you up here, you will be picking your mail up here.

Mr. DILLINGHAM. Yes, sir.

Mr. COBLE. Good to have you back.

Mr. Sturgell, the Ranking Member, I think, put this question to you. I have been in and out on the phone, but regarding the implementation of NextGen, how it would affect the rural and small communities, and I believe your answer was favorable.

Mr. STURGELL. That is correct.

Mr. COBLE. I am very interested in this because I have at least two of those airports that would fall into this category. Let me ask you this. As I say, I have been in and out, and I don't think it has been asked. To Mr. Sturgell, Mr. Leader, or Dr. Sinha, if you will, lay out the differences between today's system and the proposed modernization (a); and (b) how will modernization affect frequent fliers, that is, people who fly maybe a couple times a week, and there are many people who do this.

Mr. STURGELL. I think the second answer is probably the most important in that the goal at the end of the day is to create a system that is not going to impede the economic growth of the aviation industry or this Country's economy as we go forward. In order to meet the forecasted air traffic demand we see on the horizon, what we are trying to do is keep delays down and to keep the system's ability to move people at the same or greater pace than we see Americans wanting to travel.

Mr. COBLE. And as safely as is done now, I am sure.

Mr. STURGELL. Certainly, that is the number one consideration in all of this, safety and then efficiency.

In terms of—others can pitch in, but the simplest way, in my mind, to describe how the Next Generation system is different from today's system goes back to the fact that it is going to become a much more automated system and it is a system that is going to take us from where we are today in terms of air traffic control of individual airplanes to a role where both controllers and pilots are involved in the air traffic management. We do also want to take advantage of the capabilities in the airplanes today, which we are not currently doing.

Mr. COBLE. Any others want to weigh in?

Mr. SINHA. Thank you, Congressman. I would like to make a couple of comments regarding the changes from now to the NextGen system.

The key words that come to my mind are that the future system is still going to be human-centric, so there will be people involved both in the aircraft and on the ground, but it will be automation-intensive. There will be lots of routine tasks that the humans do today that the automation can do easier and faster. So you will see a trend of some of the roles of the humans changing in the system. The other element of the change that we will be seeing is that it will be a lot more aircraft-centric. The capabilities in the aircraft are going to be, compared to today, phenomenal, in terms of the accuracy and the information that they can have available. So you will see those two as major changes.

In terms of getting there, I think the human-in-the-loop experiment that we have done with the controllers has shown that doing business as usual is not an option. Even in some of the heavier traffic areas, 25 percent growth is not going to be possible with the current way of doing business. So even the controllers are saying we need something different.

Mr. LEADER. Yes, sir. I would just add that when we achieve the level of automation that is planned in the NextGen system, one major difference is that we will be able to manage the individual trajectory of all the aircraft that are flying under control of the National Airspace System on an individual way, and we will be able to adjust those flight trajectories after the departure of the aircraft to react to developing weather conditions.

Today, weather results creates about 70 percent of the delays in the system, and being able to more realistically react to an evolving weather condition dramatically reduces delays. And in the process of doing so, our initial modeling shows that the system-wide savings for users of the airspace will be in the tens of billions of dollars, mostly in fuel, but obviously having dramatic impact in the reduction of emissions into the environment.

So things will be dramatically different and the benefits will also be dramatic.

Mr. COBLE. Thank you, gentlemen.

This may have been touched on as well, but with the automation coming on, I presume inevitably it will reduce the number of air traffic controllers. Or will it?

Mr. STURGELL. Well, as we look out over the 10 years, we have laid out the hiring plan for our air traffic controller workforce during that period of time, and we see it increasing. Our view is that that level of controllers will be able to handle that much more additional traffic which we see coming into the system.

Mr. COBLE. I got you. Thank you.

Thank you, Mr. Chairman.

Thank you, gentlemen.

Mr. COSTELLO. Thank you.

The Chair recognizes the gentleman from Illinois, Mr. Lipinski.

Mr. LIPINSKI. Thank you, Mr. Chairman.

Just to briefly comment on the last question that Mr. Sturgell was addressing, I want to echo some comments by the Chairman and Mr. Carnahan. I want to make sure that we do have an ade-

quate number of air traffic controllers, well trained air traffic controllers as the system moves forward.

I wanted to move on to another question with Mr. Scovel. In your written testimony you state that the most urgent concern facing terminal automation is how quickly the FAA can replace aging displays at four sites: Chicago, St. Louis, Minneapolis, and Denver. Can you talk about this?

Mr. SCOVEL. Thank you. Yes, we can. This is an item of great concern to my office, and it really dates back as well to the implementation of the STARS program, because when STARS came on and then reached its roadblock, if you will, when costs began to rise and the program was curtailed to leave open over 100 facilities that lacked terminal modernization, it was identified both by FAA and by my office that four key facilities—Chicago, Denver, St. Louis, and Minneapolis—would be left with aging display equipment which really put controllers at a disadvantage and quite possibly had safety implications, and that with this aging equipment in place, a series of software upgrades were not possible to be installed.

We believe, thanks in part to our effort and FAA's budget request, that funds are now available to the FAA to replace two of those four systems. They have not yet been replaced, but the Congress had made those funds available specifically to FAA for that purpose. In the continuing resolution, in fact, additional funds have been made available.

Where we take issue, however, is with the fact that FAA has really lost an advantage when it came to executing a contract for the replacement of those aging displays at the four locations because in accepting the industry's offer between Raytheon and Lockheed Martin to enter into a joint contract for the replacement of these displays and the time that was lost in negotiating with the contractors and bringing that contract to fruition, in the meantime, the displays remained in place and software upgrades were not installed. We would urge FAA to continue to make all due progress, all due haste in this regard because when the funds are on their books and those facilities are still lacking the terminal upgrades that are necessary and the safety implications are indeed involved, then time is of the essence.

Mr. LIPINSKI. Thank you, Mr. Scovel.

I just want to move on, with the limited time I have left, to ask Mr. Sturgell, Mr. Leader, and Dr. Dillingham anything that you can tell me about efforts to harmonize NextGen with the European SESAR project that is now going on.

Mr. STURGELL. I think we have done a lot in the area of harmonizing with the Europeans. The Administrator has worked with Mr. Barron; we have an agreement in place with them. We are working on current demonstrations or other things we can do to make sure we are going to be harmonized going forward. We are doing similar things on the other side of the continent with countries like China.

You know, the goal at the end of the day is an interoperable air traffic system for the users.

Mr. LIPINSKI. Anyone else want to comment on that?

Mr. DILLINGHAM. Yes, Mr. Lipinski. I think one of the questions that is often asked of us by this Committee is who is ahead in terms of SESAR versus the U.S., and I think, when you look at implementation, it is clearly the U.S. You have heard testimony this morning about some NextGen technologies already on the books to be implemented—ADS-B, SWIM, and some of the RNP—so clearly, we are ahead in terms of implementation.

Mr. LIPINSKI. Mr. Leader?

Mr. LEADER. Yes, sir. I would just point out that we have interactions with the European community on a number of levels. We have technical interchange meetings that happen fairly regularly to discuss common technical issues that we have. We have a joint task force with the European Commission working on the harmonization of the two systems and we have, from EuroControl, a full-time liaison assigned to the FAA.

Mr. LIPINSKI. Thank you. Thank you, Mr. Chairman.

Mr. COSTELLO. Thank you. Just as a side note, I would agree with Dr. Dillingham. A few weeks ago I had the opportunity to sit down with some of the folks from EuroControl, and I would agree with you, Dr. Dillingham. While I think that in your testimony, Mr. Sturgell, you indicated that they have their funding in place, there is a commitment for funding, but I would agree with Dr. Dillingham, with his statement.

At this time, the Chair recognizes the former chairman of this Subcommittee, my friend from Tennessee, Mr. Duncan.

Mr. DUNCAN. Thank you very much, Mr. Chairman, and thank you for calling this hearing on this very important subject. All of the witness, I think, have given us very informative and very helpful testimony. But I think Inspector Scovel hit the nail on the head when he said a few minutes ago that our ultimate concern in this Committee has to be the cost.

I heard a speech one time by Charlie Cook, the political analyst that is so respected on both sides of the aisle. He said he didn't think that anybody could really comprehend any figure over a billion dollars. And we talk about these figures almost like they were nothing. But I would guess that if we were able to bring a billion dollars in $1 bills in this room, it would boggle our minds at how huge the amounts are that we are talking about.

So I am getting at a couple of things. In our briefing paper, it says in June of 2005, the GAO reported that to date the FAA has spent $43.5 billion for ATC modernization. And I remember hearings of six and seven years ago and so forth. These projections on these increases in passengers were almost exactly the same then as they are now. We were told that all this money we were spending was going to have us prepared for these big increases. Yet today we hear that the system is at its capacity and how bad the problem is. I don't doubt that.

Then it says in May of 2005, the Department of Transportation Inspector General reported that 11 major FAA acquisitions experienced cost growth totaling $5.6 billion and 9 had schedule slips ranging from 2 to 12 years. Looking toward NextGen, the DOT IG stated that the FAA needs to articulate a strategy for how it will mitigate past problems that led to massive cost growth.

Now, what I am wondering about, Mr. Sturgell and Mr. Leader, you have heard Mr. Scovel talk about certain action items. Do you agree with his action items, and what are we doing to make sure that five or ten years from now, we are not going to be having another hearing in front of this Subcommittee and hear about these massive cost growths and slippages, slippages ranging from 2 to 12 years? Are you putting some penalties or incentives in some of these contracts? What is happening?

Mr. STURGELL. We are using some of those things, and specifically, the current en route automation and modernization program for all of our centers includes those types of incentives for the contractor. That program is currently our biggest one and it is on budget and on schedule.

Mr. DUNCAN. Do you feel that you are doing these action items that Inspector Scovel mentioned?

Mr. STURGELL. I think largely we are. I can't sit here and say what the specific ones are. I would just say that during this Administrator's tenure, we have worked very closely with the Inspector General's office to help resolve what these longstanding concerns about the management of the capital programs. As they both testified today, we have made a lot of progress in the last four or five years or so in this area. And it is something that we continue to be focused on.

We have met our targets now for several years in a row, we are on track this year, we know how important it is going forward to have programs to be on cost, on schedule, meeting the metrics. So we are looking at ways to come up with better metrics, to help manage these programs, better training, more up front in terms of research, development, demonstrations, things that will help us stay on the track record we have had for the last couple of years.

Mr. DUNCAN. Mr. Leader, anything you want to add?

Mr. LEADER. No, sir, except to say that in the planning phase, we are structuring the approach to very much continue what the FAA is currently doing in terms of both leveraging existing technologies, particularly those that have been developed by the Department of Defense that are appropriate for us to build on, and also to extensively use demonstrations and flight trials to mitigate risk before we begin any major acquisition.

Mr. DUNCAN. My time is running out, but the understatement of the hearing was when Dr. Dillingham, whom we all respect so much, he said that this $13 billion in variation on these cost estimates was pretty big, or something to that effect. We were briefed about that also, and Ranking Member Petri talked about that.

Do you gentlemen have cost estimates? Do you also see those huge variations in cost estimates and are you doing something to bring them down or do you think we have been given sort of incorrect information about that?

Mr. STURGELL. Mr. Duncan, those are our cost estimates, and I would just say any corporation looking out 20 years from now, it is very tough to nail down things with precision. I think our estimates are in line, though, with what the Europeans are estimating, which is a good gauge for us as to where we are. And then as we get closer, we are much more precise. We have got $4.6 billion for the next five years laid out very specifically in several plans about

where we are going to spend that money and on what. As we go forward, these things will get much more precise.

Mr. DUNCAN. Thank you, Mr. Chairman.

Mr. COSTELLO. I thank you.

The Chair now recognizes the gentleman from Iowa, Mr. Braley.

Mr. BRALEY. Thank you, Mr. Chairman.

Mr. Scovel, I want to follow up on one of the comments you made earlier. It was also addressed in your written testimony, where you stated that the most urgent concern facing terminal automation is how quickly the FAA can replace aging displays at four large sites that are particularly critical to the national airspace system, and quite frankly, very important to my personal airspace: Chicago, Denver, St. Louis and Minneapolis, which I fly through frequently.

Can you explain in a little bit more detail the magnitude of the problem that situation presents to our air traffic system that depends so heavily on those connecting hubs in the midwest?

Mr. SCOVEL. I can in general terms, and I would be happy to provide you with a more specific answer. But as a caveat, I must note that I am not a technological whiz to begin with.

But it is my understanding, sir, that these four sites, because those terminal displays have not been replaced in a timely fashion, software upgrades have not been able to be installed at those four sites. And those pose a conceivable safety risk.

Right now, those sites, terminals at those four sites have a black and white display. It is my understanding that with the replacement of the displays at those sites and with the accompanying software upgrades that can then be installed, the controllers who are working on those machines at that point will then be able to have a much clearer picture on air traffic that they need to control safely over their airspace.

Mr. BRALEY. Last weekend, I toured the air traffic control facility at my home airport in Waterloo, Iowa. I was amazed at the range of equipment and the age of the equipment that was there for the air traffic controllers to use. Is that something that is systemic across the entire system, or is it more heavily concentrated in the regional airports? What is your understanding of that situation as a general proposition?

Mr. SCOVEL. I believe it is systemic. My basis for that conclusion would relate not only to my response to your question relating to terminal displays at the four main centers that you mentioned, but also to the situation that had to do with the STARS program, and Members of this Committee are well familiar with that, I believe. STARS began as a program that initially would cost less than a billion dollars and would upgrade control displays at 170 facilities, cost growth and schedule slips required the program essentially to be curtailed at a cost of about $1.4 billion and with less than 50 sites serviced. That means that over 100 other controller sites still have older equipment. I daresay that is the reason why you saw the equipment that you did.

Mr. BRALEY. One of the topics that was critical to a number of the presentations I reviewed had to do with the critical role of human factors research as we move into Next Generation. In your statement, you talked about the FAA identifying a variety of issues that will require additional human factors work, increased automa-

tion and new technologies and the impact they have on flight crew workload, the effect that changing roles and responsibilities have on safety, alerts and information displays a pilot needs to safely oversee conflict detection and resolution and automation failure. I would just like to present this question to the panel as a whole, but are we talking about human factors analysis that is going to go on the front end evaluation of how these systems are designed, human factors analysis of how they play out in a simulation environment before they are fully implemented, and then human factors follow-up as the NextGen gets rolled out? Or what type of human factors emphasis are we looking at here?

Mr. SCOVEL. I will defer in a moment to Mr. Sturgell and Mr. Leader on aspects of your question, sir. But at this point, let me say that our belief is that human factors, research and involvement, specifically in the case that you mentioned, by controllers, and also by flight crews, because of course, they are going to be involved, when some of the responsibility for separation of aircraft in-flight will shift from the ground control facility to the cockpit with ADS-B and other technological improvements, that human factors research needs to include those elements of the workforce, controllers and flight crews.

We would also make a point, and I don't know that, I know it is made in our testimony earlier, in our written statement, but I don't know that it has been made on the record verbally, and that has to do with the involvement of NASA. Both OIG and GAO have pointed out that NASA intends to essentially curtail its research in the JPDO area. They intend to focus more on fundamental research. In the past, NASA has devoted great effort, time and money to human factors research. And if we see NASA withdrawing from the type of research that can be readily applied by the JPDO to the NextGen effort, then it leaves open the question of what will happen with that human factors research. Who will do it, how will it be managed, how will it be paid for, what guarantees can we get as to its accuracy?

Mr. DILLINGHAM. Mr. Braley, I think the short answer to your question is that in all three cases, before, during and after, clearly when we have a system that is going to shift from, as Mr. Sturgell said, from air traffic control to air traffic management and automation, it is going to be very important that the human factors element be very much involved in this. It is also one of the reasons why we think it is important that the controllers and the technicians and the pilots and all the people who are going to be involved have a part in developing and planning the system.

Mr. LEADER. Yes, sir, I agree. We are looking in the long term, working with NASA on both the human factors issues but also on failure mode recoveries. Because in the automated system, that is a critical part, obviously, of the safety. But today we have human factors work going on within the FAA's research efforts specifically up at Atlantic City. There are today human factors experiments taking place to deal with the near and mid term issues that transformation of the system will create.

As well, I would suggest that Dr. Sinha might want to say something about the human factors work that MITRE-CAASD currently has underway here in the Washington area.

Mr. SINHA. Mr. Congressman, if I might, I think I would like to differentiate the different types of human factors analysis. One is the fundamental research in human factors in terms of creating the principles of human factors. But I think equally important is what I would call applied human factors. And I think that really, just like safety, it has to be built in from the beginning. You can't add human factors at the end or you can't add safety at the end.

So I think again, the short answer is in all phases. And some of the research that we are doing, we do bring in controllers who are qualified to work the sectors, to help us both with the ideas and the pilots in the simulation as well as in the demonstrations that we do. We agree that it is very critical. And to me, the proof of the pudding is really in the applied human factors.

Mr. BRALEY. Thank you.

Mr. COSTELLO. The Chair now recognizes the gentlelady from Oklahoma, Ms. Fallin.

Ms. FALLIN. Thank you, Mr. Chair. Gentlemen, we appreciate all your great work on this subject and helping us transform our air traffic control system.

I was interested in your comments about the human factor. I was thinking about the general aviation pilots. And with the Next Generation system that we are talking about, and you mentioned, someone mentioned earlier about the cost of the new avionics that will go into the general aviation planes could be anywhere from $7,000 to $30,000 possible guess cost for the electronics. But the human factor of learning a new system when you are just a recreational pilot and trying to fly, I was thinking back on, I am just a couple hours away from getting my license. I used to fly old 182s. My agency I worked for bought a new 182 that had all the new avionics like electrical, computer equipment and I was just lost when I was that.

So I was thinking about the pilots coming online with the Next Generation system, have we got an idea of how complicated it is going to be for the recreational pilots and what type of learning curve there will be for the human side of things?

Mr. SINHA. Let me comment from the experimentation side of how we are doing that. First of all, I would like to state that when we talk about avionics and when we talk about changes, not everything applies to everybody. So for the commercial pilot to be flying into New York is definitely way different than the recreational pilot flying out in the midwest with really nobody else bothering them, so to speak.

So when we talk about the avionics and the avionics equipage, it is very dependent on what is it that you are going to be doing with your aircraft. So for the air transport quality avionics, yes, that is going to be much more sophisticated and they will have to go through the training, just like they do today. For the recreational pilot, actually again the changes will not be that phenomenal.

We will, I think, Mr. Sturgell talked about WAAS, the wide area augmentation system, that does give you a capability, for example, to have precision approaches where you haven't had it before. So that would require some training. But again, I don't think it is going to be unsurmountable.

Ms. FALLIN. That is good to know. I have one other question on the air traffic controllers. We have talked a lot about the increased travel in the United States and projections on that, and the aging workforce of the air traffic controllers and the need for more of them. But how will the Next Generation system and the learning curve, once again, on the human factor for the air traffic controllers, how much extra training, do you have a plan in place, have you started thinking about what their needs will be as they try to learn this new system we are talking about?

Mr. STURGELL. I think we have started doing that, and that is one of the things we did with MITRE last year in terms of performance-based air traffic management and the changes in the controller's role. And all of that, we will certainly be including them today as we do and going forward as well.

Ms. FALLIN. Are you expecting they are going to have a lot more to learn in this new system? Or is it going to be relatively general basic concepts?

Mr. STURGELL. It is a different role. We are very focused, it is one of our highest priorities, on the whole retirement issue and staffing of the facilities and the hiring process. It is a new generation of controllers that we will see coming in over the next decade. It is probably a generation that is much more familiar with technology and computers than folks that were born 30, 40 years ago or whatever.

So I think this is a workforce that has seen a lot of change before. It is a workforce that is probably going to see a lot of change as we go forward. But it is a workforce that responds to changes. And I think it is going to be a better job, more exciting job for the controller workforce in the future as well.

Ms. FALLIN. Thank you very much.

Mr. SINHA. If I might add just a comment on that. I think it is going to be different type of training. And the way I characterize it is the difference in computer dexterity between myself and my kids. They just take to it like fish to water and they are there. So a lot of the training that will be done will be a lot more sophisticated in terms of the simulation based training or intelligent tutoring system. As an example, we have implemented the system that Mr. Sturgell talked about in Indianapolis. These are real controller trainees today. They are absolutely delighted with the way that it is being done and they will not go back to the older system of training.

So back to the Playstation 2 generation that is coming online, I think that is a big advantage.

Ms. FALLIN. Sounds like it might be a new marketing and recruitment tool for you.

Thank you. Thank you, Mr. Chairman.

Mr. COSTELLO. The Chair thanks the gentlelady.

At this time the Chair recognizes the distinguished Chairman of the full Committee, Chairman Oberstar.

Mr. OBERSTAR. This is a very important hearing, yet another one in a long series that Chairman Costello and Ranking Member Petri are doing and the Com aviation. What puzzles me, and Mr. Leader, I want to have your explanation of this, that we keep hearing and getting vignettes of information about the FAA planning to have

the ADS-B vendor to actually operate the system in charge of fee for its service. Is that what is in the works? Either one of you, Mr. Sturgell, Mr. Leader, toss a coin. Decide who is going to answer.

Mr. STURGELL. The contract, as we are putting it forward, Mr. Chairman, is a services performance-based contract. It is not unlike us purchasing electricity today or purchasing telecommunications today. I think to probably try and help clarify this, we're looking at a service-based contract where the service provider would provide this particular service.

At the same time, that service provider could, for example, contract directly with an operator to provide an additional service through that same mechanism. It is not unlike what we do today internationally with communications. We contract today with a company called Airinc overseas to provide international communications services between the FAA and the user of the system. At the same time, that user also contracts directly with Airinc to provide other capabilities outside of the FAA's needs. For example, a United Airlines needs to talk to a United dispatcher, that would be a service Airinc could provide to them.

That is the way the ADS-B contract is being set up. It is not unlike things we do today. I think it gives the Government a lot more flexibility. It also reduces our capital costs. It gives us, I think, better flexibility to react to future increases. And I think it puts more risk on the vendor in terms of delivering the capability.

Mr. OBERSTAR. Aren't you hanging a great deal of the future of air traffic management on the ADS-B technology?

Mr. STURGELL. We do see ADS-B as one of the backbone technologies of the NextGen system as we go forward.

Mr. OBERSTAR. Now, you don't, you use the technology of STARS in the same manner? Nor the DSR in the en route system?

Mr. STURGELL. We have systems today that we have bought, own and operate, and we have things today that we have purchased through services or other transaction agreements. It is a model that has worked very successfully for us today. It gives us both a good, robust private and public sector involvement. That is kind of the model we see going forward as well.

Mr. OBERSTAR. Who is the primary vendor on the ADS-B?

Mr. STURGELL. There are three teams that are competing for that contract. It has not been awarded yet. The leads——

Mr. OBERSTAR. Who are the three?

Mr. STURGELL. The three leads are ITT, Raytheon and Lockheed Martin.

Mr. OBERSTAR. Okay. And when do you anticipate making a final decision?

Mr. STURGELL. We anticipate awarding that contract by the end of the summer, end of August is what we're looking at.

Mr. OBERSTAR. And what protections are you planning to build into the contract? For example, against, you have a primary and then you said that the primary contractor could engage a secondary contractor. What safeguards are in the proposal you intend to float as an IFB, I assume, for protection against acquisition by a non-U.S. entity? What protections against performance problems?

Mr. STURGELL. Mr. Chairman, I can just speak generally. We do have those types of performance problem protections built into a lot of our contracts.

Mr. OBERSTAR. Will you submit those for this Committee?

Mr. STURGELL. Yes. I was going to offer that we could bring the program office and come up and brief you more specifically about what we are looking at for that contract.

Mr. OBERSTAR. Is there specific protection against sale or acquisition of this to a foreign interest?

Mr. STURGELL. I can't speak specifically on that right now. I'd have to follow up with you on it.

Mr. OBERSTAR. If you are banking the future of air traffic control management on a technology system that is going to be not owned by the FAA and sequentially contracted to a secondary vendor and then subject to acquisition by a foreign interest, then the future of aviation in the United States is, I think precarious.

Mr. STURGELL. I appreciate the concerns. I am sure we have protections built in. I just don't know them specifically off-hand. The FAA will own the data that is being provided through this service and this contract.

Mr. OBERSTAR. But not the technology itself, not the hardware?

Mr. STURGELL. This technology is being used worldwide. The Canadians are moving with it, Australia is moving it system-wide.

Mr. OBERSTAR. Yes, I understand, Canada is moving it and Australia is moving it and Europe. We just had, in the beginning of April, we had a very intense review of EuroControl and European aviation safety, safety oversight agency. I just say once again that the Southern California TRACON handles more air traffic than all of Europe combined. Don't tell me about all these other countries and systems that are so great and wonderful. I heard about Norway a few years ago. Norway has about as much air traffic as Minneapolis St. Paul. You are dealing with a huge system here.

And I hear Lockheed is one of the competitors for this. We had an 11 hour, I am sorry, until 11:30 at night, a nine hour hearing on Lockheed's mismanagement of the Coast Guard's Deepwater program, one where, very similar to what you are proposing here, self-certification, where they are going to operate this system, going to contract it out to them, they are going to run it and you are going to pay a fee for it. What has happened with the Deepwater program is that the taxpayer is paying a huge cost. They are going to have to scrap nine ships that were perfectly fine until the Coast Guard allowed this contract out and let Lockheed and Grumman Boat Division mess them up, not take advice from anybody else, self-certify.

I don't want to see that happen to our air traffic control system. These are not like airplanes that the airlines rent, in effect, from GE Leasing, or now Boeing Leasing or Airbus Leasing. You are charting the future of air traffic control in America. You have a huge responsibility on your hands. And we have to make sure it is done right.

Thank you.

Mr. COSTELLO. I thank the Chairman.

To follow up on the point that Chairman Oberstar made, Mr. Scovel, let me ask you about the RNP routes system. The FAA is

relying on a third party to help design the RNP routes, as you know. Further in Section 410 of the reauthorization proposal that the FAA submitted, it would expand the authority of the FAA to non-Government third parties to develop new procedures. I wonder if you might express your current concerns and any thoughts you may have on the RNP third party design and expanding the authority of the FAA to give non-Government authorities third party jurisdiction and procedures?

Mr. SCOVEL. Thank you, Mr. Chairman.

My staff has not had time to study this question in detail, but our initial take on it was that this represents a considerable delegation on the part of the FAA Administrator of her powers regarding RNP currently, which are to develop, implement and maintain RNP. Currently, third parties are limited only to the development of one-third of that equation. As I understand the proposed legislation, the Administrator proposes to expand third parties' powers to include not only development but also implementation and maintenance of RNP.

As a general matter, we have concerns, and I think these echo perhaps some of those that Mr. Oberstar was just making, when it comes to contracting out or privatization or outsourcing. While some of these questions are certainly policy matters for the Congress, as an Inspector General, our concerns have to do first of all with maintaining a strong Federal role for establishing performance requirements.

Secondly, Mr. Oberstar mentioned certification. We would maintain that that too is a matter of concern for us, especially when certification has to do with safety, as RNP ultimately will.

Finally, we see a continued need for agency oversight. And not the kind of oversight, certainly, that my office, as an office Inspector General, would provide. While we can go in and in great detail through a program audit for a specific period of time conduct a detailed examination of a program, what is necessary in these outsourcing or privatization efforts is the kind of oversight that the Agency itself must maintain. It must be a daily, persistent, consistent degree of oversight that really removes the Agency from the role of partner with its contractor and places it in the role of watchdog.

If those three concerns are satisfied, then it truly is a policy matter for the Congress. And as an Inspector General, I am happy to leave those decisions to you.

Mr. OBERSTAR. Will the Chairman yield?

Mr. COSTELLO. Yes.

Mr. OBERSTAR. The Inspector General is bringing an extremely important refinement on the issue and the delineation of the details of oversight that he spelled out we should review from the record and incorporate that into our thinking. I want the FAA to take particular note of those concerns.

That is exactly what I am talking about. Not end of the road, the Inspector General usually comes in when a program is well down the line and sees whether it has been performed properly. FAA is doing it day to day. That is what your distinction is, and I think that is extremely important.

Mr. COSTELLO. Thank you, Mr. Chairman.

I want to be clear, Mr. Leader, before we conclude this panel and go on to the second panel, it is my understanding from your testimony that at the end of June we can expect to get the enterprise architecture. And by the end of July, we will have the integrated work plan. At the end of July, when we have both of those plans together, I believe that you, in answer to my question, you said that it will clearly define and it will be a comprehensive plan defining both time lines, cost and the program development policy implementation. Is that correct?

Mr. LEADER. Yes, sir, with the caveat that as we coordinate it with our partners agencies, it will continue to be refined. But it is the baseline for the planning going forward.

Mr. COSTELLO. But you believe that both the enterprise architecture and the integrated work plan will be completed by the end of July? They will be comprehensive and they will answer the questions about cost time lines and how the system will be implemented?

Mr. LEADER. Yes, sir.

Mr. COSTELLO. Very good.

Unless there are other members who have questions, Ms. Fallin? Do you have any further questions? Chairman Oberstar?

Mr. OBERSTAR. May I just ask, I intended to, I didn't want to extend the time, but Dr. Dillingham, for his observations on my concerns.

Mr. DILLINGHAM. Good morning, Chairman Oberstar. We have the same concerns that you have. We echo the concerns that the Inspector General in fact voiced. We are particularly concerned with, particularly if you talk about ADS-B or more for ADS-B in terms of security, we think it is important that it is in fact the FAA that will certify and license the contractor for ADS-B. But we are concerned that we preserve the rights of the Federal Government, particularly where security is concerned.

At the same time, Mr. Oberstar, we think that we wouldn't just out of hand dismiss the possibility of some contracting out. Because at this point, it is not clear to us that the FAA has all the resources it needs to do all the things that it is chartered to do. But it needs the oversight and it needs careful scrutiny to the extent that it does do some contracting out in this way.

Mr. OBERSTAR. A lesson from the past to be observed in the present and into the future. In the 1960s and into the 1970s and the mid-1980s, the relationship between FAA and IBM in the development of air traffic control technology was such that you could not tell where FAA left off and IBM began or vice versa. For a while, when IBM was the giant uncontested, that was somewhat accepted practice. But as other technology and other firms with that capability came forward with services and equipment and software to offer, and challenged that leadership role, and we began to see that FAA was losing its objectivity, FAA was losing its innovative ability separate from that of IBM, and too strong a dependence on one vendor because a detriment to the diversification of the FAA air traffic control technology.

When we had eventually what I called at the time a meltdown, when FAA/IBM, IBM/FAA proposed technology standard was going to cost maybe $2 billion or $3 billion more, maybe not really be

achievable, is when finally the Inspector General, GAO at the time was of great service to our Subcommittee, gave us the reaffirmation of the concerns and fears that we had, that are now being repeated again. This idea of Section 410 of the reauthorization proposal to designate non-Government third parties the ability to develop aircraft operating procedures, that is back to the IBM nexus. That is a major concern that I have, a lesson that we learned painfully, that we created some distance and separation and keep FAA in the position of being the overseer, as Inspector General Scovel said, day to day, hands on management.

Thank you.

Mr. COSTELLO. I thank the Chairman, and would just, as a side note, add on the Science Committee we have seen a similar relationship between NASA and some of the contractors that they have relied on and work with on a day to day basis, and lose objectivity and oversight. The same is true with the Department of Defense as well. We have had example after example. That is why I have major concerns about contracting out and losing objectivity and oversight. That is one of the reasons why I have made the point many times that we have to be aggressive in our oversight to make certain that the agency is doing its job and we closely scrutinize their responsibilities.

With that, I thank all of our witnesses here today, and we will note to Mr. Sturgell and Mr. Leader that we have a few other questions, one of Dr. Dillingham and a few of you that we will submit in writing and ask that you answer them in writing. We thank you for your testimony today, and look forward to seeing you again.

I will now call on our second panel to come forward, please. As the second panel is coming forward to be seated, let me introduce our witnesses.

The first witness is Peter Bunce, who is the President and CEO of the General Aviation Manufacturers Association. Next is Dr. Christina Frederick-Recascino, the Interim Provost and Director of Research at Embry-Riddle Aeronautical University; Tom Brantley, the President of the Professional Airways Systems Specialists; and Dr. Michael Romanowski, who is the Vice President of Civil Aviation, Aerospace Industries Association.

We appreciate all of you being here today and look forward to hearing your testimony just as soon as you get seated. We would make note that your testimony in its entirety will appear in the record and would ask each of you to summarize your testimony. We would call on Mr. Bunch, you first, sir.

TESTIMONY OF PETER J. BUNCE, PRESIDENT AND CEO, GENERAL AVIATION MANUFACTURERS ASSOCIATION; CHRISTINA FREDERICK-RECASCINO, PH.D., INTERIM PROVOST AND DIRECTOR OF RESEARCH, EMBRY-RIDDLE AERONAUTICAL UNIVERSITY; THOMAS BRANTLEY, PRESIDENT, PROFESSIONAL AIRWAYS SYSTEMS SPECIALISTS; MICHAEL ROMANOWSKI, VICE PRESIDENT OF CIVIL AVIATION, AEROSPACE INDUSTRIES ASSOCIATION

Mr. BUNCE. Chairman Oberstar, Chairman Costello, Ranking Member Petri, thank you for inviting me to testify before the Sub-

committee today. And thank you for entering my full statement into the record.

On behalf of our 60 member corporations and the thousands of employees throughout the U.S. and the world, I applaud this Committee for taking the initiative to have a hearing on this critical issue of transformation. Despite the many differences that exist between general aviation and the major airlines, the regional airlines and the cargo folks dealing with funding of the system, there is nothing that we agree more on and nothing that binds us all together as much as the critical need for transformation.

Mr. Chairman, just last week the Senate took critical steps toward the implementation of NextGen with the introduction of S. 1300, the Aviation Investment and Modernization Act of 2007. Although GAMA has significant concerns over the bill's inclusion of a $25 user fee, we do applaud the Senate for its work in strengthening JPDO in addressing critical needs for NextGen.

Likewise, we know every member of this Committee is deeply concerned about the pace and planning for NextGen and know that your focus on this issue will bring about positive change.

Mr. Chairman, the JPDO was designed as part of Vision-100 legislation to leverage the institutional and technical knowledge of many Federal agencies involved in the transformation process. Unfortunately, many of these relationships, so desperately needed for JPDO and NextGen success, have failed to mature. We believe that in order for the JPDO to be successful, some fundamental structural changes are necessary. Greater authority needs to be given to the JPDO director, to include being a major player on the FAA's Joint Resources Council.

Clearly delineating the reporting lines for the JPDO director is important, both up the chain and for those that work for him. And also increasing the Government-wide support for NextGen to include not only signing the memorandums of understanding, but working to make positive change to their budgets, R&D approaches and a sharing of personnel with the JPDO.

And finally, to abandon the stovepipe approach that FAA acquisition processes are used within the OEP to be able to take a more systems-wide look at acquiring the system that we need to perform in NextGen.

But structural changes alone won't fix the problem. We strongly encourage Congress to work with industry and push the JPDO, the FAA and the Department of Transportation and other participating Government agencies to clearly define what they intend to build and how they intend to build it. This comprehensive plan defining both time and required costs must incorporate reasonable and executable time lines for program development, policy implementation and rule development, aircraft certification and aircraft equipage.

You have heard this morning that the plan that is going to be brought forward will talk, will be a plan that will provide a baseline for all others. But I can tell you today with certainty that this plan will not tell us as manufacturers what we have to build to put in the airplane to execute just very basic backbone systems like ADS-B. We do not have that delineation right now for the manufacturers to be able to know exactly what to put in the aircraft. That is why aircraft coming off the production line today, even though

we have ADS-B elements in it, are not going to be able to operate in the system as we probably will see it out there, because we don't have the design specifications as of yet.

In order for the system to work, aircraft owners, both commercial and GA, will have to equip their aircraft to operate in this new system. Now, the FAA Administrator defines the cost of equipage as being roughly equal to the cost of the Government investment. Let me use ADS-B as an example. The main concern facing us with ADS-B roll-out is that the benefits are still undefined to the users. In fact, we are trying to help the FAA define those benefits.

But unless we know what those benefits are, what we are going to find is that people will equip with this technology at the back end of the window, and that is what we saw with the reverse vertical separation memo, RVSM. If they wait until the back of the window, that is out at 2020. Now, the FAA just revised their estimates of what equipage would be like when they get the ground infrastructure in place at about 2014. They talked originally about perhaps having 40 percent of the fleet equipped, now they have revised that to 26 percent. If we are going to truly reach a capacity limit around the year of 2015, 2016, 2017, and we aren't going to have a majority of the fleet equipped until way out at the end of the window, at the end of near 2020, then all the time lines don't reconcile. That gives us serious concern.

GAMA believes that Congress must identify a reasonable performance-based and revenue neutral strategy to try to incentivize equipage. That is part of the debate that hasn't been talked about a lot. We talk about the Government investment in this. But unless we are able to somehow figure out a revenue neutral way to incentivize both the commercial and GA folks to be able to equip with this technology, we are not going to get the benefits early enough to be able to solve the capacity problems out in the system.

Mr. Chairman, thank you for letting me be here today and I look forward to your questions later on.

Mr. COSTELLO. We thank you, Mr. Bunce.

The Chair now recognizes Dr. Frederick-Recascino.

Ms. FREDERICK-RECASCINO. Chairman Costello, Ranking Member Petri, Chairman Oberstar, thank you for allowing me to testify today.

My name is Christina Frederick-Recascino, and I am the Interim Provost and Director of Research at Embry-Riddle Aeronautical University, the world's largest and oldest university solely devoted to aviation education and research. Our students, faculty and staff live and breathe aviation.

In the United States, we have been fortunate to enjoy a vibrant air transportation system, allowing us to move across the Country quickly and easily. However, this year, all trends indicate that congestion may be at an all-time peak. The skies are crowded, the quality of the traveling experience, according to all evidence, is declining and the American public deserves better.

At Embry-Riddle, we are currently testing solutions that will improve safety and decrease congestion in the national airspace. One of these solutions is the ADS-B system. Embry-Riddle was one of the early pioneers in the installation and testing of ADS-B. Embry-Riddle outfitted its entire fleet of 100 aircraft with this system and

has provided data to the FAA bout increases in safety resulting from this retrofit.

We believe it is a good thing, and we have shown that increased situation awareness provided to pilots and operation center staff resulting from ADS-B has enhanced the safety record of our fleet. We have experienced a significantly lower number of near mid-air incidents since our ADS-B installation.

Embry-Riddle recently has embarked on another ambitious and timely project. We have created a university public-private partnership called the Airport of the Future. With our private partners, Lockheed Martin, Transtech, ENSCO, Sensis, Jeppesen and Mosaic ATM and three others who are in process, and our public partners, Volusia County, Florida, and the Daytona Beach International Airport, we have created a cutting edge national test bed for new air modernization technologies in the tenth busiest airspace in the Country at a working commercial airport.

The Airport of the Future is a four-phase project, developed in response to the call for air traffic and airspace modernization. Each phase will focus on a different air modernization problem. The first phase examines airspace and airport safety, including further testing of ADS-B implementation. Phase two focuses on airport capacity and efficiency issues. Phase Three examines ramp management technologies and point to point technology enhanced arrivals and departures. Phase four tests solutions for all-weather airport operations.

The partners in the Airport of the Future project realize that new technologies designed to modernize the airspace system must be tested prior to implementation. At our test bed, all of our private partners have entered into a signed agreement. The will bring their technologies to Daytona Beach International Airport, where they will be tested and integrated with other teams' technologies.

Embry-Riddle will collect and analyze data from these integrated systems. We will have the ability to use the data we collect to enter into a simulation to test human factor solutions that include human participants in the airspace system. Controllers, dispatchers and pilots will be able to engage in decision-making activities to test the newest technological solutions.

In addition, the data we collect can be used to generate financial estimates of the cost of implementation of these new systems, estimates that are crucial to the Federal Government and to every taxpaying citizen in this Country.

On March 27th and 28th of this year, we presented to the world the first demo of our project. We had individuals from all over the globe come to hear the project, including representatives from the FAA, NASA and Germany's DLR. They recognize the importance of this project. In a short period of time, at DBIA, we will have technologies installed. We will show that these technologies can be integrated with all other systems that are at the airport. No other project has brought together multiple partners who have agreed to work together at one location for technology testing and integration. The project is really unprecedented in both scale and scope.

The Airport of the Future should become the next national test bed for all NextGen technologies. Since our first demonstration, other companies have expressed interest in joining our partnership

and we open it up to any companies and agencies who want to be part of this unique and important vision.

Embry-Riddle's motto is "Leading the World in Aviation and Aerospace Education and Research." In all that we do, we look to the skies and lead the way to a stronger and safer future for aviation. We are asking Congress this year to partner with us to make the Airport of the Future the national test bed for NextGen technologies. Embry-Riddle and its partners estimate the cost of the project to be $50 million over the next five years. Our private partners are contributing half the cost of the project, along with the technical support from Embry-Riddle in a facility provided to us.

We are requesting that this Committee provide language in the FAA authorization bill supporting our efforts for this important endeavor, that will provide solutions for airspace modernization in the United States.

Thank you for your time today, Mr. Chairman. This concludes my testimony.

Mr. COSTELLO. We thank you. And the Chair now recognizes Mr. Brantley.

Mr. BRANTLEY. Chairman Costello, Congressman Petri and Chairman Oberstar, thank you for asking PASS to testify today.

PASS represents approximately 11,000 FAA employees working throughout the United States and overseas. We appreciate the opportunity to present our views on the future of air traffic control modernization.

The FAA has introduced a plan to modernize the national airspace system through development and deployment of the Next Generation Air Transportation System, or NextGen. Under previous administrators, PASS worked closely with the FAA in its efforts to modernize the NAS, collaborating on such efforts as the development and deployment of the Standard Terminal Automation Replacement System, STARS, where it ultimately was deployed successfully; the display system replacement, DSR; and the National Airspace System Infrastructure Management System, or NIMS.

Throughout these projects and many others, the experience and expertise offered by PASS members proved invaluable. As Congress has seen over the years, and as testified to by the GAO again today, involving the employees who use and operate the systems in the development of those systems, greatly improves the final product and inevitably saves the taxpayer money. Yet in 2003, the FAA began to eliminate PASS' involvement, and PASS has not been a participant in developing and implementing any of the FAA's modernization projects for several years now. PASS believes the FAA must reconsider its exclusionary approach to modernization and once again involve the employees, who will ultimately play a large part in any modernization effort.

In addition, there must be a sufficient number of trained FAA technicians in place to maintain the NAS today and into the future. Since the FAA does not have a staffing model to accurately determine the number of technicians needed to meet the agency's mission, PASS is requesting that Congress require a study of FAA technician training and the methods used by the FAA to determine technician staffing needs.

The FAA is nonetheless moving forward with plans to modernize the NAS without input from FAA technicians. Recent issues associated with the implementation of the FAA telecommunications infrastructure, FTI, highlight the problems that develop when stakeholders are not involved. A few years ago, PASS' liaison was removed from the FTI project and PASS was informed that its support was no longer needed. Since that time, the costs for the program have escalated, the expected benefits have deteriorated and there have been numerous problems with implementation, leading to several outages across the Country.

Implementation problems could have been avoided or reduced had PASS been involved in the development and implementation of the system. Development of additional NextGen systems must include stakeholder participation, especially FAA technicians who are intimately aware of every aspect of the NAS and how each system affects every other system.

In addition, the agency's reauthorization proposal includes provisions that would outsource key components of the NAS, such as ADS-B, which I believe is as much a part of the Administration's privatization effort as it is the modernization effort with the NAS. To introduce concepts that would hinder or abandon the work performed by the dedicated professionals that are already in place would be to risk the foundation that keeps this Country's aviation system safe. PASS is very concerned that the Administration's desire to privatize the NAS and related services overwhelms any thought of the true implications of such an action.

PASS firmly believes that providing a safe and secure NAS is an obligation that must remain with the Federal Government. The danger of placing the world's busiest, most complex and yet safest air traffic control system into the hands of private contractors is too great a risk. The safety of the flying public should never be sold to the lowest bidder under any circumstance.

Thank you, and I would be happy to answer any questions that you have.

Mr. COSTELLO. Thank you, Mr. Brantley.

The Chair now recognizes Mr. Romanowski.

Mr. ROMANOWSKI. Thank you, Chairman Costello, Chairman Oberstar, Representative Petri.

On behalf of the nearly 300 member companies of AIA and the 635,000 high-skilled, high-wage workers they employ, I would like to thank you for allowing me to testify on the critical issues related to modernizing our aviation infrastructure.

I would also like to thank the Subcommittee for its leadership on modernization issues, particularly the establishment of the JPDO and the integrated NextGen process. We remain a strong supporter of both JPDO and NextGen, and the comments I offer here are intended to help strengthen JPDO so that NextGen can become a reality.

We have heard this morning that we all agree on the need for modernization and the importance of aviation to our Nation's economy. However, despite the pressing need, we question whether we are really adequately prepared to meet the challenge of implementing this system. The consequences are high. The JPDO has estimated that the cost of not implementing NextGen will be over

$20 billion per year by 2015 and over $50 billion per year by 2025. That is just the effect on commercial aviation. That doesn't include other areas.

Now, looking across the JPDO enterprise, we see several areas of concern that place NextGen development and implementation at risk. First, I would like to say that we applaud Mr. Leader and the moves he is making on reorganization and refocusing its working groups on implementation. Those are moves in the right direction, and there is progress being made with improving the engagement with industry. And more work there remains to be done and we are going to support him as he moves forward.

But on the Government side, we do see systemic issues that will require immediate attention and resolution. Taking these from a high level, we see across the agencies a lack of urgency. We also see a lack of accountability by the agencies for their NextGen responsibilities.

And finally, we see a lack of program integration across the agencies and a need to strengthen the JPDO, particularly its program management and systems engineering disciplines. These are all clearly illustrated by the R&D gap that Dr. Dillingham and Mr. Scovel talked about earlier that exist between FAA and NASA. This is an issue we believe needs to be addressed immediately if NextGen is going to succeed. We believe it is going to take strong Congressional leadership to resolve those issues.

It is estimated that NextGen development and implementation is going to require at least $1 billion per year. Unfortunately, the Administration's budget request fails to make that level of investment. For example, the FAA's 2008 request only increases funding for NextGen at 3 percent or $36 million. We are losing time. Mr. Sturgell stated in his testimony that by 2015, the system will not be able to handle the traffic that will exist.

Given the time required to conduct research, validate and prototype concepts, create new rules and procedures, certify systems and incorporate the necessary upgrades into our infrastructure and the operational fleet, we believe it is critical that we really jump start NextGen now. We need to be more aggressive, taking advantage of the capabilities that are already in aircraft, and we need to ensure that we are prepared to certify the new systems.

This highlights the importance of the Aviation Safety Organization in FAA. That is an organization that is currently already resource constrained. But the new regulations, policies and certification approvals that are going to be required for NextGen are going to be needed to be done at that organization. Those are front-loaded activities and we need to ensure the FAA applies sufficient resources to achieve the necessary results in that area.

However, developing new policies and certifying new systems depends on having done adequate research. This is an incredible concern for us. The concepts of operations that Mr. Leader is talking about calls out 167 research questions and 77 policy issues that have to be addressed to implement NextGen. With the research gap that exists between FAA and NASA, we question how those are going to be resolved. That research gap should not exist. Congress provided NASA an additional $166 million above their request for

2007. We believe that money needs to be applied now to transitional research for NextGen to close that gap now.

Now, if we look across the accountability and authority of JPDO and the agencies, additional work needs to be done there. We believe Vision 100 and the national aeronautics policy that President Bush recently signed gives them the authority to develop and implement the plan. But that requires the agencies to do their part. The agencies' commitment must be strengthened. They need to be held accountable to the integrated work plan and strong Congressional oversight is going to be required to make sure that occurs.

We also call out additional recommendations to strengthen the accountability and performance within the JPDO, including fully funding the JPDO and improving the resources it has at its disposal.

With that, I will conclude my testimony and welcome any questions you have. Thank you.

Mr. COSTELLO. Thank you very much.

Mr. Bunce, you indicated in your testimony, both in your testimony today and in your written testimony that I read last evening that you think that the JPDO director, instead of reporting and having accountability both to the COO and the Administrator, that it might be best to have the director report directly to the FAA Administrator. Do you want to elaborate on that?

Mr. BUNCE. Yes, Mr. Chairman. We in industry want to see Charlie succeed. We have great stakes in making sure that he can be the boss of his organization and that he can provide advice at the right level. If he reports directly to the FAA Administrator and is a member of basically the acquisition arm that the FAA has, then there is a connect between JPDO and the OEP, so that they can take this vision and bring it to reality when they go and acquire systems.

So by making the head of the JPDO report directly to the FAA Administrator and putting him on this JRC, there is a capability to raise that position and stature within the FAA to be able to try to leverage all these different systems that they are bringing on board. Also, the head of the JPDO needs to be an advisor to the Secretary of Transportation. When you look at the time frame between the last time that Mr. Mineta had all the principals together for all the different agencies, the time that has elapsed, basically two budget cycles have gone by where we have missed opportunities to put funding in budgets of other agencies to be able to further this NextGen along.

So we think that raising the stature of the head of the JPDO becomes very, very important.

Mr. COSTELLO. We are going to hear the bells go off in just a few minutes. We have four votes on the Floor coming up. So I am going to ask some questions very quickly and call on Mr. Petri.

Let me just ask you, Mr. Bunce, in your testimony you indicate, and I am quoting, that you strongly encourage Congress to both push the JPDO, FAA and DOT and other governmental participating agencies and on and on, to clearly define what they intend to build, how they intend to build it, a comprehensive plan. You have heard the testimony this morning that by the end of July that we are going to have a comprehensive plan and I guess I would

just ask you, based upon your experience in dealing with NextGen, do you have confidence that that plan, that we are near the time at the end of July where we are actually going to have a plan that lays it out?

Mr. BUNCE. Sir, I think it is an iterative process. I think that we are going to have a clearer concept, a clearer vision. And as we go and put this enterprise architecture together, it will give more and more clues as to where we eventually want to go.

Industry provided the FAA with clear concerns about ADS-B. And really, we are not going to have a notice of proposed rulemaking right now out until they say September. But in that it is very important. If we don't come out with separation criteria for ADS-B that is at least as good as what we have today, people are going to start scratching their heads. We know that what is going to come out in June and July isn't really the NPRM. That is the technical part.

When we look to industry and we say, a plan is something we can build to, and that is really our point. Industry needs to be able to build this infrastructure, and until we get the design specifications and know what some of these augmentation signal requirements are for the GPS to be able to really have a precise position, to know what kind of separation criteria is out there, we have a hard time being able to go and figure out how industry is going to be incentivized to want to go forward and build this quickly before we know how much demand is going to be out there.

So all of these things are very important to fit together.

Mr. COSTELLO. Thank you.

Mr. Brantley, you state in your testimony that the FAA adopted a position of banning PASS from the modernization project. You heard the testimony earlier of the FAA saying that they thought that they gave plenty of input, both to NATCA and to the technicians. I just want you to elaborate on your statement that their position was to ban PASS from the modernization project.

Mr. BRANTLEY. Certainly. Thank you, Mr. Chairman.

I believe the question was answered very artfully earlier. What I would offer is that the agency can direct an employee, order them to be part of a work group that is working on something that has to do with modernization as an assignment of work. Now, as an employee, they are not as free to raise issues or even to pursue them after they are raised as they are if they do it on behalf of the union.

Quite frankly, they are protected when they do it on behalf of the union. If they do it as an FAA employee, they fall into the greater than 60 percent of FAA employees who are afraid to speak up when they see a problem, because they fear retaliation.

So as a general culture, FAA employees don't speak up, if they can avoid it. So I am not surprised that they have chosen to go this route, because if you don't find problems, then you are not hindered with having to correct them.

Mr. COSTELLO. You also mention in your testimony that several recent high visibility outages have called into question the FAA's focus on maintaining the current system. I would ask you to elaborate on that.

Mr. BRANTLEY. Certainly. There have been several throughout the last year. Los Angeles, Chicago had a problem earlier. And what they had to do with is, the people that are installing the FTI system, and there are very different, many different companies across the Country, because Harris has outsourced much of that, so the vendors are probably too many to even mention. But they are not intimately familiar with the equipment that the telecommunications infrastructure is designed to feed. So many times they will, whether it is turn a system off inadvertently or when they bring the FTI online, it is not lined up properly, so the communications don't go where they should.

It is just something that the FAA is relying on the vendor to do, that they are frankly not capable of.

Mr. COSTELLO. You mentioned outsourcing. Since the certification cannot be outsourced, you indicate in your testimony that the FAA has been very creative in trying to circumvent the system, would you elaborate on that?

Mr. BRANTLEY. Yes, sir, Mr. Chairman. One of the things that we have seen and heard from the FAA in the last couple of years is that they are trying to reduce the amount of certification they do. Where today they certify the systems, the services, and in many cases the pieces of equipment, depending on the criticality, and each of those must be certified before it can be put into the overall system and be used to control air traffic.

Because legal determinations have been made that won't allow the certification to be outsourced, it is considered inherently governmental, the agency has come to the conclusion that just not doing the certification would clear that roadblock. So they want to dramatically scale back the amount and type of certifications that are done. And initially they want to go to strictly a service certification, without any equipment certified at all, which again, being done the way they are planning is going to create a lot of problems. It is going to end up putting us in a position where systems are put into the NAS that aren't ready, and outages are going to occur, people will be pointing fingers, no one will know what is going on and the travelers are going to be sitting in the terminal wondering what is going on.

Mr. COSTELLO. Thank you.

The Chair recognizes the Ranking Member.

Mr. PETRI. Thank you, Mr. Chairman. I just have one question, given the time constraints. I would like to ask Mr. Brantley, and really, all the members of the panel, in your judgment, does the Joint Planning and Development Office have the necessary resources and authority to carry out NextGen? If not, what changes should we be making to make sure that they do?

Mr. BRANTLEY. Mr. Petri, I think it is hard for me to say exactly, because, without being involved in modernization any more than reading about it in the newspaper, and what we hear at the water cooler, it is hard to make a real call on that. But from everything I hear and read, I would say that they are struggling with having the autonomy and the overall buy-in. Until that is nailed down, whatever they come up with is going to be tough to implement, unless each agency is really stepping up to the plate and are a part

of it, and that they have the autonomy to do their job without anyone overly controlling them.

I think those are probably the biggest issues.

Mr. BUNCE. Sir, I would just like to add, and be a little more frank here, the head of the JPDO has two engineers that work for him right now, has about six direct reports. So he is having challenges just having the technical expertise that he can reach down and touch and lead an organization to be able to implement NextGen. This is a huge endeavor. We have to give the head of the JPDO the tools to be able to go ahead and execute. Unless he has people that work directly for him, you know, when the military assigns people across departments, you can have an Air Force guy working for a Navy guy. When the Navy person is who that person is reporting to, he writes the report. And why these different agencies can't send quality people over to work in the JPDO, not to say that there aren't, but send their best people over, because this is very important, and have them report directly to the head of the JPDO is something I don't understand.

Mr. ROMANOWSKI. I would like to add to what Pete has been saying here. JPDO right now, as he said, very few of the people actually work for Charlie Leader. We believe that he needs to have direct performance input into those people. But also, if you look across the agencies, it is very difficult to say who is responsible in those agencies for NextGen. And one of the things that we think is very important is that somebody be named in each of those agencies that has NextGen accountability. DOD is apparently moving down an approach to name an overall NextGen program manager or program director at DOD. We think that ought to be applying to all the partner agencies at DOD, and that person should be tied in and working for Charlie Leader as a direct report as well, so that we can ensure that there is clear flow-down of need, of funding, of resources through the agencies, and that the agencies also have appropriate feedback into the overall integrated plan.

One of the key things that we are very concerned about is that, as the integrated plan develops, will that plan really reflect the capabilities and resources available at the agencies or are there gaps that are going to be there. That has to be fed back into the overall plan, the actual performance to the plan, so that we can make adjustments as necessary, the funding is actually applied where it needs to be, and the like. The same thing goes for an engagement with the industry, that the feedback that comes from the industry in terms of implementation and requirements generation gets fed back into the overall plan.

So right now, I think JPDO probably has authority given to it. If you look at the statutes in the President's policy, it has the authority to do what it needs to do. But we need to really step up the oversight and accountability. That starts with MOUs, making sure that those are not just, I think Mr. Leader testified that they were symbolic to the Science Committee last month. Those need to be real, meaningful MOUs that really call out clearly what the agencies are going to do with the resources that they are going to provide. And then moving down into the other areas.

Mr. COSTELLO. We thank you very much. We have less than four minutes to get over to the Floor, so I would let our witnesses know

that we have some written questions that we would like to submit to you and ask you to answer them for the record.

We thank you for your testimony today and look forward to continuing to work with you. Just as a side note to Mr. Bunce and Dr. Romanowski, I can tell you that we have had these conversations and I agree with you that JPDO, without question, has the authority that it needs, but it needs to be restructured and needs to be defined. And the people who work there need to report to one person. We will have further discussions about that.

We appreciate your testimony and this concludes our hearing.

[Whereupon, at 12:45 p.m., the subcommittee was adjourned.]

BRUCE L. BRALEY
1ST DISTRICT, IOWA

Congress of the United States
House of Representatives
Washington, DC 20515

May 9, 2007

Rep. Bruce Braley
Statement for the Record
Subcommittee on Aviation Hearing: *The Future Air Traffic Control (ATC) Modernization*

Thank you Mr. Chairman, and thank you for holding this hearing to consider the future of air traffic control modernization. An upgraded National Airspace System is essential to maintaining the safety and efficiency of the traveling public.

The American aviation system is the safest in the world, thanks to the skill of our air traffic controllers and the technology at their fingertips. However, that technology is waning, and continued budget cuts have threatened the safety and operability of the system. Outdated equipment and lack of funds for maintenance are starting to impede the

effectiveness of the system. It is time for a comprehensive update, and it is time for this Administration and this Congress to provide the resources necessary to move our air traffic control system into the 21st century.

Just last week, I toured the air traffic control tower in my hometown of Waterloo. While I was thoroughly impressed with the professionalism and personnel, I was astonished to see the age of the equipment there. I saw firsthand the need for the modernization effort that we are discussing at this hearing, and gained real world understanding of the impact and urgency of this issue. It is time to make this modernization happen.

The goal of this effort should be ensuring the technology is there to allow air traffic controllers to make faster and better decisions. As such, we must make sure that the controllers are involved in this process from step one. They are the ones who know best the factors that ensure the system is

working most effectively. They know what helps them make the best decisions, and what hurts. Many lives depend on the controllers, and their equipment, every day, and I look forward to their continued input as this committee moves forward on this modernization effort.

Thank you Mr. Chairman.

OPENING STATEMENT OF
THE HONORABLE RUSS CARNAHAN (M0-3)
AVIATION SUBCOMMITTEE
TRANSPORTATION AND INFRASTRUCTURE COMMITTEE
U.S. HOUSE OF REPRESENTATIVES

Hearing on
The Future of Air Traffic Control Modernization

Wednesday, May 9, 2007, 10:00 AM
2167 Rayburn House Office Building

Chairman Costello and Ranking Member Petri, I thank you for holding this important hearing on Air Traffic Control Modernization.

I am proud of our nation's long history in aviation innovation. After completing his first pilot training class in 1924, Charles Lindbergh began flying a mail delivery route from Lambert St. Louis field, the airport which Chairman Costello and I use to return home on weekends. His famed aircraft, *The Spirit of St. Louis*, was named after the city in which his investors resided and also the city which forms the northern portion of my district.

While I am proud of our nation's aviation history, I recognize that significant changes to the national airspace system are necessary to accommodate the increased demands upon the system. The NextGen system, which the Joint Planning and Development Office is producing, will allow our aviation community to continue to grow and will maintain its economic strength.

However, it is important for JPDO to recognize that the multi-billion dollar price tag on NextGen will require intense oversight and cost controls. This Committee will not allow

billions of taxpayer dollars to be improperly spent. The JPDO does not have a flawless track record. Though progress has been made, the Government Accountability Office still classifies NextGen as "high risk". I ensure you that this Committee will be watching closely as JPDO continues to develop NextGen.

I look forward to hearing from today's witnesses and again thank the Chairman and Ranking Member.

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Statement of Rep. Harry Mitchell
House Transportation and Infrastructure Committee
Subcommittee on Aviation
5/9/07

--Thank you Mr. Chairman.

--Over the past few months, this subcommittee has explored numerous issues relating to FAA reauthorization.

--Today we will examine the future of air traffic control modernization.

--As we contemplate the development and deployment of new technology, however, I

believe we must be especially careful not to take our eye off the ball. Efficiency is important, but safety has to be our top priority...both now and in the future.

--According to the FAA, 70 percent of our air traffic controllers will become eligible to retire over the next 10 years.

--We need to make sure that, no matter what kind of future system is deployed, the FAA has the resources it needs to recruit, train and

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maintain an appropriate amount of controllers to keep the flying public safe.

-- The FAA estimates that by 2015 more than one billion passengers will occupy our skies.

--That's a lot of people to keep safe.

--But I know that if we work together, in a bipartisan manner, we can figure out the best way to get the job done.

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--Today's hearing is a step in the right direction.

--I look forward to hearing from our distinguished panels of witnesses, and yield back the balance of my time.

Opening Statement
Congressman John T. Salazar
T&I Aviation Subcommittee Hearing
Hearing on the Future Air Traffic Control (ATC) Modernization
May 9, 2007

Thank you, Mr. Chairman.

We have held multiple hearings on the FAA reauthorization.

I appreciate that we are holding a hearing today on the issue of future Air Traffic Control (ATC) modernization and the transformation to NextGen.

Our nation's air traffic management system must be sufficiently updated to meet the future needs.

The Administration has yet to provide concrete details on how exactly it proposes to get there.

But while we wait, problems continue to arise and demand immediate attention.

In Colorado there was the need to solve airspace and surveillance (radar) issues now because we didn't have the time to wait for ADS-B to be implemented.

The result was the Colorado Wide Area Multi-Latteration project, which is funded by the State of Colorado and will be maintained by the FAA after installation.

It solves our current problems today, but will be upgraded to ADS-B to solve the problems of tomorrow when ADS-B is functional and aircraft are equipped to use that technology.

The FAA should provide Congress with a comprehensive plan to determine what specifically the NextGen system will entail.

Another instance of the FAA coming across as being less than forthcoming is with their poorly defined plan to realign, consolidate, co-locate, or close some of their facilities and services.

I appreciate that the FAA is looking to improve its cost control efforts, but I am concerned that some of their proposed changes would cause more harm than good.

I have had numerous conversations with the FAA on the matter of consolidating TRACONS.

There have been rumors that the FAA intends to co-locate or consolidate the Pueblo TRACON—either to Colorado Springs or Denver.

I have also been informed that the FAA is considering decommissioning the Robert VOR (Veryhigh Omni Range) at Steamboat Springs.

Not only would this reduce the approach options provided to pilots but it prematurely removes the VOR without first having a suitable GPS replacement.

While I can understand the desire to cut costs, I have serious concerns over the necessity for such moves and the possible safety issues that would result.

I look forward to the testimony today and I thank the panel members for being here.

Thank you.

Founded 1977

PROFESSIONAL AIRWAYS SYSTEMS SPECIALISTS

1150 17th Street, NW, Suite 702, Washington, D.C. 20036
Telephone: (202) 293-7727 Fax: (202) 293-7727

STATEMENT OF TOM BRANTLEY
PRESIDENT
PROFESSIONAL AIRWAYS SYSTEMS SPECIALISTS (PASS)
AFL-CIO

BEFORE THE HOUSE COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE – SUBCOMMITTEE ON AVIATION

ON
THE FUTURE OF AIR TRAFFIC CONTROL MODERNIZATION

MAY 9, 2007

Chairman Costello, Congressman Petri and members of the subcommittee, thank you for inviting PASS to testify today on the future of air traffic control modernization. Professional Airways Systems Specialists (PASS) is the oldest and second largest Federal Aviation Administration (FAA) union, representing approximately 11,000 FAA employees in five separate bargaining units throughout the United States and in several foreign countries. PASS members include Technical Operations technicians who install, maintain, repair and certify the radar, navigation, communication and environmental systems making up the air traffic control system; Flight Standards and manufacturing aviation safety inspectors responsible for inspecting and certifying every aspect of the commercial and general aviation industries; flight inspection pilots, mission specialists and procedures development specialists in Aviation System Standards; and administrative employees in the FAA's Civil Aviation Registry.

The FAA has introduced a plan to modernize the National Airspace System (NAS) through development and deployment of the Next Generation Air Transportation System (NextGen). Although the FAA estimates a target date of 2025 to realize the full benefits of NextGen, it is starting to execute ideas and plans related to the new system. As the FAA continues on this path, it is critical that the men and women responsible for maintaining, certifying and protecting this country's aviation system be meaningfully involved at every point in the process.

Under previous administrators, PASS worked closely with the FAA in its efforts to modernize the NAS, and our testimony will highlight the benefits of our involvement. Yet, in approximately 2003, the FAA began to systematically eliminate PASS's participation. As Congress has seen over the years, involving the employees who use and operate the systems in the development of those systems greatly improves the final product and inevitably saves the agency money. PASS believes the FAA must reconsider its exclusionary approach to modernization and once again involve the employees who will ultimately play a large part in any modernization effort. In addition, there must be a sufficient number of trained FAA technicians in place to maintain the NAS today and into the future.

Importance of PASS Involvement in Modernization

PASS has not been a participant in developing and implementing any of the FAA's modernization projects for several years now. This revelation is always a surprise to members of Congress and other government organizations focused on aviation safety. In fact, at a recent hearing before the House Subcommittee on Space and Aeronautics, the Government Accountability Office (GAO) emphasized the important role stakeholders, such as FAA technicians, should play in "planning for and deploying the new technology" that will be "important to the success of NextGen."[1] The GAO continued by stating that input from current technicians "who will maintain NextGen equipment is important when considering human factors and safety issues. Our work on past air traffic control modernization projects has shown that a lack of stakeholder or expert involvement early and throughout a project can lead to costly increases and delays."[2]

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[1] Government Accountability Office, *Joint Planning and Development Office: Progress and Key Issues in Planning the Transition to the Next Generation Air Transportation System,* GAO-07-693T (Washington, D.C.: March 29, 2007), p. 19.
[2] Id.

In a recent meeting between PASS, FAA Administrator Marion Blakey and Secretary of Transportation Mary Peters, PASS informed the secretary that the technicians PASS represents are not involved in NextGen or any modernization efforts. The secretary stated that she supported the FAA's position of banning PASS participation in FAA modernization projects. PASS understands that the exclusion of unions from modernization has applied to all FAA unions, not just PASS. The FAA's ill-advised position prohibiting PASS involvement is punitive to employees who are eager to see the agency succeed. In the end, the agency will inevitably suffer for choosing to give less than its best effort to FAA modernization.

The GAO has reported that a key factor in the FAA's ability to successfully meet cost and schedule goals is the sufficient involvement of relevant stakeholders, such as air traffic controllers and maintenance technicians, throughout the development and approval processes of a modernization project.[3] Yet, the FAA chooses to ignore these recommendations, preferring to develop these systems in a vacuum in which no critical views are permitted. Along with the incredible technical expertise that PASS members offer the FAA, they also provide an independent view of the FAA's program management. An FAA employee assigned by the agency to work on a modernization program can raise an issue to management but cannot pursue it beyond that point. The FAA's culture is one where management is intent on keeping employees silent when they see a problem. Although the administrator will dispute this assertion, the agency's own reports show otherwise, as evidenced in the following disturbing results from the FAA's most recent Employee Attitude Survey (2006):

Some employees may be hesitant to speak up for fear of retaliation.	62% of employees *Agree* or *Strongly Agree*.
It is generally safer to say that you agree with management even when you don't really agree.	54% of employees *Agree* or *Strongly Agree*.
Employees trust FAA management.	17% of employees *Agree* or *Strongly Agree*.

On the other hand, a PASS participant working on the same program can raise the issue repeatedly until the problem is addressed. Additionally, a PASS participant provides information to PASS that can be used to inform Congress of what is really happening with the program.

In the past, PASS was actively involved in many of the FAA's efforts to develop and modernize the NAS. The input provided by PASS bargaining unit members was invaluable, resulting in safer systems, smoother deployment and less cost. For example, PASS members were extensively involved in the development and deployment of the Standard Terminal Automation Replacement System (STARS). In 1996, the STARS program was introduced as a way to standardize air traffic control equipment by replacing older systems and controller displays with the updated systems designed to provide such benefits as high-resolution color displays and multi-radar tracking. PASS participated from the beginning with the STARS program and was an integral part of identifying major issues that would have rendered the system unusable if it had been deployed as the agency had planned. PASS involvement included a human factors study that identified 52 individual issues, all of which have since been incorporated into the final version of the system. PASS played a critical role in ensuring security of the system by insisting on the use of passwords, login

[3] Id.

screens, aural alarms[4] and the capability to load the software onsite. In addition, PASS was pivotal in designing a method to train employees with the prerequisite skills and STARS-specific training while also ensuring current onsite systems were fully supported during installation and testing.

Another collaborative effort between PASS and the FAA involved the Display System Replacement (DSR), which was scheduled to replace display channels and workstations in the late 1990s into the early 2000s. For example, the FAA agreed with a PASS recommendation that the video and power modules needed to be reconfigured for the DSR to facilitate troubleshooting and reduce cable and connector failures. PASS technicians, working with FAA experts, developed a new design for all 20 air route traffic control centers at considerable savings. With PASS's assistance, the DSR project was successfully implemented on time and within cost.

An additional example of the importance of involving PASS members in the development of new systems involves the National Airspace System Infrastructure Management System (NIMS), an acquisition program to update software used in capturing activities conducted at all NAS facilities. A PASS member was part of the product team responsible for selecting the software package. As part of that team, the PASS member visited the potential vendors and witnessed product demonstration and then helped decide which software package suited the specific design needs. The PASS member was instrumental in saving the agency $8.75 million during the purchasing of the software package when he suggested negotiating the software and maintenance fees. If the PASS member had not suggested negotiating the software package price, the agency was willing to purchase the product at a much higher price. This is a clear example of the pivotal, not to mention cost-saving, role PASS members play in the acquisition and development of a new system or product.

However, these collaborative efforts between PASS and the FAA are now a thing of the past. Recent major problems associated with the FAA's implementation of the FAA Telecommunications Infrastructure (FTI) highlight the costly inefficiencies of allowing the FAA to move forward without PASS technician involvement. In fact, PASS liaisons were summarily removed from the project and PASS was informed that its support on this program was not needed. PASS was told that the FAA program manager did not want people on the team that would point out any potential problems with the transition to the system. Unfortunately, this has resulted in numerous and costly problems with FTI.

As the primary voice/data transport system for the FAA's modernization efforts, FTI is the basis of the communications infrastructure for NextGen. FTI, currently contracted with Harris Corporation, is envisioned to provide complete telecommunications service and support for the NAS. When completed, FTI will consist of approximately 25,000 telecommunications services at over 4,400 FAA sites.

Unfortunately, our technicians in the field tell PASS of numerous problems associated with implementation of FTI, including many delays, contractor errors and outages over the past couple of years. In its April 2006 report, the Department of Transportation Inspector General (IG)

[4] As originally procured by the FAA, STARS had no audible alarms to indicate a malfunction with the system.

indicated that a major problem with the FTI program is a lack of contractor understanding.[5] Only trained FAA technicians are fully aware of the way in which every interconnected unit affects the entire NAS system and thus the aviation system as a whole. Neither the FTI Program Office nor Harris fully comprehend the requirements of site installation and the potential problems, and Harris contractors tasked with maintaining FTI are not properly supervised. For example, in November 2006, Harris contractors were performing corrective maintenance on equipment at New York's Air Route Traffic Control Center. As a result of the work being performed by the contractor, the Center lost remote and inter-facility communications, leading to significant unscheduled outages lasting over an hour that impacted airspace serving major airports including Kennedy International and Newark International. In another example, in August 2006, over 40 flights were delayed on average for over 30 minutes when contractors working with the FTI system at the San Diego Air Traffic Control Tower failed to properly coordinate maintenance activity with FAA employees. These are only two examples of the outages and problems that have occurred throughout the country, including outages in Atlanta, Boston, Chicago, Denver, Indianapolis, Little Rock, Louisville, Miami and Salt Lake City.

Poor management by the FAA of the implementation process is also a serious concern. PASS has learned of instances where FTI is being implemented without ensuring compatibility with FAA equipment. Instead, the plan is to install the equipment and then attempt to transfer to the new lines and work out the problems on a case-by-case basis. In other words, the FAA is going to be testing vital air safety services on a trial and error approach.

Poor management is also leading to an increase in cost and a corresponding decrease in benefits. In April 2006, the IG noted that FTI was a "high-risk and schedule-driven program that is unlikely to meet its December 2007 completion date."[6] The IG indicated that the FAA needed to improve management controls over the program and develop a realistic master schedule and effective transition plan. Since the time of that report, the FAA has revised its schedule yet again, extending the FTI completion date to December 2008. FAA also increased its acquisition costs to develop the FTI network by $8.6 million (from $310.2 to $318.8 million) and increased its operations lifecycle support by $100 million (from $3.0 to $3.1 billion).[7] This means that the expected benefits of FTI are lessening even further. "By December 2004, FAA's expected benefits dropped from $820 million to $672 million," stated the IG. "By the end of FY 2006, we estimated that benefits had dropped to about $415 million."[8] Since the FAA has not independently validated the FTI cost and benefits estimates, despite recommendations from the IG to do so, the actual costs and benefits remain unknown.

There are obviously major problems with the implementation of FTI, and the number of FTI-related outages highlight this fact. Over approximately a six-month period (July 4, 2006 – April 12, 2007), there were 191 FTI-related outages.[9] Between the dates of April 2 and April 10, 2007,

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[5] Department of Transportation Inspector General, *FAA Telecommunications Infrastructure Program: FAA Needs to Take Steps to Improve Management Controls and Reduce Schedule Risks*, AV-2006-047 (Washington, D.C.: April 27, 2006), p. 18.
[6] Id., p. 2.
[7] Department of Transportation Inspector General, *FAA's FY 2008 Budget Request: Key Issues Facing the Agency*, CC-2007-019 (Washington, D.C.: February 14, 2007), p. 14.
[8] Id.
[9] FAA National Operational Control Center (NOCC) daily report, July 4, 2006 – April 12, 2007.

there were over 60 unscheduled FTI-related outages in the Central Service Area alone.[10] Yet, there were only six unscheduled FTI-related outages reported by the FAA during the National Operational Control Center (NOCC) daily summary briefings.[11] Again, it seems the agency is more concerned with how things look rather than how things really are.

Testifying before this subcommittee on February 14, the IG discussed the agency's increasing problems as it transitions to FTI, citing several "key watch items" for FTI, including addressing schedule delays, improving FTI reliability and customer service, and validating cost savings. The IG emphasized that the FAA "needs to ensure that it has an effective strategy to address FTI reliability and customer service problems that have led to a number of serious outages (i.e., unscheduled outages leading to flight delays)."[12]

While implementation problems may have been avoided or reduced had PASS been involved in the development of the system, not involving FAA technicians represented by PASS in the implementation process is certainly worsening the already dismal situation. Implementation of additional NextGen systems must include stakeholder participation—especially FAA technicians who are intimately aware of every aspect of the NAS and how each system affects every other system.

In the summer of 2003, PASS had members involved in several of the FAA's most critical modernization programs, including ADS-B, AMASS, ASDE-X, ASR-11, ATOP, ECG, ERAM, Free Flight, FTI, ITWS, LAAS, NEXCOM, NIMS, STARS, WAAS and WARP. Together, these programs represent an investment by American taxpayers of more than $13 billion. At a time when the FAA asserts daily that it is in a fiscal crisis unlike it has ever faced, should that money not be spent doing everything possible to ensure the success of the programs?

Over the last few years, the FAA has boasted of major improvements in its modernization efforts. According to the agency, it has made great progress in managing the costs and schedule of modernization programs and is operating in a more "businesslike" manner. However, as long as the FAA refuses to allow participation in modernization programs by employees who are working on behalf of PASS, overly optimistic agency reports should be strictly scrutinized to ensure that they accurately portray the status of FAA modernization. PASS believes that the FAA *must* work with PASS to find ways to incorporate user involvement early in the acquisition and development processes. PASS members have the expertise and field experience needed to identify problems before the systems are deployed, and the FAA *needs* this expertise in order to field systems that are cost effective and safely meet the operational requirements of the NAS.

Technician Staffing and Training

As the FAA moves forward with its plans for NextGen, it is not only vital that FAA technicians be thoroughly involved but also that there be enough trained technicians in place to ensure success of the new systems while also making sure that current systems continue to operate in a safe manner.

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[10] FAA Central Service Area daily reports, April 2, 2007 – April 10, 2007.
[11] FAA NOCC daily briefing reports, April 2, 2007 – April 10, 2007.
[12] Department of Transportation Inspector General, *FAA's FY 2008 Budget Request: Key Issues Facing the Agency*, CC-2007-019 (Washington, D.C.: February 14, 2007), p. 14.

According to the GAO, "FAA will be largely responsible for implementing the policies and systems necessary for NextGen, while safely operating the current air traffic control system 24 hours a day, 7 days a week."[13] In other words, although the FAA is focusing on the deployment of NextGen technology, it must nonetheless continue to manage and sustain the current system. A large aspect of this is ensuring that there is an adequate number of trained technicians in place.

Insufficient technical staffing continues to be a major problem at numerous facilities throughout the country, and an increasing attrition rate in these safety-sensitive positions is worsening the critical staffing crisis. Staffing figures released by the agency already show a significant decrease in technician staffing from December 2006, a decrease that further stretches the gap between target staffing numbers and actual figures in many regions. Some facilities are staffed at less than half of what the facility has been allotted, as highlighted in PASS's recent testimony before this subcommittee.[14] Not only does this make daily operations difficult, it lessens the FAA's ability to respond to an emergency in a timely and efficient manner and will make it difficult to modernize the NAS.

The chronic understaffing of the FAA's technical workforce is exacerbated by the agency's inability to accurately determine the right number of employees and job skills needed to safely and efficiently maintain the NAS. Currently, the FAA does not have a staffing standard or model that can accurately determine the number of trained FAA technicians needed to meet the agency's mission "to provide the safest, most efficient aerospace system in the world." In today's changing aviation environment, it is *critical* that there is a staffing standard in place for the FAA technical workforce and that the FAA is required to abide by that standard and ensure that it has an adequate number of professionally trained technical employees. When viewed in combination with the agency's "scorched earth" labor relations posture, PASS believes that the FAA is deliberately understaffing its Technical Operations workforce in order to make it a more attractive target for outsourcing.

One major impact resulting from the inadequate technician staffing is that the FAA is moving to a "fix on failure" approach where preventive maintenance and certification of NAS systems and equipment are significantly reduced. In other words, instead of hiring additional employees, the FAA is lowering its maintenance standards, claiming a move towards efficiency; in reality, PASS believes this change will place aviation safety at risk and is merely an attempt to temporarily mitigate the impacts of inadequate staffing.

Several recent high-visibility outages have called into question the FAA's focus on maintaining its current systems, including an incident in August 2006 where the instrument landing system (ILS) malfunctioned at Los Angeles International Airport, leading to 46 delays because the lone technician was in the air traffic control tower fixing other equipment and could not respond to the ILS issue. If the proper technical staff had been readily available at the time, the duration of the outage and the number of delays could have been significantly decreased. Many are making the

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[13] Government Accountability Office, *Next Generation Air Transportation System: Progress and Challenges in Planning and Implementing the Transformation of the National Airspace System*, GAO-07-649T (Washington, D.C.: March 22, 2007), p. 1.

[14] Professional Airways Systems Specialists, *Statement of Tom Brantley, President, Professional Airways Systems Specialists (PASS), AFL-CIO, Before the House Committee on Transportation and Infrastructure – Subcommittee on Aviation on FAA Reauthorization Review of FAA's Operational and Safety Programs*, March 22, 2007, pp. 4 – 6.

clear connection that the increasing number of outages is an indication that systems are failing more frequently. In a recent testimony, the GAO focused on the duration of unscheduled outages, citing an increase from an average of 21 hours in 2001 to about 40 hours in 2006 as a potential sign that "maintenance and troubleshooting activities are requiring more effort and longer periods of time."[15] According to the GAO, "It will be critical for FAA to monitor and address equipment outages to ensure the safety and efficiency of the legacy systems, since they will be the core of the national airspace system for a number of years and, in some cases, will become part of NextGen."[16] The FAA claims that the increased duration of unscheduled outages is not a problem because it "considers user impact and resource efficiency when planning and responding to equipment outages."[17] In FAA terms, however, "user impact" means only that the user is not aggressively complaining and does not reflect potential safety implications resulting from of the outage. And "resource efficiency" means nothing more than the agency will get someone out to fix the system as soon as it is feasible, given the shortage of staffing in the field.

In order to ensure effective modernization of the air traffic control system, it is obvious that the state of technician staffing needs immediate attention in terms of the number of employees and the level of training. The GAO has even expressed agreement with the significance of creating a staffing model for the technician workforce, stating at a recent hearing that development of a staffing model is "important in the changing aviation environment and is critical to FAA's ability to ensure that its safety programs and workload are aligned to meet the future demands for which NextGen is preparing."[18] As such, PASS is requesting that Congress instruct the Comptroller General to conduct a study of the training of FAA technicians, including a recommendation for a future approach to training these employees. In addition, PASS is requesting that Congress direct the National Academy of Sciences to conduct a study of the assumptions and methods used by the FAA to estimate staffing needs for FAA technicians to ensure proper maintenance and certification of the NAS.

FAA's Reauthorization Proposal

As the FAA moves forward with plans to modernize the NAS, it must keep in mind the safety of this country's aviation system. Yet, in its reauthorization proposal, "Next Generation Air Transportation System Financing Reform Act of 2007," the FAA attempts to make significant changes that would not only impact the work done by FAA employees but has the potential to threaten the safety and efficiency of the entire system.

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[15] Government Accountability Office, *Next Generation Air Transportation System: Progress and Challenges in Planning and Implementing the Transformation of the National Airspace System*, GAO-07-649T (Washington, D.C.: March 22, 2007), pp. 10 – 11.

[16] Government Accountability Office, *Federal Aviation Administration: Key Issues in Ensuring the Efficient Development and Safe Operation of the Next Generation Air Transportation System*, GAO-07-636T (Washington, D.C.: March 22, 2007), p. 10.

[17] Government Accountability Office, *Next Generation Air Transportation System. Progress and Challenges in Planning and Implementing the Transformation of the National Airspace System*, GAO-07-649T (Washington, D.C.: March 22, 2007), p. 11.

[18] Government Accountability Office, *Federal Aviation Administration: Key Issues in Ensuring the Efficient Development and Safe Operation of the Next Generation Air Transportation System*, GAO-07-636T (Washington, D.C.: March 22, 2007), p. 31.

PASS is extremely concerned over the FAA's introduction of the Facilities Realignment and Consolidation (FRAC) program, a concept that completely ignores the safety implications associated with such an undertaking. Section 409 of the FAA's proposal establishes a commission appointed by the secretary of transportation to review the FAA Administrator's recommendations for closing or consolidating FAA facilities. Under the FRAC procedure, the FAA administrator will publish a list of facilities for realignment and closure and the commission will evaluate the recommendations and then send them to the president, who will approve or disapprove the recommendations. The FRAC process culminates with the submission of the president's report to Congress. The language in the proposed bill provides that if Congress does not act to block the president's report through passage of a joint resolution within 60 days, the president's recommendations for facility and services closures and realignments will automatically go into effect.

Under current law, the FAA has the authority to consolidate or close facilities where doing so will reduce the capital, operating, maintenance and administrative costs as long as the changes are consistent with the highest degree of aviation safety. At least privately, FAA officials are fond of blaming Congress for the agency's inability to consolidate facilities, claiming that congressional interests prevent the agency from making needed changes. The FRAC process is simply a way for the administration to rubberstamp any consolidations or closures deemed appropriate without giving Congress a meaningful opportunity to weigh in. This is an extremely risky plan that does not allow for adequate oversight of the impact of closing or consolidating FAA facilities. The GAO has expressed concern with this process, stating that "any such consolidations must be handled through a process that solicits and considers stakeholder input throughout, and fully considers the safety implications of any proposed facility closures or consolidations."[19] Quite simply, decisions on closing or consolidating FAA facilities should be made only through consultation with stakeholders, including PASS, and with safety of the aviation system as the primary goal.

Regarding this proposal, PASS recommends that the subcommittee require the FAA to develop and issue a report to the subcommittee before closing or consolidating existing facilities. The report should describe in detail the benefits (i.e., cost savings, improved service, greater efficiency) and/or hardships (i.e., reduced service, less availability of service, increased costs, increased time to restore service following an outage) of such a closing to the FAA as well as users and customers of the impacted facilities. The report should explain what provisions, if any, the FAA is prepared to offer users or customers who will see a reduction in service resulting from a facility closing or consolidation. Furthermore, the FAA should be required to involve stakeholders in the development of its report, including allowing stakeholders the opportunity to offer a rebuttal to the subcommittee if they disagree with the content of the report.

PASS is equally alarmed that the FAA would consider a plan that would allow the administrator to transfer ownership, operating and maintenance responsibilities from the FAA to selected smaller airports. The FAA has expressed to PASS that it wants to "get out of" any airport that is not an Operational Evolution Plan (OEP) airport. In other words, if it is not one of the top 35 airports in

[19] Government Accountability Office, *Next Generation Air Transportation System: Progress and Challenges in Planning and Implementing the Transformation of the National Airspace System*, GAO-07-649T (Washington, D.C.: March 22, 2007), p. 12.

the country, the FAA wants to let that airport fend for itself. Currently, these smaller airports rely on FAA technicians to maintain and operate systems and equipment, but, through Section 317 of its plan, the FAA is now offering the airports a monetary "incentive" to take this responsibility on themselves. FAA technicians are highly skilled employees specifically trained to address the intricate details of this work and should be the only people trusted with this responsibility. Essentially bribing airports to assume responsibility for locations that the agency no longer deems important because they are not major hubs for large air carriers is an inappropriate action based on misguided assumptions.

The FAA is not considering what happens to these airports when the authority that accepts the responsibility is not able to successfully operate and maintain the airport. Furthermore, the FAA is proposing overseeing these airports in much the same way that it currently oversees aviation repair stations in the United States and overseas, relying largely on the airport to police themselves to ensure that they meet safety standards. Considering the manner in which surveillance of repair stations has gotten away from the FAA, applying a similar concept in this situation seems dangerous and irresponsible. Having already reduced its own expertise and resources available to the airport, the FAA will not be able to offer much assistance to a struggling airport. Given the large number of airports that are threatened by this proposal, if even 10 percent of them are unable to take over operation and maintenance successfully, the impact to smaller communities across the country could be devastating.

An important change that the agency is making that is not included in the administration's FAA reauthorization bill is the precipitous reduction in the number of certifications performed by technicians in the field. Certification is the process in which a certificated FAA employee checks and tests systems or pieces of equipment on a periodic basis in order to ensure that the systems or pieces of equipment can be safely returned to service and not negatively impact any aspect of the NAS. According to the FAA, "Certification is a quality control method used by the ATO [Air Traffic Organization] to ensure NAS facilities are providing their advertised service. The ATO employee's independent discretionary judgment about the provision of advertised services, the need to separate profit motivations from operational decisions, and the desire to minimize liability, make the regulatory function of certification and oversight of the NAS an inherently governmental function."[20] Since certification is an inherently governmental function,[21] it can *only* be accomplished by FAA employees. The FAA sees this important safety function as a barrier rather than a necessary safeguard since it prevents the agency from outsourcing NAS maintenance across the board rather than only where there is a compelling reason to do so. Given the desire of the FAA to contract out or privatize as much of the NAS as possible, the agency has been very creative in finding ways to circumvent certification; since it cannot be contracted out, the FAA has simply decided to dramatically reduce the certifications that are done. Despite the obvious benefit of maintaining certification requirements to the NAS and the flying public, the agency is willing to reduce the safety margin by reducing the number of certifications simply to facilitate more widespread outsourcing.

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[20] FAA Order 6000.15E – *General Maintenance Handbook for National Airspace System (NAS) Facilities.*

[21] Manager, General Law Branch, AGC-110, memorandum to Manager, Maintenance Engineering Division, ASM-100, "Contractor Certification of Navigational Systems in National Airspace System (NAS)," June 18, 1991.

PASS is also concerned with Section 410 of the agency's proposal, which provides the administrator with the authority to delegate out responsibility for the development, testing and maintenance of flight procedures. This work, which is part of NextGen, is currently being done by trained and skilled professionals in Aviation System Standards (AVN), where flight procedures and flight inspection employees are charged with developing, evaluating, certifying and maintaining the 16,000 instrument flight landing and takeoff procedures for every major and municipal instrument-capable airport across the country. These employees have met or exceeded every legacy and new technology or performance-based navigation goal set forth by the FAA; yet, the agency now wants the power to delegate this important work to the private sector.

The development, testing and maintenance of flight procedures involves strict compliance with a complex series of computations, measurements and modeling standards. FAA flight inspectors and flight procedures development specialists receive intensive classroom and on-the-job training. Once these employees are deemed qualified, they are issued certificates of authority on instrument procedures development, airborne certification of NAS equipment and instrument flight procedures. The FAA flight procedures and flight inspection is the only program in the nation that includes the whole package of developmental and airborne certification of navigation systems and flight procedures. The agency does not currently have a certification process to qualify third parties to design and develop, test and flight check, and implement and maintain instrument flight procedures in the NAS. While the FAA's proposal would not allow these third parties to self-certify flight procedures, oversight of the processes would fall to an already understaffed and overburdened Technologies and Procedures division of Flight Standards. With airspace infrastructure around our nation's airports becoming increasing crowded and complex, delegating out this work performed by professional FAA employees puts at risk the basis of this country's aviation infrastructure.

Regardless of the dangers associated with delegating out flight procedures work, and even before Congress has acted on the FAA's reauthorization proposal, the FAA recently approved contracting out the development of Required Navigation Performance (RNP) procedures for airlines and airports in the United States to a private organization. Currently, the FAA produces RNP procedures with its own highly trained and specialized workforce, inherently governmental work that should not be contracted out. It is impossible for the FAA to assure Congress that it can effectively regulate, supervise or review the work of these third parties, or even guarantee the safety of the procedures and processes used by independent entities. The development, testing and maintenance of flight procedures is inherently governmental work performed by federal AVN employees that should no doubt remain a function of the U.S. government and not be turned over to a private corporation.

PASS is very concerned about many of the goals the FAA is working toward with its reauthorization proposal. It is within the administration's authority to outsource parts of the federal government where there is a valid reason to do so. However, PASS is extremely concerned that the administration's desire to privatize the NAS and related services overwhelms any thought of the true implications of such an action. PASS firmly believes that providing a safe and secure NAS is an obligation that *must* remain with the federal government. The danger of placing the world's busiest, most complex, and yet safest air traffic control system into the hand's of private contractors is too great to risk. The bottom line is that the safety of the flying public should *never* be sold to the lowest bidder, under any circumstances.

An aspect of the FAA's plan that has received considerable attention is the sweeping changes offered to the way the agency is funded, changes that take away congressional oversight and, in some ways, assume congressional responsibilities. Essentially, the FAA is proposing to set the fees and tax rates that are paid with no congressional oversight. While it has been touting the introduction of user fees, the FAA's proposal puts forward no credible plan for establishing these fees other than taking Congress out of the picture. In fact, the FAA even wants the ability to hold on to any funds appropriated until these funds are expended, a major shift from the way in which unspent appropriated funds are currently addressed at the end of the fiscal year. The agency is vague on details in its financing proposal, but PASS is concerned that the FAA is intent on establishing a system in which it can set its own fees and tax rates with only token congressional oversight. Regarding funding for the FAA, in recent testimony, the GAO has stated that "funding NextGen does not mean that the current funding structure needs to be changed."[22] Although the FAA characterizes this as "finance reform," in actuality, the FAA's scheme will greatly disadvantage small airports and the general aviation community. PASS believes Congress should take into consideration recommendations made by the GAO and other groups prior to moving forward with any drastic financing changes.

In Section 401 of the FAA's reauthorization proposal, the agency introduces the Air Transportation System Advisory Board to replace the Management Advisory Council and the Air Traffic Services Committee. Among other things, the Air Transportation System Advisory Board would be responsible for reviewing and providing advice on the administration's safety programs and reviewing and making recommendations on the administration's plan for modernizing the system. These are clearly two areas in which the experience and expertise of FAA technicians would prove invaluable; yet, the agency's proposal does not include a seat for these employees on the Advisory Board. PASS believes that if the Advisory Board is to be a productive and useful entity, it is imperative that unions be included as members of the Board, specifically FAA technicians who are responsible for certifying and maintaining the NAS.

The FAA's reauthorization proposal must be carefully considered as the agency continues with its plans for the development and deployment of NextGen. As the FAA moves forward with its plans for modernization, it is imperative that the safety and efficiency of the NAS remain the top priority. In order to ensure successful development and deployment of NextGen systems, there must be coordination between the agency and the users of the systems, especially FAA technicians who are intimately familiar with the systems and pieces of equipment that comprise the NAS. Only the highest level of cooperation between the FAA and its employees will result in a safe and successful modernization of the system.

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[22] Government Accountability Office, *Federal Aviation Administration: Observations on Selected Changes to FAA's Funding and Budget Structure in the Administration's Reauthorization Proposal,* GAO-07-625T (Washington, D.C.: March 21, 2007), p. 10.

U.S. House of Representatives
Committee on Transportation and Infrastructure

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May 15, 2007

Mr. Tom Brantley
President, Professional Airways Systems Specialists
1150 17th St., NW, Suite 702
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Dear Mr. Brantley,

On May 9, 2007, the Subcommittee on Aviation held a hearing on **The Future of Air Traffic Control Modernization.**

Attached are questions to answer for the record. I would appreciate receiving your written response to these questions within 14 days so that they may be made a part of the hearing record.

Sincerely,

Jerry F. Costello
Chairman
Subcommittee on Aviation

May 9, 2007
Subcommittee on Aviation
HEARING on
"The Future of Air Traffic Control Modernization"

Questions for the Record
To:

Mr. Tom Brantley,
President, Professional Airways Systems Specialists

➢ **Mr. Brantley, in your written testimony, you state that the development, testing and maintenance of flight procedures involves strict compliance with a complex series of computations, measurements and modeling standards. You also state that the FAA does not currently have a certification process to qualify third parties to design and develop, test and flight check, and implement and maintain instrument flight procedures, and that oversight of these processes would fall to an already understaffed Technologies and Procedures division of Flight Standards. Would you please explain what type of oversight would be required and elaborate on the staffing issues you have mentioned?**

As stated in PASS's written testimony, we are extremely concerned with Section 410 of the agency's proposals, which would give the administrator the authority to delegate out responsibility for the development, testing and maintenance of flight procedures—work that is currently being done by trained professionals in Aviation System Standards (AVN). The work performed by these employees requires intensive training and knowledge, and the FAA flight procedures and flight inspection is the only program in the nation that includes the whole package of developmental and airborne certification of navigation systems and flight procedures.

The agency does not currently have a certification process to qualify third parties to design and develop, test and flight check, and implement and maintain instrument flight procedures in the National Airspace System (NAS). The agency's plan would require additional FAA oversight of the processes. This oversight would be very similar to what the FAA is currently providing in its oversight of airlines and maintenance facilities. The FAA would have to develop requirements that the third-party developer would have to follow; the surveillance activities and oversight of these new vendors would be turned over to an already over-burdened Flight Standards workforce. PASS is unsure whether this oversight role would actually fall to the Technologies and Procedures division or another of the Flight Standards divisions that provide oversight to some part of the aviation industry. Regardless of where the work would be assigned within Flight Standards, the additional workload could not be accommodated with current staffing. As stated several times in PASS's recent testimonies, the inspector workforce is seriously understaffed. There are simply not enough aviation safety inspectors in place to fulfill the many and varied current responsibilities of the job let alone adding new tasks to the list.

In the past, the FAA has turned to its designee programs to make up for inadequate inspector staffing, and PASS is concerned that the FAA may take that route in this instance as well. Rather than hiring more inspectors to satisfy job requirements, it is more likely that the FAA would choose to assign oversight of this new work to a group of "designees," essentially establishing a system where one third party would conduct oversight of another third party, who would have the ultimate authority to design and develop, test and flight check, and implement and maintain instrument flight procedures on behalf of the federal government. This would be yet another instance of the industry overseeing itself, making federal oversight of the process nearly non-existent. For these reasons, it is impossible for the FAA to assure Congress that it can effectively regulate, supervise or review the work of these third parties, or even guarantee the safety of the procedures and processes used by independent entities. The development, testing and maintenance of flight procedures is inherently governmental work performed by federal AVN employees that should no doubt remain a function of the U.S. government and not be turned over to a private corporation.

➢ **Mr. Brantley, section 317 of the FAA's proposal would create a pilot program allowing airports to operate and maintain air navigation equipment. In your written testimony, you state that the FAA is not considering what happens to these airports if they are not able to maintain and operate the equipment. You also state that the FAA is proposing overseeing these airports in the way that it currently oversees aviation repair stations. Would you elaborate more on these comments and explain why you believe that the FAA's approach is problematic.**

PASS is extremely concerned that the FAA is considering a plan that would allow the administrator to transfer ownership, operating and maintenance responsibilities from the FAA to selected airports. Currently, these airports rely on highly trained FAA technicians to maintain and operate systems and equipment, but Section 317 of the FAA's proposal seeks to change that structure drastically.

The FAA technicians that currently perform this work for these airports are specifically trained to address the intricate details of this work and should be the only people trusted with this responsibility. In most cases, if another entity decided to take on the responsibility of operating and maintaining the systems used at an airport, it would do so without any actual experience operating and maintaining National Airspace System (NAS) equipment. This increases the possibility that many of these entities will ultimately fail in their attempt to take over this responsibility. However, when an airport accepts the responsibility, the FAA will no longer be held accountable for that airport and will either move the resources being used at the facility or, more likely, cut those resources from its budget. When the airport fails at performing this work independently, the FAA will not be in a position to assume responsibility for that airport without several years to budget for the additional resources, hire and train employees, and resume its role of providing those services to the airport and its users. Ultimately, it will be the users of the airport who will suffer when the FAA is only able to service the airport from a distance, sending technicians to address problems when they are available and able to travel. In a recent testimony, PASS highlighted several examples of the problems that result when technicians are not immediately available to tend to a problem at a facility. Incidentally, the FAA has not even

indicated that it would resume providing operation and maintenance of an airport that fails at this venture.

As PASS stated in our testimony, the FAA is proposing overseeing these airports in much the same way that it currently oversees aviation repair stations in the United States and overseas. The oversight that the FAA provides to repair stations, particularly foreign repair stations, is extremely minimal and does not ensure that these repair stations are following FAA standards and guidelines for safety and security of the repair station. While the FAA is mandated to oversee these repair stations, it has essentially abdicated that responsibility. In the case of foreign repair stations, the FAA relies almost exclusively on authorities of foreign governments to provide the oversight on the agency's behalf. In fact, in a recent hearing before this committee, testimony from multiple sources, including the Department of Transportation Inspector General (IG), confirmed that much of this oversight is suspect, with reports from foreign locations being incomplete, incorrect or incomprehensible due to language constraints. The IG further reported that, "FAA inspectors for 1 air carrier had not visited a major foreign engine repair facility even though the repair station had performed maintenance on 39 (74 percent) of the 53 engines repaired for the air carrier. In addition, the FAA international field office inspectors for this facility had not conducted any spot inspections of this facility in 5 years." Reports from PASS members confirm these findings, with many of our inspectors stating that inspections of foreign facilities are often more cosmetic than useful. While there are obviously extensive problems with inspecting repair stations overseas, there are multiple problems overseeing domestic repair stations as well. The aviation safety inspector workforce has not kept pace with the airlines' increasing use of outsourced repair stations, making it impossible to guarantee oversight of the work performed at these repair stations.

Even if the FAA is able to develop standards that a third party is able to comprehend and follow in a manner consistent with aviation safety standards, the FAA does not have the expertise or resources to ensure that other entities are safely and effectively maintaining systems used to control air traffic. This is a direct threat to this country's reputation as having the safest aviation system in the world. Furthermore, as with many other aspects of the aviation industry that the FAA is attempting to turn over to the private sector, oversight of operation and maintenance for these airports would undoubtedly be abandoned by the FAA in favor of allowing another third party or "designee" to provide the oversight.

➢ **Mr. Brantley, you have testified that, when working on an air traffic control modernization project, FAA employees are not as free to raise issues or even to pursue them after they are raised unless they raise the issues on behalf of a union. You also stated that employees are protected when they raise issues on behalf of a union. Will you please elaborate on this and explain in detail the types of protections you are talking about?**

Under previous administrators, PASS worked closely with the FAA in its efforts to modernize the National Airspace System (NAS) and the agency enjoyed success from these collaborative efforts. For example, PASS members were extensively involved in the development and deployment of the Standard Terminal Automation Replacement System (STARS). Although STARS was ultimately viewed by many as a failure for the FAA, the limited success that was

seen was a direct result of PASS involvement, specifically PASS identifying major issues that would have rendered the system unusable if it had been deployed as the agency had originally planned.

Regardless of the important input provided by PASS members, in approximately 2003, the FAA began to systematically eliminate PASS's involvement, and PASS has not been a participant in developing and implementing any of the FAA's modernization projects for several years now.

PASS's recent testimony examined the rising costs and decreasing benefits of the FAA Telecommunications Infrastructure (FTI) program as an example of the problems that can develop when users of the system are not involved in development and implementation. A few years ago, PASS's liaison was removed from the FTI project and PASS was informed that its support on the program was not needed. PASS was actually told that the FAA program manager did not want people on the team that would point out any potential problems with the transition to the system. As a result of this shortsighted approach, the costs for the program have escalated, the expected benefits have deteriorated and there have been numerous issues with implementation leading to several outages and other problems across the country. A major reason behind the problems with the program, as emphasized in a 2006 Department of Transportation Inspector General (IG) report, is a lack of contractor understanding. Only trained FAA technicians are fully aware of the way in which every interconnected NAS system affects the entire unit and thus the aviation system as a whole. Neither the FTI Program Office nor the contractor is able to fully comprehend the requirements of site installation and the potential problems, and the contractors tasked with maintaining FTI are not properly supervised.

The IG continued in its assessment of the program by stating that FTI was a "high-risk, schedule driven effort that was unlikely to meet its December 2007 completion date." Since the time of that report, the FAA has revised its schedule, yet again extending the FTI completion date to December 2008. FAA also increased its acquisition costs to develop the FTI network by $8.6 million (from $310.2 to $318.8 million) and increased its operations lifecycle support by $100 million (from $3.0 to $3.1 billion). This means that the expected benefits of FTI are lessening even further. "By December 2004, FAA's expected benefits dropped from $820 million to $672 million," stated the IG. "By the end of FY 2006, we estimated that benefits had dropped to about $415 million." The problems that have plagued the FAA's FTI program are a direct result of not having PASS participation in the project.

When FAA employees as opposed to PASS representatives are assigned to work on a program, they can point out problems or concerns that they find, but only to a certain point. It is well known that FAA employees are reluctant to point out problems or concerns because of fear it will put their careers in jeopardy. This reality was clearly illustrated in results from the FAA's own Employee Attitude Survey (2006), where an alarming 62 percent of employees agreed or strongly agreed that they may be hesitant to speak up for fear of retaliation, and 54 percent agreed or strongly agreed that it is generally safer to say you agree with management even when you do not really agree.

Given this environment, it is unlikely that FAA employees will bring up problems or concerns when working on a project. Furthermore, even if an employee does bring up an issue, they

cannot pursue it beyond that point. On the other hand, a PASS representative working on the same program can, and will, raise the issue repeatedly until the problem is addressed. Under federal labor law (U.S.C. Sec. 7102), employees are protected against threats, intimidation or coercion when working on behalf of a union. This protective umbrella that employees are given when they participate on behalf of PASS is incredibly important to the process. When the employee knows that they can pursue a critical problem without fear of reprisal, it allows them to be as open and forthright as the situation calls for in order ensure that the problem is properly identified and corrected.

Another key function provided by a PASS liaison that cannot be provided by an employee assigned by the FAA is to monitor cost, schedule and operational data regarding the program. It is certainly no coincidence that the FAA began to claim success in meeting cost and schedule goals after it informed its unions that their participation was no longer needed. Without an independent set of eyes and ears on the program, there is simply no way to properly monitor the accurateness of the information that the FAA gives out regarding modernization programs. However, a PASS liaison can provide information that is extremely beneficial to Congress in its oversight role.

Highlighting this problem is the FAA's practice of rebaselining its major acquisition programs and then claiming to be on schedule and budget based on the new goals. As Congress is fully aware, rebaselining is meant to be used by an agency to assess any additional cost or time requirements so they can determine if the program will still be beneficial to the agency's ability to perform its mission and should therefore continue with its development. As used by the FAA, however, rebaselining has become a method where the agency can arbitrarily move its own performance targets to whatever will allow it to declare success. The independent monitoring of a program's cost and schedule, in addition to operational concerns, is one of the greatest advantages of having PASS participation in FAA modernization.

The final advantage provided by PASS liaisons that is not always available from an FAA employee assigned by the agency is a high level of technical expertise. PASS has always chosen the best and brightest to represent it on FAA programs. Many times, the agency would oppose persons provided by PASS because of staffing concerns. In other words, if the person selected came from a location that was understaffed, the agency would be reluctant to release that employee from their normal duties to allow them to participate in the program for which they were chosen. The FAA, on the other hand, routinely chooses people from locations where they can more easily be released from their normal duties. Although these employees can be technically proficient, they are not always able to provide the most benefit to the project; instead, they are simply the most convenient.

Without a doubt, PASS participation in modernization programs is critical to the FAA's ability to successfully develop and implement the components of NextGen. PASS strongly urges Congress to take action to ensure that PASS will once again be allowed to provide its technical and operational knowledge to FAA modernization.

Testimony of Peter J. Bunce
President and CEO
General Aviation Manufacturers Association
House Transportation and Infrastructure Subcommittee on Aviation
"Future of Air Traffic Control Modernization"
May 9, 2007

Chairman Costello, Representative Petri and members of the Subcommittee, thank you for the opportunity to testify before you today regarding an issue of great importance to the entire aviation community; the transformation to the Next Generation Air Transportation System (NextGen).

I am here today as President and Chief Executive Officer of the General Aviation Manufacturers Association (GAMA), an international trade association based in Washington, D.C., representing the manufacturers of general aviation (GA) airplanes and component parts. GAMA's 60 member companies include almost every leading aviation manufacturer in the world. Many of these member companies build avionics systems for all segments of the industry and will therefore play a critical role in modernization as we transform from a ground-based to a cockpit/satellite-based navigation and surveillance system.

It is with that membership base that I address the Subcommittee today, hopeful that in the coming years, the United States will possess the world's most advanced and efficient air transportation system, one that is capable, within the next decade, of efficiently moving a predicted one billion passengers per year around our great nation. As the Commission on the Future on the United States Aerospace Industry stated,

> ...(the) superior mobility afforded by air transportation is a huge asset and competitive advantage for the United States. Because of the tremendous benefits derived from a highly mobile citizenry and rapid cargo transport, the United States must make consistent and significant improvements to our nation's air transportation system a top national priority.[1]

Industry-wide Support for the NextGen System

Despite the many differences that exist between the major airline, general aviation, regional airline and cargo communities regarding future funding of the Federal Aviation Administration (FAA), our industries steadfastly agree on one important issue; the need to transform our nation's air traffic management system from one based on 1950s technology to a state of the art system capable of meeting the capacity demands of the future.

Whether it occurs in the next five, seven or ten years, there is wide agreement amongst industry and the FAA that enplanements will top one billion passengers per year in the next decade. Demand for increased capacity of this nature will require not only additional

[1] Final Report of the Commission on the Future of the United States Aerospace Industry; November, 2002 Page 2-15.

runways and airport improvements, but also a modern air traffic control (ATC) mechanism to move the increased traffic in a safe and efficient manner. An economy based on just-in-time delivery and freedom of movement demands a system capable of meeting this imminent need. It is therefore critical that we begin to do more than simply talk about the vision or concept of NextGen. We must produce an actionable plan that includes design specifications for equipment, in order to lay the foundation for the ability to move information and data at very high speeds between not only ground facilities and aircraft, but also from aircraft to aircraft directly.

Although GA flight activity comprises less than three percent of traffic at the nation's top 20 airports, the need to increase system capacity at the airline hubs is a key factor that will determine the future vitality of GA. As these hub chokepoints become more saturated, the airlines look to other airports to ease congestion. We see this today at our nation's 35 busiest airports (the Operational Evolution Partnership 35 Airports) where 90 percent of reported delays occur.[2] Whether at Midway, Fort Lauderdale or numerous other airports around the country, when airlines increase their footprint at an airport, GA is the most vulnerable user of the system and pays the ultimate cost; loss of access. This is why increasing system capacity is so important and why, when it comes to transformation, the GA community is not just "talking the talk." GA actively supports the transformation effort with involvement in every facet of the Joint Planning and Development Office (JPDO) and the NextGen process and takes a back seat to no one in our support for, and dedication to, developing the NextGen System.

Joint Planning and Development Office and Intergovernmental Relationships

The JPDO was designed (as part of the Vision 100 legislation of 2003) to take advantage of the institutional and technical knowledge available at the many federal agencies involved in the transformation process. It was believed that in order for the JPDO to succeed in a timely and cost efficient manner, these partner agencies [the Departments of Defense, Homeland Security, Transportation and Commerce, the Office of Science and Technology Policy, the FAA and the National Aeronautics and Space Administration (NASA)] would need to provide significant expertise, manpower and funding.

Unfortunately, in some cases these partnerships have failed to adequately mature. This failure is easiest to identify when examining the relationship between the JPDO and NASA. In recent years, NASA has refocused its efforts on the President's Moon-Mars Initiative and moved away from much of the cutting edge aeronautics research that made the United States the world leader in aviation. This redirection of resources (NASA funding for aeronautics research has dropped more than 50 percent since fiscal year 1994) provides yet another challenge for NextGen as much of the air traffic management and safety research required for National Airspace System (NAS) transformation was to be conducted by NASA. NASA's decision to limit its research to that which is foundational in nature raises the question of who will conduct or fund the critical transitional research required for NextGen completion. Perhaps most worrisome are the figures produced by the Research Engineering and Development Advisory Committee

[2] "FAA Operational Evolution Plan Version 5" and the 6 percent would be "FAA ETMS-C" database.

(established by the FAA) that estimate NextGen delays of five years and increased costs of $150 million annually if NASA were to abandon aeronautics research completely.[3]

This pending failure by government organizations to clearly identify and commit to a scope of work for the endeavor exemplifies one of the key disappointments with the JPDO, its relationships with other government agencies. In fact, even today, more than three years after the passage of Vision 100, the JPDO has yet to secure signatures from both the Department of Defense and the Department of Homeland Security regarding their participation in the NextGen process.

GAMA believes that in order for the JPDO to be successful, fundamental changes are necessary, the first of which would be increased authority granted to the JPDO Director. Currently, the Director has only a handful of employees who report directly to him, with nearly all employees working on this project on loan from, but still reporting to, other government agencies. In fact, the Director has a total of just two engineers assigned directly to the JPDO. For there to be any type of coherent modernization plan moving forward, increased authority must be provided to the JPDO Director. For a leader to be successful, he must be responsible for and to those in his organization. Put simply, those who work for the JPDO should report to the JPDO.

Structural problems not only exist for those working at the JPDO, but also in regards to whom the JPDO Director is responsible. We must examine the leadership and decision making authority currently available to the JPDO. Although a multi-agency project such as this provides many potential benefits in terms of shared expertise and costs, it also leads to the problematic issue of unclear final authority. In many cases, it is uncertain who in the NextGen process can make a final decision. The lines of authority and accountability for the JPDO are unclear, at best. JPDO's organizational charts indicate that the Director of the JPDO is directly accountable to the JPDO Board and then to the Senior Policy Committee, as outlined by the Vision 100 legislation. As the JPDO plans and coordinates activities within seven different government agencies, this line of authority seems appropriate. However, FAA's organizational charts indicate that the head of the JPDO is accountable to the FAA's Chief Operating Officer and at least tacitly to the FAA Administrator. Clearly, the scope of the JPDO is much broader than the FAA, or even the Department of Transportation. GAMA therefore encourages Congress to allow for the JPDO Director to report solely to the FAA Administrator.

It has become abundantly clear that, as currently designed, neither the Department of Transportation (DOT), nor the FAA, nor even the JPDO has the ability or apparent desire to compel any of the other government agency partners to step forward and commit to the research or funding that the JPDO views as crucial to timely planning and future implementation of NextGen. In fact in a March 2007 statement before the Senate Aviation Subcommittee, Susan Fleming of the Government Accountability Office stated,

> As JPDO is a coordinating body, it has no authority over its partner agencies' key human and technological resources needed to continue developing plans and system

[3] FAA Research, Engineering and Development (R,E&D) Advisory Committee, NAS Operations Subcommittee Report.

> requirements for NextGen. For example, JPDO has been working to establish a memorandum of understanding (MOU) with its partner agencies to more clearly define partner agencies' roles and responsibilities since at least August 2005. As of March 16, 2007, however, the MOU remained unsigned.[4]

Unfortunately, the problems regarding government-wide support extend to the highest levels of each organization. The Vision 100 language called for the establishment of a Senior Policy Committee to be made up of the senior-most officials of each of the JPDO involved organizations and to provide overall leadership and direction for the NextGen process.[5] Yet even this organization is failing to function, as the last Senior Policy Committee meeting was held in November of 2005 and the next is not scheduled until June of 2007. In the 18 months since the last meeting, the federal government has completed two budget cycles, and now whatever is accomplished in June, in the best case, would have impacts on the fiscal year 2009 budget but more likely not until fiscal year 2010.

We urge Congress, as part of the 2007 reauthorization process, to examine the fundamental structure of the JPDO and the entire NextGen effort and to better align and manage this complex multi-agency program while encouraging more involvement from the critical JPDO partner agencies.

Perhaps most importantly, we must move away from the "stovepipe" approach to the acquisition process currently being employed by the Operational Evolution Partnership (OEP). Due to the nature of the acquisition process, each project is currently treated individually. This type of construct and the lack of a systems engineering approach in the OEP does not allow for a more global view of the NextGen System and therefore may lead to delays and increased cost.

Another problem is the way projects are considered for funding by the FAA's Joint Resources Council (JRC). Each individual project must pass a stand alone benefit/cost analysis before it is approved. This is an antiquated way of evaluating projects. Total benefits from implementing NextGen will be greater than the sum of benefits identified for each individual modernization project. Benefits from one project often amplify the benefits from others, and the whole is definitely greater than the sum of the parts. Unfortunately, the FAA's Acquisition Management System prohibits applying the same benefits to more than one project. Once a pool of benefits have been used to justify one project, they cannot be used again to justify another project. This artificially "stove pipes" benefits to single projects and ignores any benefits derived from synergy between projects.

These problematic, and ultimately costly, approaches to modernization must be addressed before the NextGen process moves from one focused on planning and development to one focused on implementation.

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[4] Testimony of Susan Fleming, Acting Director, Physical Infrastructure Issues, United States General Accountability Office before the United States Senate Commerce Subcommittee on Aviation, March 22, 2007.

[5] Section 710 of Public Law No. 108-176.

What is Next for NextGen?

Despite repeated commitments by the Administration and the FAA, there is still no clear plan for transformation of the ATC system or even what technologies will be required to ensure that transformation is a success. What we do have is a draft Concept of Operations (ConOps). We have had a draft ConOps since 2002 and before that, we had a concept proposal we called "free flight." The difference between a plan and a concept is key. A plan would have the specificity to allow manufacturers to know what to build when. For example, aircraft coming off the production line today have components of Automatic Dependent Surveillance - Broadcast (ADS-B), because the concept includes ADS-B as a core-level technology for NextGen. But without knowing the true design specifications of the NextGen System that would be included in an integrated plan, those same aircraft will have to be retrofitted when final decisions are made on system architecture. This sort of ambiguity about the NextGen System continues to lead many to have serious concerns about the future system as a whole. Another example deals with facility realignment. If a coherent, time phased plan existed, the Administration would be able to tell Congress definitively when we, as a nation, could divest of expensive ground infrastructure like radar and navigational aids. Without knowing when we can shed this costly infrastructure, the business case for transformation becomes more difficult to quantify.

We strongly encourage Congress to push the JPDO, the FAA, the DOT and other participating government agencies to work with industry to clearly define what it is they intend to build and how they intend to build it. This comprehensive plan, defining both time required and cost, must incorporate reasonable scenarios for program development, policy implementation, rule development and equipage. No business could ever attempt to secure funding for modernization before a detailed plan is developed. It is, therefore, incomprehensible to many in industry to have a debate on future funding before this critical planning task is complete. Unfortunately, the Administration and the FAA see things differently, choosing to focus on funding rather than completion of a plan for ATC modernization.

The FAA's reauthorization proposal, entitled "The Next Generation Air Transportation System Financing Reform Act of 2007" focuses too little on modernization and too much on abolishing the current funding system (based on fuel and excise taxes). In fact, of the 88 pages in the FAA's reauthorization document, only two pages are dedicated to issues dealing with the JPDO.[6]

In reality, there is absolutely no link between NextGen and the Administration's FAA funding proposal based on user fees. The NextGen System can, and should, be funded under the current excise and fuel tax system. In fact, over the next five years, when the FAA has budgeted $4.6 billion for NextGen projects, the current funding mechanism would raise $900 million more than their proposed user fee scheme.

As part of their 2007 reauthorization proposal, the FAA is also asking for more freedom in how it funds its operations and less Congressional oversight. GAMA believes that the opposite is called for. Over the next 20 years the FAA will enter into an enormously time

[6] "The Next Generation Financing Reform Act of 2007" Pages 60-61.

sensitive venture to transform our air traffic control system. Oversight by the Congress will become more important than ever in order to keep focus on timelines and costs. Now is not the time for Congress to lessen its financial or programmatic oversight.

It is time for the airlines, GA and cargo to move past the debate over funding and unite behind a transformed air traffic management system. Our industry and our nation's economy cannot withstand the impact of a system in gridlock. We must work together to ensure that we create the safest and most efficient system possible.

Costs of the NextGen System

The Administration is projecting NextGen costs between $15 and $22 billion for government investment through 2025, but this estimate is only half the picture. In order for the system to work, aircraft owners (both commercial and GA) will have to equip their aircraft to operate in the new system at what the FAA Administrator describes as a cost approximately equal to that required by the government for NextGen. The sooner equipage occurs, the earlier the new satellite-based system will be operable and provide benefits to the users, the government and the general public.

It should be stated that, in many cases, NextGen cost figures are merely educated guesses. As mentioned above, the FAA and the JPDO continue to lack a cohesive and overarching plan for the NextGen System or even for which technologies might be employed, particularly for communications. Therefore, when trying to ascertain budget estimates for an entire new system, industry has specific concerns over whether the budget numbers being discussed today will even closely resemble those we will face in 2015 or 2025.

While industry agrees with the FAA that ADS-B is one of the key building blocks for the future NAS, the ADS-B (Out) rulemaking (currently being developed by the FAA) is just one of many pieces needed for a transformed NAS. Although ADS-B is seen as the technology that will handle primary surveillance in the busy and high altitude airspace of the future, other technologies will still be needed for secondary surveillance (back-up) and to address non-participating aircraft (for security purposes).

The FAA is the primary beneficiary of transitioning to ADS-B (Out). The agency will ultimately be able to save hundreds of millions of dollars by shutting down many secondary radars, and by avoiding the expense of replacing older ones. On the other hand, operators should see benefits of ADS-B (Out) if this technology enables closer separation criteria at night and in weather.

In contrast, ADS-B (In) will provide significant safety benefits to all users, such as real-time traffic display in all airspace, relay of real-time graphical weather information to the cockpit and perhaps most importantly, operational efficiency and increased capacity due to more refined air-to-air separation data.

For the foreseeable future, the FAA only plans to implement ADS-B (Out) and in September of this year, the FAA plans to issue a notice of proposed rulemaking that will

mandate ADS-B (Out) equipage in certain airspace with the final ADS-B rule taking effect in the fall of 2009. FAA projects that 26 to 40 percent of the fleet will be equipped with ADS-B (Out) by 2014 with mandatory compliance set for 2020. This timeline for equipage presents tremendous challenges for the implementation of the entire NextGen System and the business case analysis to support it.

Typically, airplane operators do not install new avionics until near the mandatory installation date. Recent experience with the transition to Reduced Vertical Separation Minimums (RVSM) is a great example of this behavior. As late as six months prior to the RVSM mandatory compliance date of January 20, 2006, many operators still had not scheduled their aircraft for mandatory avionics upgrades. Manufacturers accumulated large inventories, and "slots" at avionics installation shops went unused. But six months before the mandatory date, all that changed. Operators rushed into installation shops - only to find that all of the "slots" had been filled. Fortunately, with a great deal of overtime, installers were able to complete nearly all of the upgrades before the mandatory date.

Similar behavior could negatively impact the FAA's concept for the implementation of ADS-B (Out) given a mandatory compliance date of 2020. If operators wait to equip until the end of the compliance window, the bedrock technology of NextGen could slide other enabling technologies further into the future.

Incentivized Equipage

The main concern facing industry regarding the ADS-B roll-out is that the small benefit received by industry to equip with the early version of the technology [requirements for ADS-B (In) equipage, a technology with greater benefit to operators have yet to be defined] will impede any mass migration to this new technology. As with RSVM, we believe most operators will wait until the end of the window to make the large investment ($10,000 - $50,000 for GA and light jets, and $30,000 - $60,000 for the current regional and mainline air carrier fleet[7]) in equipage. GAMA believes that Congress must identify a reasonable, performance-based and revenue neutral strategy to incentivize system users to equip with this new technology, one which will act as the basis for future system improvement and transformation.

ADS-B (Out) is only the first step in the process. NextGen will be a system of systems with each piece built upon its predecessor. Only upon further development by the JPDO, FAA and industry, will we be able to grasp a clear understanding of what will come next.

Conclusions

- The general aviation community continues to support the NextGen System through its involvement in every aspect of the Joint Planning and Development Office and we look forward to playing an instrumental role in developing the world's safest and most efficient air traffic management system.

[7] MITRE; General Aviation ADS-B Transition Costs.

- It is time to move past the "user fee" funding debate and work together to determine how, under a system of excise and fuel taxes, the air traffic management system of tomorrow will be developed.

- With the help of industry, the FAA and the JPDO must move forward to produce a comprehensive plan to determine what the NextGen System will entail, when each portion of the system will be constructed, the proper timelines for rulemaking and implementation, and a reliable cost estimate for both government and industry equipage.

- The 2007 FAA reauthorization proposal calls for decreased Congressional oversight of FAA revenue collection and expenditures. Congress must maintain its oversight role at this critical time as we embark on a multi-billion dollar modernization effort.

- The JPDO must be strengthened with better staffing and clear reporting lines established. The stovepipe approach to equipment acquisition by the OEP must be replaced with a systems integration approach that leverages each technology to complement the entire spectrum of NextGen.

- The first phase of NextGen [ADS-B (Out)] will benefit government far more than any system user, particularly general aviation which encompasses the vast majority of the fleet. As such, Congress should examine ways by which system users would be offered incentives to equip as early as possible. Any measure to incentivize equipage should be performance based and revenue neutral.

We no longer have time to wait. With predictions of one billion enplanements in the years ahead, accelerated planning and implementation of the NextGen System must begin. Runways must be constructed, satellite based navigation and surveillance systems must be deployed and operators must equip if we are to meet the coming demands.

Chairman Costello, Representative Petri and members of the Subcommittee, thank you for the opportunity to testify before you today and I look forward to answering your questions.

United States Government Accountability Office

GAO

Testimony

Before the Subcommittee on Aviation, Committee on Transportation and Infrastructure, House of Representatives

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NEXT GENERATION AIR TRANSPORTATION SYSTEM

Status of the Transition to the Future Air Traffic Control System

Statement of Gerald L. Dillingham, Ph.D.
Director, Physical Infrastructure Issues

GAO-07-784T

May 9, 2007

GAO
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Highlights

Highlights of GAO-07-784T, a testimony before the Subcommittee on Aviation, Committee on Transportation and Infrastructure, House of Representatives

NEXT GENERATION AIR TRANSPORTATION SYSTEM

Status of the Transition to the Future Air Traffic Control System

Why GAO Did This Study

The nation's current air traffic control system is reaching its capacity limits as demand for air transportation grows. The Next Generation Air Transportation System (NextGen) represents a new system that will use state-of-the-art technologies and procedures. Transitioning to NextGen will require the Federal Aviation Administration (FAA) to continue to sustain the current air traffic control system while acquiring new systems on schedule and on budget. In 2003, Congress authorized the creation of the Joint Planning and Development Office (JPDO), housed within FAA, to plan NextGen and coordinate the transition. GAO's testimony focuses on the progress FAA is making in implementing businesslike operations that could provide a foundation for managing the transition to NextGen, the status of JPDO's planning and facilitation of NextGen, and some key challenges that FAA and JPDO need to address in moving toward NextGen. This statement is based on GAO's November 2006 report and recent testimonies as well as ongoing work. GAO's November report recommended that FAA study its technical and contract management expertise and that JPDO take actions to institutionalize its collaborative practices. FAA and JPDO said they would consider our recommendations.

www.gao.gov/cgi-bin/getrpt?GAO-07-784T.

To view the full product, click on the link above. For more information, contact Gerald L. Dillingham, Ph.D., at (202) 512-2834 or dillinghamg@gao.gov.

What GAO Found

During the last few years, FAA has made significant progress in implementing businesslike operations and procedures for managing and acquiring air traffic control systems. These operations and procedures have improved FAA's management of the current system and should better position the agency to manage the enormously complex transition to NextGen. One outcome of these changes is that FAA has reported exceeding its system acquisition goals for the past 3 fiscal years. However, further work remains to fully address past problems in acquiring systems and institutionalizing changes throughout the agency.

JPDO has continued to make progress in furthering its key planning documents. JPDO has experienced delays in the release of key documents, but currently plans to have initial versions of these documents released by July 2007. JPDO has been working since 2005 to establish a memorandum of understanding between its partner agencies, although as of May 4, 2007, the memorandum had been signed by the Departments of Transportation and Commerce and NASA, but was not yet signed by the Departments of Defense and Homeland Security. JPDO is also working with the Office of Management and Budget to establish mechanisms to identify NextGen-related projects across the partner agencies and consider NextGen as a unified, cross-agency program for funding decisions.

FAA and JPDO continue to face a number of challenges in moving toward NextGen, including questions about FAA's technical and contract management expertise; FAA's ability to maintain a number of existing systems, including monitoring and addressing equipment outages to ensure the safety of these existing systems as it transitions to NextGen; and conducting necessary human factors research. In addition, while JPDO recently estimated that the total federal cost for NextGen infrastructure through 2025 will range between $15 billion and $22 billion, questions remain about which entities will fund and conduct the necessary research, development, and demonstration projects that will be key to achieving certain NextGen capabilities. Also, JPDO faces a continuing challenge in ensuring the involvement of all key stakeholders, such as active air traffic controllers and system technicians, in its NextGen planning efforts.

Mr. Chairman and Members of the Subcommittee:

I appreciate the opportunity to testify before you today to discuss the future of air traffic control modernization. The nation's current air traffic control system is reaching its capacity limits as demand for air transportation continues to grow each year. The Next Generation Air Transportation System (NextGen) represents a transformation to a new system that will use satellite-based technologies and state-of-the-art procedures to handle the increasing volume of air traffic, while further improving safety and security. Transitioning to NextGen, however, will require the Federal Aviation Administration (FAA) to continue to operate and sustain the current air traffic control system while simultaneously acquiring and deploying the new NextGen systems on budget and on schedule.

In December 2000, President Clinton signed an executive order, and Congress passed supporting legislation that, together, provided FAA with the authority to create the performance-based[1] Air Traffic Organization (ATO) to administer and improve FAA's management of its current air traffic control modernization efforts. In 2003, Congress authorized the creation of the Joint Planning and Development Office (JPDO), housed within FAA, to plan for and coordinate a transition to NextGen—envisioned as a move from largely ground-based radars to precision satellite-based navigation and including digital, networked communications; an integrated weather system; layered, adaptive security; and more. In addition to FAA, JPDO operates in conjunction with multiple federal partner agencies and with the private sector to collaboratively conceptualize and plan the NextGen system.[2]

The reauthorization of FAA provides an opportunity to examine how the agency is managing the transformation to NextGen. My testimony today focuses on the following questions: (1) What progress is FAA making in implementing initiatives that could provide a solid foundation for managing the transition to NextGen? (2) What is the status of JPDO's

[1]Performance-based organizations are discrete units, led by a chief operating officer, that commit to clear objectives, specific measurable goals, customer service standards, and targets for improved performance.

[2]JPDO's partner agencies include the Departments of Transportation, Commerce, Defense, and Homeland Security; FAA; the National Aeronautics and Space Administration (NASA); and the White House Office of Science and Technology Policy.

planning and facilitation of the transition to NextGen? and (3) What are some key challenges that FAA and JPDO need to address in moving toward NextGen? My statement is based on our November 2006 report[3] and recent testimonies[4] as well as on-going work. We conducted this work in accordance with generally accepted government auditing standards.

In summary:

- During the last few years, FAA has made significant progress in implementing businesslike operations and procedures for acquiring and managing air traffic control systems which have improved FAA's management of the current system and should better position the agency to manage the enormously complex transition to NextGen. However, further work remains to fully address past problems in acquiring systems and to institutionalize changes throughout the agency. By creating the Air Traffic Organization and appointing a chief operating officer, FAA established a new management structure and adopted more leading practices of private sector businesses to address the cost, schedule, and performance shortfalls that have plagued air traffic control acquisitions. One outcome of these changes is that for the past 3 fiscal years, FAA has reported exceeding its system acquisition goals. For fiscal year 2006, FAA reported that its critical acquisitions were 100 percent on budget and over 97 percent on schedule. FAA has also improved its management of the air traffic control system through increased efforts to achieve cost savings by outsourcing and consolidating facilities. Currently, FAA is seeking savings through outsourcing its planned nationwide deployment of a critical NextGen surveillance technology. To help sustain progress in managing acquisitions and address remaining program risks, FAA is working with the Office of Management and Budget (OMB) to develop goals and milestones for FAA to meet in further reducing acquisition risks. Despite FAA's progress, however, the FAA administrator's term ends in September 2007 and the chief operating officer left in February 2007, after serving 3 years. Thus, FAA will have lost two of its significant agents for change by

[3]GAO, *Next Generation Air Transportation System: Progress and Challenges Associated with the Transformation of the National Airspace System*, GAO-07-25 (Washington, D.C.: Nov. 13, 2006).

[4]GAO, *Federal Aviation Administration: Key Issues in Ensuring the Efficient Development and Safe Operation of the Next Generation Air Transportation System*, GAO-07-636T (Washington, D.C.: Mar. 22, 2007) and GAO, *Joint Planning and Development Office: Progress and Key Issues in Planning the Transition to the Next Generation Air Transportation System*, GAO-07-693T (Washington, D.C.: Mar. 29, 2007).

the end of September. FAA's new leaders will need to demonstrate the same commitment to improvement as the outgoing leaders.

- JPDO has made progress in furthering its key planning documents, but continues to face challenges in institutionalizing its collaborative practices. JPDO is developing several key documents—a Concept of Operations, an Enterprise Architecture, and an Integrated Work Plan—that together form the foundation of NextGen planning. JPDO has missed earlier milestones regarding the release of its Concept of Operations and Enterprise Architecture. JPDO currently plans to release initial versions of all three documents by July 2007. As we noted in November 2006, JPDO is fundamentally a planning and coordinating body that lacks authority over the key human and technological resources of its partner agencies. Thus, institutionalizing the collaborative process between these partner agencies will continue to be critical to JPDO's success. However, JPDO still does not have in place a formal, long-term agreement among its partner agencies on their roles and responsibilities in planning and facilitating the transition to NextGen. JPDO has been working since 2005 to establish a memorandum of understanding between the partner agencies, although as of May 4, 2007, the memorandum had been signed by the Departments of Transportation and Commerce and NASA; the Departments of Defense and Homeland Security had not yet signed.[5] It will also be important for institutionalizing collaboration to incorporate NextGen goals and activities into the partner agencies' key planning documents, as FAA is currently doing with its Operational Evolution Partnership—FAA's new implementation plan for NextGen. JPDO is also working with OMB to establish mechanisms to identify NextGen-related projects across the partner agencies and consider NextGen as a unified, cross-agency program for funding decisions.

- FAA and JPDO continue to face a number of challenges in moving toward NextGen, including determining whether the organizations have the adequate and appropriate technical and contract management expertise, managing and sustaining the current system, identifying who will conduct necessary research and development activities, obtaining stable leadership, conducting needed human factors research, and ensuring the involvement of all key stakeholders. In November 2006, we recommended that FAA examine its strengths and weaknesses with regard to the technical and contract management expertise that will be required to define, implement, and integrate the numerous complex programs

[5]According to JPDO, it is not appropriate for the Office of Science and Technology Policy, as a White House agency, to sign the MOU.

inherent in the transition to NextGen. In response to our recommendation, FAA is working with the National Academy of Public Administration to explore these issues. JPDO recently estimated that the total federal cost for NextGen infrastructure through 2025 will range between $15 billion and $22 billion. However, questions remain over which entities will fund and conduct some of the necessary research, development, and demonstration projects that will be key to achieving certain NextGen capabilities. According to officials at FAA and JPDO, they are currently studying these issues and trying to assess how much research and development FAA can assume. Of critical importance in the area of NextGen research is human factors research given the fundamental changes that NextGen envisions in the roles of air traffic controllers and pilots due to automation and changes in surveillance technologies and communications. JPDO has suffered from a lack of stable leadership and is now functioning under its third director. This issue is exacerbated by JPDO's senior policy committee, which has met only four times and has not met at all as a formal body since November 2005. Finally, JPDO faces a continuing challenge in ensuring the involvement of all key stakeholders, such as active air traffic controllers and technicians. Our work on past air traffic control modernization projects has shown that a lack of stakeholder or expert involvement early and throughout a project can lead to costly increases and delays.

In November 2006, we recommended that the Secretary of Transportation direct FAA to undertake a formal exploration of the agency's strengths and weaknesses with regard to the technical expertise and contract management expertise that will be required to define, implement, and integrate the numerous complex programs and systems inherent in the transition to NextGen. We recommended that the Secretary direct JPDO to take actions to institutionalize the partner agencies' collaboration in supporting NextGen, including action on a memorandum of understanding among the partner agencies, actions to finalize procedures to leverage partner agency resources, and actions to develop procedures for dispute resolution. We also recommended that the Secretary direct JPDO to determine whether key stakeholders and expertise are not currently represented in JPDO planning efforts. FAA and JPDO officials neither agreed nor disagreed with our recommendations, but said they would consider them.

Improved, Businesslike Operations Should Better Position FAA to Implement and Manage NextGen, but Further Work Remains

During the last few years, FAA has made significant progress in implementing businesslike processes and procedures for managing and acquiring air traffic control systems. This contrasts with the previous decade's air traffic control modernization program which was characterized by chronic cost and schedule difficulties with systems acquisitions. The implementation of these businesslike operations has improved FAA's management of the current system and should better position the agency to manage the enormously complex transition to NextGen. However, further work remains to fully address past problems and institutionalize these changes throughout the agency, especially given the changing leadership within both FAA and ATO.

Progress Has Been Made but Further Work Remains to Institutionalize Recent Improvements in Management and Acquisition Processes

A successful transition to NextGen will depend, to a great extent, on FAA's ability to manage the acquisition and integration of multiple NextGen systems. In recent years, FAA has made significant progress toward improving its management of acquisitions. However, FAA's air traffic control modernization program remains on our list of high risk programs because of its history of systemic management and acquisition problems that contributed to cost growth, schedule slippages, and performance shortfalls and the relative recentness of the turnaround in the program's performance. The realization of NextGen goals could be severely compromised if FAA's improved program management and outcomes are not institutionalized and carried over into the implementation of NextGen, which is an even more complex and ambitious undertaking than past modernization efforts.

By creating ATO and appointing a chief operating officer (COO) to head ATO, FAA established a new management structure and adopted more leading practices of private sector businesses to address the cost, schedule, and performance shortfalls that have plagued air traffic control acquisitions. ATO has worked to create a flatter organization, with fewer management layers, and has reported reducing executive staffing by 20 percent and total management by 16 percent. In addition, FAA uses a performance management system to hold managers responsible for the

success of ATO. More specifically, to better manage its acquisitions and address problems we have identified,[6] FAA has

- undertaken human capital initiatives to improve its acquisition workforce culture and build towards a results-oriented, high-performing organization;
- developed and applied a process improvement model to assess the maturity of its software and systems capabilities resulting in, among other things, enhanced productivity and greater ability to predict schedules and resources; and
- reported that it has established a policy and guidance on using earned value management (EVM) in its acquisition management system and that 19 of its major programs are currently using EVM.[7]

One outcome of the implementation of the changes in program management and operations is that for the past three fiscal years, FAA has reported exceeding system acquisition goals. FAA's goals for fiscal year 2006 were to have 85 percent of critical acquisition programs within 10 percent of budget, as reflected in its capital investment plan, and to have 85 percent of critical acquisition programs on schedule. For fiscal year 2006, FAA reported that its critical acquisitions were 100 percent on budget and over 97 percent on schedule.

FAA Has Reported Cost Savings through Outsourcing and Facility Consolidations

FAA has also improved its management of its air traffic control program through increased efforts to achieve cost savings by outsourcing and consolidating facilities. For example, FAA is outsourcing flight service stations and estimates a $2.2 billion savings over 12 years. Similarly, FAA is seeking savings through outsourcing its planned nationwide deployment of Automatic Dependent Surveillance-Broadcast (ADS-B), a critical NextGen surveillance technology. FAA is planning to implement ADS-B

[6]GAO, *Federal Aviation Administration: Stronger Architecture Program Needed to Guide Systems Modernization Efforts*, GAO-05-266 (Washington, D.C.: Apr. 29, 2005); *Air Traffic Control: System Management Capabilities Improved, but More can be Done to Institutionalize Improvements*, GAO-04-901 (Washington, D.C.: Aug. 20, 2004); and *Information Technology: FAA Has Many Investment Management Capabilities in Place, but More Oversight of Operational Systems is Needed*, GAO-04-822 (Washington, D.C.: Aug. 20, 2004).

[7]EVM is a project management technique that combines measurements of technical performance, schedule performance, and cost performance with the intent of providing an early warning of problems while there is time for corrective action.

through a performance-based contract in which FAA will pay "subscription" charges for the ADS-B services and the vendor will be responsible for building and maintaining the infrastructure. (FAA also reports that the ADS-B rollout will allow the agency to remove 50 percent of its current secondary radars, saving money in the program's baseline. The remaining radars will serve as a back-up system to ADS-B.) As for consolidating facilities, FAA is currently restructuring ATO's administrative service areas from nine offices to three offices, which FAA estimates will save up to $460 million over 10 years.

We previously reported that FAA should pursue further cost control options, such as exploring additional opportunities for contracting out services and consolidating facilities. However, we recognize that FAA faces challenges with consolidating facilities, an action that can be politically sensitive. In recognition of this sensitivity, the administration's reauthorization proposal presents an initiative in which the Secretary of Transportation would be authorized to establish an independent, five-member Commission, known as the Realignment and Consolidation of Aviation Facilities and Services Commission, to independently analyze FAA's recommendations to realign facilities or services. The Commission would then send its own recommendations to the President and Congress. In the past, we noted the importance of potential cost savings through facility consolidations; however, any such consolidations must be handled through a process that solicits and considers stakeholder input throughout and fully considers the safety implications of both proposed facility closures and consolidations.

Mitigating Remaining Risks and Institutionalization of Improvements Will Continue to Be a Challenge for FAA

Sustaining the acquisition progress achieved to date and addressing the remaining program risks remains a challenge for FAA. FAA's air traffic control modernization program has been on GAO's high-risk list since 1995. In recent years the agency has made measurable improvements in its acquisition processes. GAO acknowledged those improvements in its 2007 high risk report.[8] In 2005, FAA submitted a plan to OMB for reducing the risks of cost overruns, schedule slippages, and performance shortfalls with goals and milestones for FAA to meet in further reducing acquisition risks. FAA expects to complete the risk mitigation plan by the end of calendar year 2008.

[8]GAO, *High Risk Series: An Update*, GAO-07-310 (Washington, D.C.: January 2007).

Additionally, we have an ongoing study that is examining FAA's performance and reporting on its critical acquisitions, including applicable performance measures. We are exploring FAA's use of the most recently approved cost and schedule baselines, which may have changed significantly since the start of an acquisition, to measure and report on program performance. Rebaselining acquisitions is an accepted practice and there can be valid reasons for doing so, such as when changes in a program's requirements fundamentally alter the acquisition and make the originally approved schedule unrealistic. Because rebaselining resets the cost and schedule variances to zero, however, we want to verify that FAA's practice is not masking acquisition performance problems and is providing full disclosure to the Congress. We expect to issue a report on these issues later this year.

Institutionalizing Changes Within FAA Will Require Continued Strong Leadership

It will be important, as FAA begins to implement NextGen systems, to maintain critical acquisitions on schedule and on budget to meet the goal of transitioning to NextGen by 2025 and to prevent escalation of the costs of NextGen. While FAA has implemented many positive changes to its management and business processes in recent years, it currently faces the loss of key leaders. We reported that the experiences of successful transformations and change management initiatives in large public and private organizations suggest that it can take 5 to 7 years or more until such initiatives are fully implemented and cultures are transformed in a sustainable manner.[9] Such changes require focused, full-time attention from senior leadership and a dedicated team. However, FAA will have lost two of its significant agents for change—the FAA administrator and the COO—by the end of September 2007. The administrator's term ends in September 2007; the COO left in February 2007, after serving 3 years. For the financial, management, and acquisition improvements to further permeate the agency, and thus provide a firm foundation upon which to implement NextGen, FAA's new leaders will need to demonstrate the same commitment to improvement as the outgoing leaders. Because this is a critical time for FAA, the agency needs to move expeditiously to find a new COO for ATO. A COO who could commit to the current statutory 5-year term also would be useful in providing stable leadership at ATO as foundational NextGen systems begin to be implemented.

[9]GAO, *National Airspace System: Transformation will Require Cultural Change, Balanced Funding Priorities, and Use of All Available Management Tools*, GAO-06-154 (Washington, D.C.: Oct. 14, 2005).

JPDO Has Made Progress in Planning NextGen, but Continues to Face Challenges with Its Organization

JPDO has continued to make progress in furthering its key planning documents, but still faces challenges in institutionalizing its collaborative practices.

JPDO Has Made Progress Toward Releasing Key Planning Documents, although Further Work Remains

JPDO's authorizing legislation requires the office to create a multi-agency research and development plan for the transition to NextGen. To comply, JPDO is developing several key documents that together form the foundation of NextGen planning. These documents include a NextGen Concept of Operations, a NextGen Enterprise Architecture, and an Integrated Work Plan.

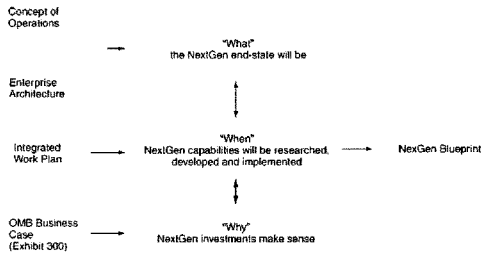
The Concept of Operations is the most fundamental of JPDO's key planning documents, as the other key documents flow from it. Although an earlier version was delayed so that stakeholder comments could be addressed, Version 1.2 of the Concept of Operations is currently posted on JPDO's Website for review and comment by the aviation community. This 226-page document provides written descriptions of how the NextGen system is envisioned to operate in 2025 and beyond, including highlighting key research and policy issues that will need to be addressed.[19] For example, some key policy issues are associated with automating the air traffic control system, including the need for a backup plan in case automation fails, the responsibilities and liabilities of different stakeholders during an automation failure, and the level of monitoring needed by pilots when automation is ensuring safe separation between aircraft. Over the next few months, JPDO plans to address the public comments it receives and issue a revised version of the Concept of Operations.

[19]Following an introductory section, the Concept of Operations has eight sections covering air traffic management operations, airport operations and infrastructure services, net-centric infrastructure services, shared situational awareness services, security services, environmental management framework, safety management services, and performance management services.

In addition to the Concept of Operations, JPDO is working on an Enterprise Architecture for NextGen—that is, a technical description of the NextGen system, akin to blueprints for a building. The Enterprise Architecture is meant to provide a common tool for planning and understanding the complex, interrelated systems that will make up NextGen. According to JPDO officials, the Enterprise Architecture will provide the means for coordinating among the partner agencies and private sector manufacturers, aligning relevant research and development activities, and integrating equipment. JPDO plans to issue an early version of its Enterprise Architecture next month, although three previous release dates—March 2006, June 2006, and September 2006—were not met. According to JPDO officials, until the Enterprise Architecture is released, precise cost estimates cannot be developed and the partner agencies' research plans cannot be coordinated.

Finally, JPDO is developing an Integrated Work Plan that will describe the capabilities needed to transition to NextGen from the current system and provide the research, policy and regulation, and acquisition timelines necessary to achieve NextGen by 2025. The Integrated Work Plan is akin to a project plan and will be critical for fiscal year 2009 partner agency budget and program planning. According to a JPDO official, the office intends to issue its initial draft of the Integrated Work Plan in July 2007.

Figure 1: Key NextGen Planning Documents



Source: JPDO

We have discussed JPDO's planning documents with JPDO officials and examined both an earlier version of JPDO's Concept of Operations[11] and the current version that is out for public comment.[12] As we previously testified, JPDO is focusing on the right types of key documents for the foundation of NextGen planning.[13] As for the Concept of Operations, the current version is improved from the prior version due to additional detail. Nonetheless, we believe that it still does not include key elements such as scenarios illustrating NextGen operations, a summary of NextGen's operational impact on users and other stakeholders, and an analysis of the benefits, alternatives, and trade-offs that were considered for NextGen. In addition, it lacks an overall description that ties together the eight key areas that the document covers. As noted earlier, JPDO does plan to release another version of the Concept of Operations later this year.

In fact, JPDO plans further versions of all of its key planning documents. We see the development of all three of JPDO's key documents as part of an

[11]Concept of Operations for the Next Generation Air Transportation System, version 0.2, July 24, 2006.

[12]We reviewed JPDO's current Concept of Operations for the Next Generation Air Transportation System, version 1.2, dated February 28, 2007, by comparing it with the IEEE Standard 1362-1998 for concept of operations documents.

[13]GAO-07-693T.

iterative and evolutionary process. Thus, it is unlikely that any of these documents will ever be truly "finalized," but rather will continue to evolve throughout the implementation of NextGen to reflect, for example, the development of new technologies or problems uncovered during research and development of planned technologies.

Finally, while each of the three key documents has a specific purpose, the scope and technical sophistication of these documents makes it difficult for some stakeholders to understand the basics of the NextGen planning effort. To address this issue, JPDO is currently drafting what the office refers to as a "blueprint" for NextGen, meant to be a short, high-level, non-technical presentation of NextGen goals and capabilities. We believe that such a document could help some stakeholders develop a better understanding of NextGen and the planning effort to date.

Institutionalizing the Collaborative Process Will Continue to be Critical to JPDO's Facilitating NextGen

In our November 2006 report, we noted that JPDO is fundamentally a planning and coordinating body that lacks authority over the key human and technological resources of its partner agencies. Consequently, institutionalizing the collaborative process with its partner agencies will be critical to JPDO's ability to facilitate the implementation of NextGen. JPDO, however, has not established some practices significant to institutionalizing its collaborative process. For example, at a fundamental level, JPDO does not have formal, long-term agreements among its partner agencies on their roles and responsibilities in creating NextGen. There is no mechanism that assures that the partner agencies' commitment will continue over the 20-year timeframe of NextGen or that ensures accountability to JPDO. According to JPDO officials, they are working to establish a memorandum of understanding (MOU), signed by the Secretary or other high-ranking official from each partner agency, which will broadly define the partner agencies' roles and responsibilities. JPDO first informed us of the development of this MOU in August 2005; in November 2006 we recommended that JPDO finalize the MOU and present it to JPDO's senior policy committee for its consideration and action. Nonetheless, according to a JPDO official, as of May 4, 2007, the MOU has been signed by the Departments of Transportation and Commerce and NASA, but remains unsigned by the Departments of Defense and Homeland Security.

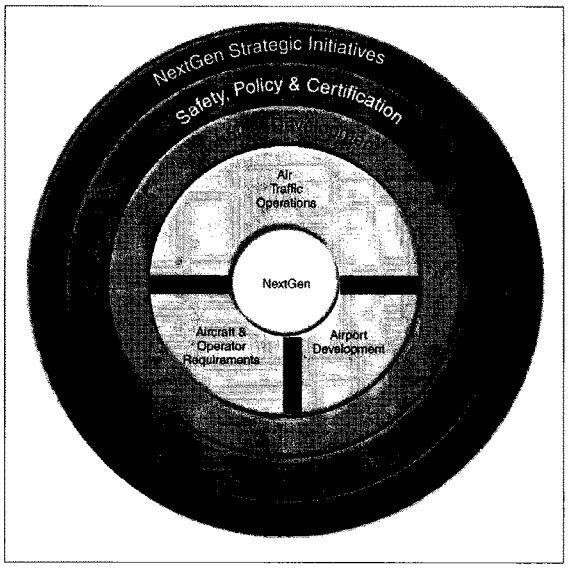
Another key method for institutionalizing the collaborative effort is incorporating NextGen goals and activities into the partner agencies' key planning documents. For example, we noted in November 2006 that NASA and FAA had incorporated NextGen goals into their strategic plans. These types of efforts will be critical to JPDO's ability to leverage its partner

agency resources for continued JPDO planning efforts. Even more importantly, these efforts will be critical to helping ensure that partner agencies—given competing missions and resource demands—dedicate the resources necessary to support the implementation of NextGen research efforts or system acquisitions.

Recognizing that JPDO does not have authority over partner agency resources, FAA and JPDO have initiated several efforts to institutionalize NextGen. First, JPDO is working with FAA to refocus one of FAA's key planning documents on the implementation of NextGen—an effort that also appears to be improving the collaboration and coordination between JPDO and ATO. FAA has expanded and revamped its Operational Evolution Plan (OEP)—renamed the Operational Evolution Partnership—to become FAA's implementation plan for NextGen.[14] The OEP is being expanded to apply to all of FAA and is intended to become a comprehensive description of how the agency will implement NextGen, including the required technologies, procedures, and resources. (Figure 2 shows the new OEP framework.) An ATO official told us that the new OEP is to be consistent with JPDO's key planning documents and its budget guidance to the partner agencies. According to FAA, the new OEP will allow it to demonstrate appropriate budget control and linkage to NextGen plans and help ensure that FAA's research and development is relevant to NextGen's requirements. According to FAA documents, the agency plans to publish a new OEP in June 2007.

[14]Prior to expansion of the OEP, the document centered around plans for increasing capacity and efficiency at 35 major airports.

Figure 2: New OEP Framework



Source: JPDO.

Note: The concentric rings indicate the nature of initiative development from the outer ring (NextGen strategic initiatives), in which new programs and concepts are analyzed and demonstrated; to the second ring, where decisions are made regarding safety, operating policy, performance standards, and certification requirements; to the third ring (technical development), where concepts are prototyped and investment analysis decisions are made. The progression through the rings is not necessarily linear, and a program may be in more than one ring at a time. Data communications, for example, is in the technical development ring and also in the middle ring as policy and rulemaking is considered. The core is divided into three sections, which indicate the FAA offices that implement the final NextGen program.

In addition, to further align FAA's efforts with JPDO's plans for NextGen, FAA has created a NextGen review board to oversee the OEP. This review board is co-chaired by JPDO's director and ATO's vice president of operations planning services. Initiatives, such as concept demonstrations

or research, proposed for inclusion in the OEP now need to go through the review board for approval. These efforts are assessed for relation to NextGen requirements, concept maturity, and risk. An ATO official told us that the new OEP process should also help identify some smaller programs that might be inconsistent with NextGen and which could be discontinued. Additionally, as a further step towards integrating ATO and JPDO, the administration's reauthorization proposal calls for the JPDO director to be a voting member of FAA's joint resources council and ATO's executive council.

While progress is being made in incorporating NextGen initiatives into FAA's strategic and planning documents, more remains to be done with FAA and the other JPDO partner agencies. For example, one critical activity that remains in this area will be synchronizing the NextGen enterprise architecture—once JPDO releases and further refines it—with the partner agencies' enterprise architectures. Doing so should help align agencies' current work with NextGen while simultaneously identifying gaps between agency plans and NextGen plans. Also, while FAA is making significant progress toward creating an implementation plan for NextGen with its OEP, the other partner agencies are less far along or have not begun such efforts. JPDO's lack of authority over partner agency resources will be minimized as a challenge if the partner agencies commit to NextGen goals and initiatives at a structural level. By further incorporation of NextGen efforts into strategic planning documents, the partner agencies will better institutionalize their commitments to JPDO and the NextGen initiative.

Finally, JPDO has made progress in establishing mechanisms for leveraging partner agency resources—another important practice for institutionalizing JPDO's collaborative effort. As we noted in our November 2006 report, JPDO is working with OMB to develop a process that would allow OMB to identify NextGen-related projects across the partner agencies and consider NextGen as a unified, cross-agency program. We recommended that JPDO develop written procedures that formalize agreements with OMB regarding the leveraging of partner agency resources and the identification of NextGen-related programs within agency budgets. We recently met with OMB officials who said that they felt there has been significant progress with JPDO over the last year. JPDO is now working on an OMB Exhibit 300 form for NextGen that will allow JPDO to present OMB a joint business case for the NextGen-related

efforts within the partner agencies and will be used as input to funding decisions for NextGen research and acquisitions across the agencies.[15] This Exhibit 300 will be due to OMB in September 2007 to inform decisions about the partner agencies' 2009 budget submissions.

Ultimately, the success of JPDO will have to be measured in the efforts of its partner agencies to implement policies and procedures, conduct research, and acquire systems that support NextGen. For example, JPDO is currently working to establish a joint weather office involving FAA and the Departments of Defense and Commerce. The goal of this joint office is to eliminate redundancies in weather research and leverage the resources of these partner agencies to implement a joint weather product by 2012, according to a senior JPDO official. Similarly, JPDO has secured a commitment from the Departments of Defense and Homeland Security and FAA to jointly fund the developmental testing of scenarios for network enabled operations.

With regard to implementation of NextGen technologies, JPDO can point to its success in collaborating with FAA to fund and speed FAA's rollout of two systems considered cornerstone technologies for NextGen: ADS-B and System Wide Information Management (SWIM). ADS-B will replace many existing radars with less costly ground-based transceivers. SWIM will provide an initial network centric capability to all the users of the air transportation system. This means that the FAA and the Departments of Homeland Security and Defense will eventually share a common, real-time, secure picture of aviation operations across the airspace system. Identifying such NextGen programs across the partner agencies and establishing implementation plans for them in JPDO's Integrated Work Plan will be critical going forward to creating performance metrics for JPDO.

[15]Section 300 of OMB Circular No. A-11, Preparation, Submission, and Execution of the Budget (Nov. 2, 2005), sets forth requirements for federal agencies for planning, budgeting, acquiring, and managing information technology capital assets.

FAA and JPDO Continue to Face a Number of Challenges in Moving Toward NextGen

FAA and JPDO continue to face a number of challenges as they move toward the implementation of NextGen systems and procedures, including assessing FAA's technical and contract management expertise, sustaining the current air traffic control system, identifying which entities will handle necessary research and development, addressing JPDO's leadership challenges, conducting human factors research, and ensuring the involvement of all key stakeholders.

FAA Needs to Explore Whether It Has the Technical and Contract Management Expertise Necessary to Implement NextGen

In the past, a lack of expertise contributed to weaknesses in FAA's management of air traffic control modernization efforts, and industry experts with whom we spoke questioned whether FAA will have the technical expertise needed to implement NextGen. In addition to technical expertise, FAA will need contract management expertise to oversee the systems acquisitions and integration involved in NextGen.

Recognizing the complexity of the NextGen implementation effort and the possibility that FAA may not have the in-house expertise to manage it without assistance, we have identified potential approaches for supplementing FAA's capabilities. One of these approaches is for FAA to contract with a lead systems integrator (LSI). Generally, an LSI is a prime contractor that would help to ensure that the discrete systems used in NextGen will operate together and whose responsibilities may include designing system solutions, developing requirements, and selecting major system and subsystem contractors. The government has used LSIs before for programs that require the integration of multiple complex systems. Our research indicates that although LSIs have certain advantages, such as the knowledge, understanding, skills, and ability to integrate functions across various systems, their use also entails certain risks.[16] For example, because an LSI may have significantly more responsibility than a prime contractor usually does, careful oversight is necessary to ensure that the government's interests are protected and that conflicts of interest are avoided. Providing the oversight that is needed, however, can be compromised when government expertise is lacking. Consequently, selecting, assigning responsibilities to, and managing an LSI could pose significant challenges for JPDO and FAA.

[16]GAO, *Defense Acquisitions: Future Combat System Risks Underscore the Importance of Oversight*, GAO-07-672T (Washington, D.C.: Mar. 27, 2007).

Another approach that we have identified involves obtaining technical advice from federally funded research and development corporations to help the agency oversee and manage prime contractors. These nonprofit corporations are chartered to provide long-term technical advice to government agencies in accordance with various statutory and regulatory rules to ensure independence and prevent conflicts of interest.

In November 2006, we recommended that FAA examine its strengths and weaknesses with regard to the technical expertise and contract management expertise that will be required to define, implement, and integrate the numerous complex programs inherent in the transition to NextGen.[17] In response to our recommendation, FAA has contracted with the National Academy of Public Administration (NAPA) to determine the needed skill mix and the number of those skilled persons, such as technical personnel and program managers, that would be necessary to implement the new OEP and to compare those requirements with current FAA staff resources. According to FAA, the next step in this process would be to contract with NAPA or another organization for advice on how best to fill any skills gaps and how to proceed with management and oversight of the implementation of NextGen. We believe this is a reasonable approach that should help FAA begin to address this challenge.

Although FAA Is Now Focusing on NextGen, It Must Continue to Manage and Sustain the Current System

While FAA works to acquire and deploy NextGen technologies, it will be equally important that FAA maintain many existing systems and, for those systems that FAA determines should be phased out, that the agency do so using a risk-based approach. The adequacy of FAA's maintenance of existing systems was raised following a power outage and equipment failures in Southern California that caused hundreds of flight delays during the summer of 2006. Investigations by FAA and the Department of Transportation Inspector General into these incidents identified a number of underlying issues, including the age and condition of equipment. Nationwide, the number of scheduled[18] and unscheduled outages of air traffic control equipment and ancillary support systems has been increasing. Increases in the number of unscheduled outages indicate that systems are failing more frequently. It will be critical for FAA to monitor and address equipment outages to ensure the safety and efficiency of the

[17] GAO-07-25.

[18] Scheduled outages occur for scheduled maintenance.

legacy systems, since they will be the core of the national airspace system for a number of years and, in some cases, will become part of NextGen.

FAA and JPDO Have Begun to Release Early Cost Estimates for NextGen, but Questions Remain Over Who Will Conduct Necessary Research and Development

In our November report, we noted that JPDO had not yet developed a comprehensive estimate of the costs of NextGen. Since then, in its recently released 2006 Progress Report,[19] JPDO reported some estimated costs for NextGen, including specifics on some early NextGen programs. JPDO believes the total federal cost for NextGen infrastructure through 2025 will range between $15 billion and $22 billion. JPDO also reported that a preliminary estimate of the corresponding cost to system users, who will have to equip with the advanced avionics that are necessary to realize the full benefits of some NextGen technologies, produced a range of $14 billion to $20 billion. JPDO noted that this range for avionics costs reflects uncertainty about equipage costs for individual aircraft, the number of very light jets that will operate in high-performance airspace, and the amount of out-of-service time required for installation.

FAA, in its capital investment plan for fiscal years 2008-2012, includes estimated expenditures for 11 line items that are considered NextGen capital programs.[20] The total 5-year estimated expenditures for these programs is $4.3 billion. In fiscal year 2008, only 6 of the line items are funded for a total of roughly $174 million; funding for the remaining 5 programs would begin with the fiscal year 2009 budget. According to FAA, in addition to capital spending for NextGen, the agency will spend an estimated $300 million on NextGen-related research and development from fiscal years 2008 through 2012. The administration's budget for fiscal year 2008 for FAA includes a total of $17.8 million to support the activities of JPDO.

[19] JPDO, *Making the NextGen Vision a Reality: 2006 Progress Report to the Next Generation Air Transportation System Integrated Plan* (Washington, D.C.; Mar. 14, 2007).

[20] FAA has six capital investment programs that it considers transformational NextGen programs slated to receive funding in fiscal year 2008: ADS-B nationwide implementation, System Wide Information Management (SWIM), NextGen Data Communications, NextGen Network Enabled Weather, National Airspace System Voice Switch, and NextGen Technology Demonstration. In addition, five other programs are slated to begin funding in 2009: NextGen System Development, NextGen High Altitude Trajectory Based Operations, NextGen High Density Airports, NextGen Networked Facilities, and NextGen Cross-Cutting Infrastructure.

While FAA and JPDO have begun to release estimates for FAA's NextGen investment portfolio, questions remain over which entities will fund and conduct some of the necessary research, development, and demonstration projects that will be key to achieving certain NextGen capabilities. In the past, a significant portion of aeronautics research and development, including intermediate technology development, has been performed by NASA. To its credit, NASA plans to focus its research on the needs of NextGen. However, NASA is also moving toward a focus on fundamental research and away from developmental work and demonstration projects, which could negatively impact NextGen if these efforts are not assumed by others.

In addition, JPDO will need to conduct modeling for NextGen and may look to its partner agencies to provide modeling capabilities and support. For example, NASA's NAS-wide modeling platform, the Airspace Concepts Evaluation System (ACES),[21] permits JPDO to, among other things, evaluate alternative research ideas and assess the performance of competing vendors. According to a JPDO official, this capability, which is critical to NextGen research, is eroding as JPDO's investment simulation requirements are expanding. As part of its fundamental research mission, NASA intends to upgrade to ACES-X (a more sophisticated representation of the national airspace system), but not for another two years. Until then, JPDO's investment modeling capability will be constrained unless the office or another partner agency can assume the modeling work. For example, the Department of Defense has detailed aircraft models and the Department of Homeland Security has detailed models of airport terminals that are relevant for JPDO's simulations. This is an issue that needs to be addressed in the short-term.

JPDO faces the challenge of determining the nature and scope of the research and technology development necessary to begin the transition to NextGen, as well as identifying the entities that can conduct that research and development. According to officials at FAA and JPDO, they are currently studying these issues and trying to assess how much research and development FAA can assume. An FAA official recently testified that the agency proposes to increase its research and development funding by

[21] ACES provides a detailed flight simulation environment and an open framework to integrate the results of other simulations. This allows JPDO to test concepts well before they have to be demonstrated with real hardware and people. This platform provides a basis for evaluating the timing of many agencies' current budget requests and is a method for comparing competitive ideas.

$280 million over the next 5 years. However, a draft report by an advisory committee to FAA stated that FAA would need at least $100 million annually in increased funding to assume NASA's research and development work, and establishing the necessary infrastructure within FAA could delay the implementation of NextGen by 5 years.[22] JPDO's Integrated Work Plan will permit NASA and the other partner agencies to assess the research and development needs of NextGen, determine funding, and conduct the necessary initiatives. The Integrated Work Plan is critical for the timely completion of research and testing of proposed NextGen systems and keeping NextGen on schedule.

JPDO's Lack of Stable Leadership and the Authority to Enforce Accountability Threaten the Credibility of Organization

While basic organizational structure of JPDO has been in place for several years (see app. 1), it has suffered from a lack of stable leadership. As JPDO begins its fourth year in operation, it is functioning under its third director and operated for much of 2006 under the stewardship of an acting director. The current director of JPDO has held the position since August 2006. The Next Generation Air Transportation System Institute (the Institute), created to facilitate the participation of nonfederal stakeholders in the NextGen effort, noted in its recent annual report that JPDO's leadership turnover had made it a challenge for JPDO to move out more aggressively on many goals and objectives, as the office waited on a full-time director. The Institute also stated that JPDO's leadership turnover had limited the ability of the Institute's executive committee[23] to forge a stronger relationship with JPDO leadership and work jointly on strategic issues and challenges. These fundamental leadership issues are exacerbated by the lack of meetings of JPDO's senior policy committee. Although JPDO has been functioning for just over 3 years, the senior policy committee has met only four times, and has not met at all as a formal body since November 2005.

[22]Research, Engineering and Development Advisory Committee, *Draft Report on Financing the Next Generation Air Transportation System* (Washington, D.C.; April 2006).

[23]The Institute's executive committee is a subset of the Institute's governing body, the Institute Management Council. The Institute Management Council members represent commercial airline operations, commercial pilots, air traffic control technology, air traffic controllers, airport operators, business aircraft operations, federal advisory committees, universities, and non-profit research organizations, small aircraft general aviation, helicopter operations, manufacturers of air vehicles and airborne/space-borne and ground based equipment, and regional commercial airline operations. The JPDO director is an ex-officio member and there are two at-large members.

In addition to the lack of stable leadership, JPDO's management lacks the authority to hold much of JPDO's staff accountable for their performance. As we noted in November 2006, JPDO has staffed the various levels of its organization with employees from its partner agencies and this practice helps to leverage partner agency human resources. However, a drawback of such staffing is a lack of real or perceived accountability to JPDO. According to JPDO officials, the JPDO workforce consists largely of part-time partner agency personnel who have been detailed to JPDO and part-time private sector volunteers. Only a few permanently-assigned FAA staff have their performance appraised by JPDO management, although the director does provide input to the performance appraisals of some of the managers detailed to JPDO from partner agencies. We have noted in previous studies that improved performance has been linked to accountability.[24]

Similarly, although the organizational structure of the Institute has been in place for 2 years, the Institute is currently led by an acting director while a search is being conducted for the Institute's third executive director. Some Institute Management Council (IMC) members with whom we spoke believed that this turnover might be indicative of problems with the structure of the Institute and a need for greater clarity in roles and responsibilities. For example, these IMC members noted that there were stresses placed on the Institute's executive director resulting from the need to meet the competing demands of the IMC, the IMC executive committee, and JPDO management. Other IMC members attributed the stresses on the executive director to the lack of clarity in the Institute's role. These members noted that while the Institute is clearly charged with selecting private sector participants for JPDO's work groups, the Institute's role of conducting research for the JPDO could be viewed as overlapping with other advisory organizations such as RTCA.[25] Two IMC members believed that the Institute's award of only two research contracts in two years illustrates that the Institute is not yet functioning as intended. Some IMC members also pointed out that a formal mechanism for

[24]GAO, *Air Traffic Control Modernization: Status of the Current Program and Planning for the Next Generation Air Transportation System*, GAO-06-653T (Washington, D.C.: June 21, 2006)

[25]Organized in 1935 and once called the Radio Technical Commission for Aeronautics, RTCA is today known by its acronym. RTCA is a private, not-for-profit corporation that develops consensus-based performance standards for ATC systems. RTCA serves as a federal advisory committee, and its recommendations are the basis for a number of FAA's policy, program, and regulatory decisions.

providing industry input to JPDO on NextGen concepts and issues has not yet been fully established, even though this is one of the missions of the Institute. Although the Institute is currently seeking a new executive director, some IMC members felt that the IMC would do better to first try and gain a better understanding of the factors that have led to the turnover in the executive director position.

Human Factors Research Is Critical to Some Fundamental NextGen Capabilities

Among the central assumptions of the NextGen system is a concept of operations that envisions an increased reliance on automation, which dramatically changes the roles and responsibilities of both the air traffic controllers and the pilots. In such an automated environment some of the controller's responsibilities will shift from air traffic control to air traffic management and pilots will take on a greater share of the responsibility for maintaining safe separation and other tasks currently performed by controllers. These changes in roles and responsibilities raise significant human factors issues for the safety and efficiency of the national airspace system.

Although JPDO has begun to model how shifts in air traffic controllers' workloads would affect their performance, it has not yet begun to model the effect of how this shift in workload to pilots would affect pilot performance. According to a JPDO official, modeling the effect of changes in pilot workload has not yet begun because JPDO has not yet identified a suitable model to incorporate into its suite of modeling tools. According to a JPDO official, the evolving roles of pilots and controllers is the NextGen initiative's most important human factors issue, but will be difficult to research because data on pilot behavior are not readily available for use in creating models. In addition to the study of changing roles, JPDO has not yet studied the training implications of various systems or solutions proposed for NextGen. For example, JPDO officials said they will need to study the extent to which new air traffic controllers will have to be trained to operate both the old and the new equipment as the concept of operations and enterprise architecture mature.

JPDO Faces A Continuing Challenge in Ensuring the Involvement of All Key Stakeholders

Some stakeholders, such as current air traffic controllers and technicians, will play critical roles in NextGen, and their involvement in planning for and deploying the new technology will be important to the success of NextGen. In November 2006, we reported that active air traffic controllers were not involved in the NextGen planning effort and recommended that JPDO determine whether any other key stakeholders and expertise were not represented on its integrated product teams, divisions, or elsewhere

within the office. Since then, the head of the controllers' union has taken a seat on the IMC. However, no active controllers are yet participating at the more detailed group planning level. Also, aviation technicians do not participate in NextGen efforts. Input from current air traffic controllers who have recent experience controlling aircraft and current technicians who will maintain NextGen equipment is important when considering human factors and safety issues. Our work on past air traffic control modernization projects has shown that a lack of stakeholder or expert involvement early and throughout a project can lead to costly increases and delays.

In addition, we found that some private sector stakeholders have expressed concerns that participation in the Institute might either preclude bidding on future NextGen acquisitions or pose organizational conflicts of interest. FAA's acquisition process, generally, precludes bids from organizations that have participated in, materially influenced, or had prior knowledge of the requirements for an acquisition. The Institute was aware of this concern and attempted to address it through an amendment to its governing document that strengthened the language protecting participants from organizational conflicts of interest for participation in the NextGen initiative. However, while the amendment language currently operates to protect stakeholders, the language has never been tested or challenged. Thus, it is unclear at this time whether any stakeholder participation is being chilled by conflict of interest concerns.

Mr. Chairman, this concludes my statement. I would be pleased to respond to any questions from you or other Members of the Subcommittee.

GAO Contacts and Staff Acknowledgment

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Appendix I: JPDO's Organizational Structure Facilitates Collaboration, but Continues to Evolve

In November 2006, we reported that the Joint Planning and Development Office's (JPDO) organizational structure incorporated some of the practices that we have found to be effective for federal interagency collaborations—an important point given how critical such collaboration is to the success of JPDO's mission. For example, the JPDO partner agencies have worked together to develop key strategies for the Next Generation Air Transportation System (NextGen) and JPDO has leveraged its partner agency resources by staffing various levels of its organization with partner agency employees. Also, our work has shown that involving stakeholders can, among other things, increase their support for a collaborative effort.

Vision 100 includes requirements for JPDO to coordinate and consult with its partner agencies, private sector experts, and the public. JPDO's approach has been to establish an organizational structure that involves federal and nonfederal stakeholders throughout the organization. This structure includes a federal interagency senior policy committee. JPDO's senior policy committee is headed by the Secretary of Transportation (as required in Vision 100) and includes senior-level officials from JPDO's partner agencies. The JPDO board is an adjunct to the senior policy committee and is composed of at least one senior representative from each of the partner agencies.

The Next Generation Air Transportation System Institute (the Institute) was created by an agreement between the National Center for Advanced Technologies[1] and the Federal Aviation Administration to meet Vision 100's requirement that JPDO coordinate and consult with the public. The Institute incorporates the expertise and views of stakeholders from private industry, state and local governments, and academia. In addition, the Institute arranges for the participation of nonfederal stakeholders in JPDO's planning efforts, reviews and selects private sector organizations to conduct research studies needed by JPDO, and holds public meetings to obtain the views of the aviation community. The Institute held its first public meeting in March 2006 and plans to hold another public meeting in May 2007. The Institute is directed by an Institute Management Council (IMC), which consists of top officials and representatives from the aviation community. The IMC oversees the policy, recommendations, and products of the Institute and provides a means for advancing consensus

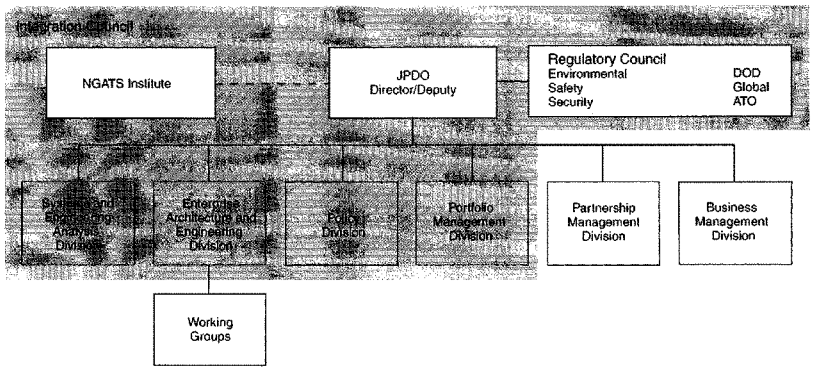
[1]The National Center for Advanced Technologies is a nonprofit unit established by the Aerospace Industries Association.

positions on critical NextGen issues. An executive committee, consisting of the IMC's two co-chairs and three members selected by them, conducts business on behalf of the IMC. The Institute is managed on a day-to-day basis by an executive director, who reports to the IMC and the executive committee, and works closely with JPDO management.

Recently, JPDO announced they are in the process of implementing several structural and operational changes to improve the efficiency of the organization (see fig. 3). JPDO's structure used to include eight integrated product teams (IPT), which was where the federal and nonfederal experts came together to plan for and coordinate the development of capabilities for NextGen. The eight IPTs were linked to eight key strategies that JPDO developed early on for guiding its NextGen planning work. The IPTs were headed by representatives of JPDO's partner agencies and include more than 200 nonfederal stakeholders from over 100 organizations.

JPDO recently converted each IPT into a "working group" with the same participants as the former IPT, but with each working group led by a joint government and industry steering committee. These steering committees will oversee the creation of small, ad hoc subgroups that will be tasked with short-term projects exploring specific issues and delivering discrete work products. Under this arrangement, working group members will be free of obligations to the group when not engaged in a specific project. According to JPDO officials, they believe the working groups will be more efficient and output- or product-focused than the former IPTs. JPDO officials noted that they are also in the process of staffing a new, ninth working group to address avionics issues.

Figure 3: JPDO New Organizational Chart



Governance

- Senior Policy Committee
- Board of Directors

Advisors

- REDAC Executive Committee
- Institute Management Council

Inter-Agency Coordination

- Joint Architecture and Engineering Board

Source: JPDO.

Note: There are nine working groups covering aircraft, air navigation services, airports, environment, global harmonization, net-centric operations, safety, security, and weather.

We believe that these changes could help address concerns that we have heard from some stakeholders about the productivity of some IPTs and the pace of the planning effort at JPDO. However, it will be important to monitor these changes to ensure that the participation of stakeholders is neither decreased nor adversely affected. Maintaining communications within and among work groups could increase in importance if, as work group members focus on specific projects, they become less involved in the overall collaborative planning effort. The effectiveness of the changes to JPDO's organizational structure will need to continue to be evaluated over time. Currently, we have on-going study examining the views and

concerns of JPDO's federal and nonfederal stakeholders about the office and its performance. We expect to issue a report on our findings later this year.

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May 30, 2007

The Honorable Jerry F. Costello
Chairman
Subcommittee on Aviation
Committee on Transportation and Infrastructure
House of Representatives

Subject: *Responses to Questions for the Record; Hearing on the Future of Air Traffic Control Modernization*

Dear Chairman Costello:

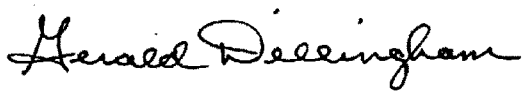
This letter responds to your May 10, 2007, request that we address questions submitted for the record related to the May 9, 2007, hearing entitled *The Future of Air Traffic Control Modernization*. Our answers to your questions are attached. Our responses are based on our previous work,[1] preliminary results of ongoing work, and our knowledge of the areas addressed by the questions. We prepared our responses during May 2007 in accordance with generally accepted government auditing standards. Because our responses are based on our previously issued products for which we sought and incorporated agency comments, as well as updates that we obtained through interviewing FAA officials and reviewing their documentation, we did not seek agency comments on our responses to these questions.

We are sending copies of this letter to the Administrator, Federal Aviation Administration, and the Director, Joint Planning and Development Office. We will make copies available to others on request. This letter is also available on GAO's Web site at www.gao.gov.

[1] GAO, *Next Generation Air Transportation System: Status of the Transition to the Future Air Traffic Control System*, GAO-07-784T (Washington, D.C.: May 9, 2007); *Joint Planning and Development Office: Progress and Key Issues in Planning the Transition to the Next Generation Air Transportation System*, GAO-07-693T (Washington, D.C.: Mar. 29, 2007); *Federal Aviation Administration: Key Issues in Ensuring the Efficient Development and Safe Operation of the Next Generation Air Transportation System*, GAO-07-636T (Washington, D.C.: Mar. 22, 2007); and *Next Generation Air Transportation System: Progress and Challenges Associated with the Transformation of the National Airspace System*, GAO-07-25 (Washington, D.C.: Nov. 13, 2006).

If you have any questions or would like to discuss the responses, please contact me at (202) 512-2834 or dillinghamg@gao.gov.

Sincerely yours,



Gerald L. Dilligham, Ph.D.
Director
Physical Infrastructure Issues

Enclosure

Enclosure

Responses to Post-Hearing Questions for the Record
"The Future of Air Traffic Control Modernization"
Subcommittee on Aviation
Committee on Transportation and Infrastructure
U.S. House of Representatives
Hearing held on May 9, 2007

Questions for Dr. Gerald L. Dillingham, Director
Physical Infrastructure Issues
U.S. Government Accountability Office

Questions for the Record Submitted by Chairman Jerry F. Costello

1. **Several stakeholders and other observers have suggested that JPDO is at a juncture wherein its current organizational structure and operating procedures should be revisited. The suggestions have ranged from the idea that JPDO should cease to exist as soon as it publishes its primary planning documents to the idea that it should become more autonomous, with more authority and budgetary control.**

    a. **How long should JPDO continue to exist, and if it should continue to exist, in what ways should its role and responsibilities with regard to NextGen change?**

JPDO was established to plan and coordinate the development of the next generation air transportation system (NextGen) and should exist for the duration of those tasks. The basic planning documents that JPDO is developing for NextGen are near completion, but further iterations of these planning documents will be needed as NextGen technologies are developed and implemented. With NextGen's progression from the initial planning to the early implementation phase, JPDO's role has evolved to include coordination and facilitation activities, as well as planning activities. GAO believes this is a reasonable evolution and a proper role for JPDO and is consistent with the language of JPDO's authorizing legislation.

One example of this evolution is the role JPDO has begun to play in incorporating NextGen goals and activities into the Air Traffic Organization's (ATO) strategic plans. ATO has expanded and revamped its Operational Evolution Partnership (OEP) to become the Federal Aviation Administration's (FAA) implementation plan for NextGen. The Review Board that oversees the OEP is cochaired by JPDO and ATO. Similar developments are expected to occur with other partner agencies as JPDO completes a memorandum of understanding with these agencies. If JPDO ceased to exist before NextGen was more fully developed, some alternative means of planning and coordinating NextGen's development would have to be established, which could delay NextGen's implementation.

JPDO's role could further evolve to include more coordination and oversight activities. For example, JPDO could establish a program oversight capacity that would enable it to perform such functions as (1) harmonizing the enterprise architectures among the partner agencies; (2) coordinating the research, development, and systems-engineering and integration activities of the cooperating agencies and industry; (3) overseeing multi-agency projects; (4) overseeing, with FAA, the selection of products or outcomes of research and development that would be moved

to the next stage of a demonstration project through the Joint Resources Council (JRC);[1] (5) overseeing the fundamental research activities that support the long-term strategic investments of NextGen by managing a research portfolio among NASA, academia, federally funded research and development centers, and industry; and (6) maintaining a baseline modeling and simulation environment for testing and evaluating alternative concepts to satisfy NextGen enterprise architecture requirements.

Another example of the evolution of JPDO's role is the organizational shift from integrated product teams to working groups. This shift reflects the extension of JPDO's role beyond planning to the development of work products or "outcomes" that will contribute to the early development of NextGen and facilitate its implementation. As JPDO assumes more responsibility for facilitating NextGen's implementation, greater authority and resources would allow it to do more to coordinate the efforts of the partner agencies and work with the Office of Management and Budget as the principal NextGen point of contact. With adequate funding and authority, JPDO could acquire staff with the project management and systems engineering skills needed for JPDO to be an effective oversight and coordinating office.

b. To what extent do you think that moving JPDO out of the Federal Aviation Administration's Air Traffic Organization will give it greater visibility and authority?

Currently, JPDO is located within FAA and reports to both the FAA Administrator and the Chief Operating Officer of ATO. In GAO's view, JPDO should not be moved out of FAA. Since JPDO provides the vision for the future air traffic control (ATC) system and ATO is to be the principal implementer of that vision, the two organizations need to continue working closely together.

However, JPDO's dual reporting status hinders its ability to interact on an equal footing with ATO and the other partner agencies. On one hand, JPDO must counter the perception that it is a proxy for the ATO and, as such, is not able to act as an "honest broker." On the other hand, JPDO must continue to work with ATO and its partner agencies in a partnership in which ATO is the lead implementer of NextGen. Therefore, it is important for JPDO to have some independence from ATO. One change that could begin to address this issue would be to have the JPDO Director report directly to the FAA Administrator. This change may also lessen what some stakeholders now perceive as unnecessary bureaucracy and red tape associated with decision making and other JPDO and NextGen processes.

As a part of any change in the dual reporting status of JPDO's Director, consideration could be given to the possibility of creating the position of Associate Administrator of NextGen and elevating the JPDO Director to that post.

c. What are the potential pluses and minuses of such a move?

One plus or advantage of moving JPDO out of ATO is that it could raise JPDO's authority and visibility in interagency deliberations by putting JPDO on an equal footing with ATO and other FAA lines of business. For example, moving JPDO out of ATO might strengthen its linkages to the Department of Defense (DOD) and the Department of Homeland Security (DHS). In addition, JPDO may be able to work more effectively with other FAA lines of business, such as Airports, for which JPDO has planning responsibilities. For example, JPDO is responsible for

[1] FAA's Joint Resources Council establishes and manages acquisition program baselines, which define cost, schedule, performance, and benefit parameters for programs over their full life cycle.

developing plans to increase airport capacity. A minus or disadvantage of moving JPDO out of ATO is that because much of the work related to implementing NextGen must occur under ATO, this work could be harder to accomplish.

d. What are some potential alternative organizational structures or arrangements and operating procedures for JPDO?

We think that besides moving JPDO out of ATO and changing JPDO's reporting status, a potential organizational alternative for JPDO could be elevating the JPDO Director's position by having the Director and the ATO Chief Operating Officer cochair the Joint Resources Council, the body within FAA that provides executive review and oversight of acquisitions. (Currently, the JRC is chaired by the Federal Acquisition Executive, a responsibility delegated by the Administrator to the Vice President of ATO-Administration.) Consideration could also be given to creating the position of Associate Administrator of NextGen for the JPDO Director. This would give greater authority, credibility, and visibility to this important position.

e. What are your thoughts on the following suggestions?

1) JPDO should be established as a program office with program management capabilities and tools to interact with other program offices such as the FAA program office, the program office that DOD has committed to create, and the joint weather office involving DOD, DOC, and FAA.

Currently, we do not think JPDO has the technical resources, tools, or operational knowledge to function as a program office. Moreover, the partner agencies, led by ATO, have the operational knowledge to best implement NextGen systems. JPDO, however, could function purely as a coordinating body or executive council. For example, JPDO could be provided with the resources and authority to establish a program oversight capacity that would enable it to perform such functions as (1) harmonizing the enterprise architectures among the partner agencies; (2) coordinating the research, development, and systems-engineering and integration activities of the cooperating agencies and industry; (3) overseeing multi-agency projects; (4) overseeing, with FAA, the selection of products or outcomes of research and development that would be moved to the next stage of a demonstration project through the Joint Resources Council (JRC);[2] (5) overseeing the fundamental research activities that support the long-term strategic investments of NextGen by managing a research portfolio among NASA, academia, federally funded research and development centers, and industry; and (6) maintaining a baseline modeling and simulation environment for testing and evaluating alternative concepts to satisfy NextGen enterprise architecture requirements.

2) JPDO lacks the technical capacity to evaluate the R&D efforts of its government partners and private sector clients and should be provided with an increased capacity and technical resources to carry out this function.

To oversee multi-agency programs and have the capacity to evaluate NextGen R&D efforts, JPDO must have the requisite human and technical resources, such as a sufficient number of personnel with expertise in areas related to NextGen technologies. JPDO does not currently have these

[2] FAA's Joint Resources Council establishes and manages acquisition program baselines which define cost, schedule, performance, and benefit parameters for programs over the full lifecycle of the program.

[4] Congressional Budget Office, *Financing Investment in the Air Traffic Control System* (Washington, D.C.: Sept. 27, 2006)

resources, but it could obtain them with funding over and above the level in the FAA reauthorization proposal. Such resources are needed for JPDO to monitor the implementation of NextGen.

3) **JPDO lacks a clear process to identify inconsistencies in partner agency budgeting. JPDO should become a partner in the budgeting process and there should be a budget resolution council to provide a forum for negotiation of budget priorities.**

JPDO is already a partner in the budgeting process. JPDO has been working with OMB to develop a process that would allow OMB to identify NextGen-related projects across the partner agencies and consider NextGen as a unified, cross-agency program. Under this process, JPDO and its partner agencies can jointly present OMB with business cases for the partner agencies' NextGen-related efforts, and these business cases can be used as inputs to funding decisions for NextGen research and acquisitions across the agencies.

We do not believe JPDO needs a forum to negotiate budget priorities. The Senior Policy Committee (SPC), headed by the Secretary of Transportation, includes senior-level officials from JPDO's partner agencies and was established, in part, to address NextGen budget issues. In JPDO's enabling legislation, SPC was explicitly made responsible for identifying NextGen resource needs and making recommendations to the members' respective agencies for the necessary funding.

Enclosure

2. **Much has been written and spoken about the role of and contributions of the various partner agencies to JPDO. Some observers have commented that the degree of participation by the partner agencies seemed to be on a continuum from a significant amount of participation to seemingly not very much at all. FAA and NASA are consistently indicated as the most involved participants.**

   a. **In your opinion, to what extent are the partner agencies participating in the vision and work of JPDO?**

The partner agencies' participation in the vision and work of JPDO has varied to date and will continue to evolve over time. Interagency partnerships are difficult because it takes time to forge working relationships and establish accountability. While FAA and NASA have been the most involved in the planning and coordination of NextGen, the other agencies are also participating. The Department of Defense, for example, is transferring to NextGen the technology it has developed for sharing information across networks, is establishing a program office to coordinate all of its NextGen activities, and is collaborating with FAA and the Department of Commerce to develop and implement NextGen's weather forecasting capability. The Department of Homeland Security is participating by contributing "in-kind" services in the form of personnel and research.

   b. **How could the roles of the partner agencies be changed to enhance their participation or positively affect the development of NextGen?**

We believe that the partner agencies' participation in NextGen could be enhanced by incorporating NextGen goals and activities in the agencies' key planning documents and research agendas. For example, JPDO is working with FAA to refocus one of FAA's key planning documents—its Operational Evolution Partnership (OEP)—on the implementation of NextGen. Formerly a plan for airport capacity, OEP has been expanded and revamped to become a comprehensive description of how FAA will implement NextGen. We believe that similar efforts by the other partner agencies could increase both their accountability to JPDO and JPDO's authority over them. In addition, JPDO has been working with OMB to develop a process for identifying NextGen-related research in the partner agencies' budgets (see 1e. (3)).

   c. **What do you think about the idea of having each partner agency designate a senior-level official as the responsible individual for all NextGen-related programs in the agency?**

Designating a senior-level official within each partner agency as responsible for all of that agency's NextGen-related programs could be an effective way of helping to ensure that all the partner agencies are interacting on an equal footing and providing the needed leadership and commitment.

   d. **Some observers have noted that there seems to be a lack of accountability and authority in the current JPDO structure, especially with regard to partner agencies. Would you agree or disagree with this assertion? If you agree with the assertion, how could this problem be addressed?**

We would agree that, as a planning and coordinating organization, JPDO lacks authority over the key human and technological resources of its partner agencies. Consequently, institutionalizing its process for collaborating with its partner agencies will be critical to JPDO's ability to leverage its partner agencies' resources and facilitate the implementation of NextGen. Institutionalizing

the collaborative process means that, as administrations and staffing within JPDO change over the years, those coming into JPDO will clearly understand what is expected of them and what time and resource commitments are entailed. JPDO, however, has not yet established some practices that are important to institutionalizing its collaborative process. For example, JPDO does not yet have formal long-term agreements among its partner agencies on their roles and responsibilities in creating NextGen. According to JPDO officials, a memorandum of understanding (MOU), signed by the Secretary or another high-ranking official from each partner agency, will define the partner agencies' roles and responsibilities. To date, this MOU has been signed by the Departments of Transportation and Commerce and NASA, but remains unsigned by the Departments of Defense and Homeland Security. (See 2e.)

e. **What kind of changes to the authority and resources now provided to JPDO would you suggest to enhance its effectiveness in coordinating the partner agencies?**

Besides institutionalizing the collaborative process between JPDO and its partner agencies, elevating the position of JPDO within the NextGen implementation process could enhance its effectiveness in coordinating the partner agencies. In addition, JPDO could be provided with the resources and authority to establish a program oversight capacity that would enable it to perform such functions as (1) harmonizing the enterprise architectures among the partner agencies; (2) coordinating the research, development, and systems-engineering and integration activities of the cooperating agencies and industry; (3) overseeing multi-agency projects; (4) overseeing, with FAA, the selection of products or outcomes of research and development that would be moved to the next stage of a demonstration project through the Joint Resources Council (JRC); (5) overseeing the fundamental research activities that support the long-term strategic investments of NextGen by managing a research portfolio among NASA, academia, federally funded research and development centers, and industry; and (6) maintaining a baseline modeling and simulation environment for testing and evaluating alternative concepts to satisfy NextGen enterprise architecture requirements.

JPDO's efforts to reorganize itself internally may also increase its authority and enhance the participation of its partner agencies. We see this as a positive development that extends JPDO's role beyond planning to focus more on the development of work products or "outcomes" that will contribute to the early development of NextGen and facilitate its implementation. As JPDO assumes more responsibility for facilitating NextGen's implementation, greater authority and resources would allow it to do more to coordinate the efforts of the partner agencies and work with the Office of Management and Budget as the principal NextGen point of contact. We believe that with adequate authority and funding, JPDO could acquire staff with the project management and systems engineering skills needed for JPDO to be an effective oversight and coordinating office for NextGen.

3. **JPDO has been described as having a government staff of fewer than a dozen full-time government employees to coordinate a long-term initiative involving tens of billions of dollars investment. Some observers say that JPDO will only be credible in its joint role when funded by all principal partners. Only FAA and NASA currently fund JPDO and its funding has not grown since inception despite its maturing requirements.**

   a. **What are your thoughts on the following suggestions related to funding JPDO?**

   1) **JPDO operations should be funded equally with money from FAA, NASA, DOD, DHS, and DOC until such time as a memorandum of understanding can be established to determine an alternative proportional scheme.**

We believe the partner agencies' funding of JPDO operations could be based on the roles and resources of the the partner agencies or the partner agencies could continue to contribute cash, expertise, and other resources as needed and available. For example, DOD plans to provide $5 million for a demonstration of information sharing across networks this year (FAA and DHS are also providing $5 million each for this demonstration). The other partner agencies provide a variety of "in-kind" services through personnel assigned to JPDO and research. Nonetheless, it is most important to ensure that JPDO's funding needs are fully met.

   2) **FY09 funding from DOD, DHS, and DOC should match the ongoing commitment from FAA and NASA of at least $18M per entity for a total of $90M in FY09.**

Contributions of some amount by the partner agencies could encourage those agencies to have JPDO undertake work that is valuable to them as well as to JPDO. While some stakeholders have said that requiring $18 million per agency, the amount currently contributed by FAA and NASA, would not be likely to have a significant impact on the R&D budgets of DOD, DHS, and DOC, we believe it is most important that the agencies contribute some amount to JPDO relative to their roles and responsibilities for making NextGen a reality.

   b. **Some stakeholders and other observers have opined that it is essential that JPDO be independent of ATO to be successful in objectively facilitating the implementation of NextGen with its other governmental partners.**

In GAO's view, making JPDO independent of ATO could help to reduce or eliminate any perceptions on the part of JPDO's other governmental partners that JPDO might be too closely aligned with FAA to serve as an objective, independent facilitator of a multiagency partnership. Independence could also raise JPDO's authority and visibility in interagency deliberations by putting it on an equal footing with ATO and other FAA divisions. Furthermore, we believe loosening JPDO's ties to ATO could strengthen its linkages to DOD and DHS and enable it to work more effectively with other FAA divisions, such as Airports, for which JPDO has planning responsibilities. For example, JPDO is responsible for developing plans to increase airport capacity. Moving JPDO out of ATO could, however, make it harder for JPDO to obtain ATO's collaboration on efforts related to the implementation of NextGen.

Enclosure

c. **What are some alternative governance structures that could be used by JPDO?**

Besides moving JPDO out of ATO and thereby eliminating its dual reporting status (to both the FAA Administrator and the ATO Chief Operating Officer), the operation of the Joint Resources Council, the body within FAA that provides executive review and oversight of acquisitions, could be changed so that is the council would be chaired jointly by the Chief Operating Officer and the JPDO Director. (Currently, the JRC is chaired by the Federal Acquisition Executive, a responsibility delegated by the Administrator to the Vice President of ATO-Acquisition & Business Services.) Additionally, consideration could be given to creating the position of Associate Administrator of NextGen to put the JPDO Director on a more equal organizational footing with the ATO Chief Operating Officer.

d. **What are the advantages and disadvantages of any such governance structures, including potential unintended consequences?**

As discussed, moving JPDO out of ATO and elevating the position of the JPDO Director could increase JPDO's independence, raise its authority and visibility in interagency deliberations, strengthen its linkages to DHS and DOD, and enable it to work more effectively with other FAA divisions. Such changes could, however, make it harder for JPDO to collaborate with ATO.

e. **You testified that the Senior Policy Committee (SPC) meets only sporadically and has not been actively engaged in providing cross-agency leadership. What do you think would be the effect of a mandated schedule for SPC meetings, i.e., quarterly or semi-annually?**

To date, the SPC has not met regularly. During the time JPDO has been functioning–just over 3 years—the SPC has met four times and has not convened as a formal body since November 2005. Although JPDO's enabling legislation calls for the SPC to advise the Secretary of Transportation, provide policy guidance for NextGen, and provide ongoing policy review for the transformation of the air transportation system, the legislation does not require a meeting schedule for the SPC. To the extent that the SPC cannot voluntarily meet on a regular schedule, then we think requiring regular meetings could be beneficial.

f. **The JPDO Board has no legislative basis, as it was not created by Vision 100. A junior and senior level board (i.e., SPC) for governance is unprecedented in industry. Why not dissolve the JPDO Board?**

The JPDO Board acts as an action arm of the SPC members whose wide-ranging responsibilities limit their continuing and comprehensive involvement in NextGen. We believe a designated senior person from each agency who has access to and can act with the authority of the SPC member from that agency is needed to carry out necessary actions.

g. **What are your thoughts on the following governance related ideas?**

1) **JPDO should report directly to the Office of the Secretary of Transportation.**

In GAO's view, JPDO should not report to the Secretary of Transportation because placing JPDO in the Secretary's office would remove it too far from the implementation and operations of NextGen.

Enclosure

2) **The JPDO Director should report to the FAA Administrator exclusively, rather than also to the ATO Chief Operating Officer (COO), as is currently the case and proposed in FAA's reauthorization.**

As discussed, this change could increase JPDO's independence and authority and strengthen JPDO's linkages to some other agencies and divisions, but it could also hamper interactions with ATO.

3) **FAA funding of JPDO should be direct from FAA Financial Services, as is the case for other independent internal FAA entities, e.g., Airports and Commercial Space Transportation, rather than through ATO.**

Yes, this change would be consistent with moving JPDO out of ATO and could help to raise the visibility and legitimacy of JPDO. If JPDO becomes organizationally independent of ATO, then its FAA funding should come directly from FAA Financial Services, as does the funding for FAA's Airports and Commercial Space Transportation divisions.

4) **FAA should create the position of "Associate Administrator for Next Generation Systems" that is co-equal internally with positions of the same title for Commercial Space Transportation, Airports, and Aviation Safety.**

FAA should consider creating the position of Associate Administrator of NextGen and elevating the JPDO Director to that post. We think that this would give greater credibility, authority, and visibility to this important position.

5) **If such a position were created what do you think would be the effect of the JPDO Director filling that position or reporting to it?**

The JPDO Director could fill that position. Another reporting level could increase red tape and bureaucracy.

6) **The Director of JPDO or Associate Administrator for Next Generation Systems should be a voting member of the FAA Joint Resources Council and participate in making capital investment decisions.**

In GAO's view, the JPDO Director should be a member of the Joint Resources Council (JRC), the body within FAA that makes capital investment decisions and provides executive review and oversight of acquisitions. The FAA reauthorization proposal calls for the JPDO Director to be a voting member of the JRC, as is the Chief Operating Officer of ATO. This change would help ensure that NextGen plans are consistent with current operations.

Enclosure

4. **You have testified that FAA's funding system based on the current ticket and fuel taxes is sufficient to fund the NextGen. However, the Administrator suggests that if the current funding structure were able to support NextGen, it would be a much longer process and has argued for a user fee based system.**

    a. **What would be the effect, if any on the NextGen budget if Congress does not enact the Administration's proposed aviation financing reform package (ticket taxes; aviation fuel taxes) as part of a new authorization, but instead leaves the current ticket and fuel taxes in place?**

The current FAA funding structure can provide sufficient funding for NextGen—with some caveats. Congress has used the current funding structure—excise taxes plus a General Fund contribution—to fund FAA for many years. As the number of air travelers has grown, so have excise tax revenues. Even though revenues fell during the early years of this decade as the demand for air travel fell, they began to rise again in fiscal year 2004, and FAA estimates that if the current taxes remain in effect at their current rates, revenues will continue to increase. According to projections prepared by the Congressional Budget Office (CBO),[4] revenues obtained from the existing funding structure are projected to increase substantially. Assuming the General Fund provides about 19 percent of FAA's budget, CBO estimates that through 2016 the Trust Fund can support about $19 billion in additional spending over the baseline FAA spending levels CBO has calculated for FAA (the 2006 funding level, growing with inflation) provided that most of the spending occurs after 2010. How far this money will go to fund modernization is subject to a number of uncertainties—including the future cost of NextGen investments, the volume of air traffic, the future cost of operating the national airspace system (NAS), and the levels of future appropriations for the Airport Improvement program, all of which influence funding for FAA.

However, if the desired level of funding exceeded what was likely to be available from the Trust Fund at current tax rates, Congress could make further changes within the current structure that would provide FAA with additional revenue. Congress could raise more revenue from airspace system users for NextGen or for other purposes by raising the rates on one or more of the current excise taxes. Congress could also provide more General Fund revenues for FAA, although the nation's fiscal imbalance may make a larger contribution from this source difficult.

    b. **If additional financial resources, in the range of $200 million annually for the next five years over the President's current budget request, were made available to JPDO, what would or should be its priorities aimed at expediting NextGen capabilities into the NAS?**

In GAO's view, JPDO could expedite the development of NextGen capabilities with accelerated funding over and above the President's current budget request. There are several areas in which additional research and development and deployment could be undertaken or accelerated with funding over and above the President's current budget request. Two closely related areas that could be candidates for increased funding are avionics development and aircraft equipage. Additional support in these areas could accelerate the transition to satellite-based navigation, which requires the commercial fleet to be equipped with advanced avionics. This transition would allow FAA to pursue the elimination of costly ground-based navigation aids; the transition to data link; and the standardization of future aircraft capabilities such as flight management systems, traffic collision avoidance systems, and modular avionics. The successful development and deployment of NextGen will require a series of incremental changes that must be tested to

help ensure that they do not degrade the safety of the current system. Developing the evidence for regulatory bodies and for the public that these incremental changes are safe will be time consuming, costly, and difficult. For example, additional development funding could help with the testing of a system in which both pilots and air traffic controllers share in decisions about flight paths. Such testing would increase the level of safety assurance for en route and terminal automation and support the acquisition of air-to-ground data communications used in trajectory negotiation.

Research and development for advanced concepts and applications could also accelerate and strengthen the area of airborne applications. This research area could include spacing and merging for approaches including: optimizing the spacing of aircraft that are in fight, allowing for closely spaced parallel approaches and reduced separation standards, and addressing the issue of wake turbulence. Additional funding could also allow for limited field trials to refine operational and system requirements, and work could be done to integrate unmanned aerial systems into the NAS. Establishing supporting processes for rulemaking and software certification could also accelerate the removal of potential bottlenecks to implementing NextGen.

Another area that could benefit from additional funding is human factors research. As you know, one of the principal changes under NextGen will be a transformation from air traffic control to air traffic management. This will mean new roles for all participants in the system, including air traffic controllers and pilots. Additional funding could accelerate human factors research and training initiatives that are central to the success of NextGen, such as initiatives defining the relative responsibilities of aircraft personnel and ground controllers, and modernizing controller training through the use of advanced simulation and intelligent tutoring tools.

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5. **Traditionally, NASA has developed promising technologies to a high maturity level enabling FAA to incorporate them into its air traffic control system without too much additional development. Now that NASA is confining its development work to a basic level of technical maturity, JPDO/FAA must find ways to have the necessary R&D work conducted by other organizations. This R&D includes work needed for planning as well that needed for validation and demonstrations.**

   a. **To what extent do FAA and the other federal partners have the resources and capability to meet the R&D needs in these two areas?**

The National Aeronautics and Space Administration (NASA) formerly conducted the type of intermediate research and development (R&D) and demonstration projects that will be needed for the NextGen program, but the funding for these efforts was discontinued when NASA's aeronautical research portfolio was restructured to focus more on fundamental research. Although FAA has not fully determined the impact of the NASA restructuring on the R&D needs for NextGen, We agree with some key stakeholders that additional R&D funds will be needed and are critical for the timely development of NextGen. FAA recognizes that this is a critical issue and has already taken some action to address it. For example, in the President's fiscal year 2008 budget request for FAA, funds have been included for developmental and transition research, in the Facilities and Equipment (F&E) Activity 1 account. In light of the NASA restructuring, FAA has also undertaken a study to assess the nature and scope of its NextGen R&D needs. According to JPDO officials, this study will be completed in August 2007. FAA officials say the results of this study will be used as a basis for determining how any "gap" identified can be addressed with government or private sector resources.

   b. **What actions should JPDO take to help ensure that the demonstrations, certifications, and transition R&D needed to validate new technologies be conducted in a timely manner so that NextGen will not be delayed?**

The time required to prototype, validate, and certify a technology can present a significant risk to the timely and cost-effective implementation of NextGen. We have studied the lead times required to prototype, validate, and certify new technologies. Neither JPDO nor FAA currently has sufficient resources to prototype, validate, and certify new technologies, and neither agency can currently develop the technologies internally without causing significant delays in the implementation of NextGen. In addition, stakeholders have expressed concern over the time it takes to develop rules for new equipment and the problems caused when equipment is fielded before rules are finalized. Any activities that will be required to implement new policies, demonstrate new capabilities, set parameters for the certification of new systems, and develop technologies will take time. Just as important, the time required to prototype, validate, and certify a new technology must be balanced against the need to ensure the reliability of the technology and the safety of the flying public.

If JPDO had sufficient resources, it could prototype, validate, and certify new technologies in a timely manner. We believe another option would be for JPDO to identify other organizations with the capacity to accomplish these tasks and provide them with the resources to take on these tasks. In addition, JPDO could work with FAA's Aviation Safety organization to establish the metrics needed to assess compliance with the standards to which these systems must conform.

   c. **It takes considerable time to prototype, validate, and certify new technologies required for NextGen, in addition to time required for**

rulemakings. How much of a risk do these processes pose to timely development of NextGen?

We cannot quantify how much of risk exists, but we think that a significant risk does exist for the timely development of NextGen because demonstrations and transition R&D are necessary to develop certification standards for new technologies.

JPDO does not currently have the resources to prototype, validate, and certify new technologies. Moreover, several of the stakeholders with whom we spoke believed that even if JPDO were to obtain the needed resources, it could require as much as 5 years to establish the infrastructure needed to prototype, validate, and certify new technologies. Any activities that will be required to implement new policies, demonstrate new capabilities, set parameters for certifying new systems, and develop technologies will take time. Just as important, the time required to prototype, validate, and certify new technologies must be balanced against the need to ensure the reliability and safety of the technology.

d. What do you think of the following suggestions related to research and development?

1) **Establish JPDO as the modeler for the NextGen business case, with a formal charter and supporting resources made available to allow the creation of a National Virtual Test Bed to link government, academic, and industry simulation models in a nonpartisan and transparent fashion to assess technical options and quantify cost and benefits of the evolving implementation approach for NextGen.**

Yes, this role seems to be consistent with JPDO's authorizing legislation. As JPDO becomes more involved in facilitation, it must test, validate, and assess technical options and quantify their costs and benefits so that decision makers can evaluate the options for inclusion in the NAS.

2) **In order for FAA/JPDO to be able to conduct all but the most long-term, fundamental research supporting NextGen development, some or all of NASA's aeronautics research capabilities should be transferred to FAA/JPDO, specifically Langley Research Center and portions of Ames Research Center.**

In GAO's view, some or all of NASA's aeronautical research capabilities that are located at Langley Research Center and portions of Ames Research Center could be transferred to FAA or JPDO. However, another alternative to consider might be to make more use of the resources available at the FAA Technical Center in Atlantic City, New Jersey, and the FAA Aeronautical Center in Oklahoma City, Oklahoma. This decision will be informed by the results of a JPDO study that is currently underway to assess the nature and scope of NextGen's R&D needs. According to JPDO officials, this study will be completed in August 2007.

(540156)

United States Government Accountability Office
Washington, DC 20548

May 18, 2007

The Honorable Jerry F. Costello
Chairman
Subcommittee on Aviation
Committee on Transportation and Infrastructure
House of Representatives

Subject: *Responses to Questions for the Record; Hearing on The Future of Air Traffic Control Modernization*

Dear Chairman Costello:

This letter responds to your May 9, 2007, request that I address questions submitted for the record by Members of the Subcommittee related to the May 9, 2007, hearing entitled *The Future of Air Traffic Control Modernization.* The answers to your questions are enclosed. The responses are based on GAO's previous and ongoing work and my knowledge of the areas addressed by the questions. I prepared the responses during May 2007 in accordance with generally accepted government auditing standards. Since my responses are based in large part on previously issued products for which GAO sought and incorporated agency comments, I did not seek agency comments on my responses to these questions.

If you have any questions or would like to discuss the responses, please contact me at (202) 512-4803 or dillinghamg@gao.gov

Sincerely yours,

Gerald L. Dillingham, Ph.D.
Director
Physical Infrastructure Issues

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Responses to Post-Hearing Questions for the Record
"The Future of Air Traffic Control Modernization"
Subcommittee on Aviation
Committee on Transportation and Infrastructure
U.S. House of Representatives
Hearing held on May 9, 2007

Questions for Dr. Gerald L. Dillingham, Director
Physical Infrastructure Issues
U.S. Government Accountability Office

Questions for the Record Submitted by Chairman Jerry F. Costello

GAO has previously reported that FAA briefed the industry on preliminary near-term costs for NextGen in April 2006, and this preliminary estimate provided approximately $1 billion more through 2011 than FAA's most recent 5 year capital investment plan for FAA facilities and equipment. If Congress were to provide the level of funding outlined in FAA's preliminary estimate, would it help to accelerate the development and deployment of NextGen?

Yes, I think that if Congress provided FAA with the level of funding outlined in FAA's April 2006 preliminary estimate of the cost of NextGen, the additional funding could be applied to a variety of projects and initiatives that would help to accelerate the development and deployment of NextGen.

Would additional Facilities and Equipment funding help to bridge the so-called NASA gap? In other words, could it be used for the type of intermediate development and demonstration projects that NASA would no longer fund?

Yes. As your question indicates, the National Aeronautics and Space Administration (NASA) formerly conducted the type of intermediate research and development (R&D) and demonstration projects that will be needed for the NextGen program, but the funding for these efforts was discontinued when NASA's aeronautical research portfolio was restructured to focus more on foundational research. Although FAA has not fully determined the impact of the NASA restructuring on the R&D needs for NextGen, I agree with some of the key stakeholders that additional R&D funds will be needed and are critical for the timely development of NextGen. FAA recognizes that this is a critical issue and has already taken some action to address it. For example, in the President's

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fiscal year 2008 budget request for FAA, funds have been included for developmental and transition research, in the Facilities and Equipment (F&E) Activity 1 account. In light of the NASA restructuring, FAA has also undertaken a study to assess the nature and scope of its NextGen R&D needs. According to JPDO officials, this study will be completed in August 2007.

Would you cite additional research, development and deployment that could be done with funding over and above FAA's capital investment plan funding levels?

I think there are several areas in which additional research and development and deployment could be undertaken or accelerated with funding over and above the level provided in FAA's capital investment plan. Two closely related areas that could be candidates for increased funding are avionics development and aircraft equipage. Additional support in these areas could accelerate the transition to satellite navigation, which requires the commercial fleet to be equipped with advanced avionics. This transition would allow FAA to pursue the elimination of costly ground-based navigation aids; the transition to data link; and the standardization of future aircraft capabilities such as flight management systems, traffic collision avoidance systems, and modular avionics.

The successful development and deployment of NextGen will require a series of incremental changes that must be tested to help ensure that they do not degrade the safety of the current system. Developing the evidence for regulatory bodies and for the public that these incremental changes are safe will be time consuming, costly, and difficult. For example, additional development funding could help with the testing of a system in which both pilots and air traffic controllers share in decision-making regarding the aircraft's flight path, which would increase the level of safety assurance for en route and terminal automation and support the acquisition of air-to-ground data communications to support trajectory negotiation.

Another area that could benefit from additional funding is human factors. As you know, one of the principal changes under NextGen will be a transformation from air traffic control to air traffic management. This will mean new roles for all participants in the

system, including air traffic controllers and pilots. Additional funding could accelerate human factors research and training initiatives that are central to the success of NextGen, such as initiatives defining the relative responsibilities of aircraft personnel and ground controllers, and modernizing controller training through the use of advanced simulation and intelligent tutoring tools.

Research and development for advanced concepts and applications could also be strengthened and accelerated in the areas of airborne applications. This research area could include spacing and merging for approaches including: optimizing the spacing of aircraft that are in flight, allowing for closely spaced parallel approaches, and reduced separation standards and addressing the issue of wake turbulence. Additional funding could also allow for limited field trials to refine operational and system requirements, and work could be done to integrate unmanned aerial systems into the National Airspace System. Establishing supporting processes for rulemaking and software certification could also accelerate the removal of potential bottlenecks to implementing NextGen.

In addition, I believe that it will be critical for FAA and JPDO to have sufficient personnel with the expertise needed to properly use any additional or incremental funding as effectively as possible. One possibility would be to use some of the additional funding to obtain the personnel with the needed expertise.

These responses to the Questions for the Record were submitted May 18, 2007.

EMBRY-RIDDLE
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TESTIMONY BEFORE THE COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE'S SUBCOMMITTEE ON AVIATION

THE FUTURE OF AIR TRAFFIC CONTROL MODERNIZATION

Chairman Costello, Congressman Mica, and Members of the Subcommittee:

Thank you for allowing me to testify today before the committee. My name is Christina Frederick-Recascino and I am the Interim Provost and Director of Research at Embry-Riddle Aeronautical University, the world's largest and oldest University solely devoted to aviation education and research. Embry-Riddle Aeronautical University has three campuses: two residential campuses in Daytona Beach, Florida and Prescott, Arizona, and a Worldwide Campus with 130 centers across the globe. We have 6,500 students at our Daytona and Prescott campuses and over 30,000 enrollments at our Worldwide locations. Embry-Riddle trains more pilots than any other college in the country with nearly 40% of the market share in this area. In addition, our aerospace engineering program has been ranked number one in the country for the past 7 years for colleges without a Ph.D. program. Our students, faculty and staff live and breathe aviation.

In the United States, we have been fortunate to enjoy a vibrant air transportation system allowing us to move across the country quickly and easily. However, in recent years problems in the air transportation system, such as flight delays, bumped passengers and lost bags have been steadily increasing. This year all trends indicate that congestion may be at an all-time peak, surpassing even the delays and weather problems experienced during the summer of 2000. Almost daily, we read

newspaper accounts of passengers who were forced to sit on planes for hours at a time while waiting to take-off or deplane. I am sure it would surprise those disgruntled travelers that the cost to the country for providing air traffic management services was 2.4 billion dollars last year and weather forecasts cost taxpayers more than $500 million dollars, all to fund an increasingly congested and faulty system.

It is absolutely necessary that we act immediately and quickly to modernize our air transportation system. The skies are crowded, the quality of the traveling experience according to all evidence is declining, and the American public deserves better. At Embry-Riddle, we are currently testing several solutions that will improve safety and security, and decrease congestion in the national airspace.

One of these solutions is the ADS-B system. Embry-Riddle was one of the early pioneers in the installation and testing of ADS-B. As part of the Small Aircraft Transportation System program begun at NASA, and now as the lead member of the FAA's Center of Excellence in General Aviation Research, Embry-Riddle outfitted its entire fleet of 100 aircraft with ADS-B in 2002 and has provided data to the FAA about increases in safety resulting from this retrofit. Our students and instructors have flown with the ability to see other planes around them. On the ground, our operations center can track every single Embry-Riddle plane. We now like to tell our students, there is no such thing as flying alone – we know where you are all the time. We believe this is a good thing and we have shown that the increased situation awareness provided to pilots and operations center staff resulting from ADS-B implementation has enhanced the safety record of our training fleet. We have experienced a lower number of near mid-air incidents and incursion incidents since our ADS-B installation. With ADS-B installed on our fleet, advanced displays provide information about other so-equipped aircraft. This enhances situation awareness and allows our student pilots to pay greater attention to other planes in the airspace that may not be ADS-B equipped.

At Embry-Riddle, we are training the next generation of pilots, air traffic controllers, meteorologists, aerospace engineers and human factors specialists. We are already providing the curriculum used to teach private pilots how to fly the newest glass cockpit aircraft, equipped with advanced displays and flight management systems. The training standards we developed have been

embraced by the FAA and aircraft companies, such as Cessna, Adam, Mooney, and others. We welcome the opportunity to do the same thing for air traffic controller training.

Embry-Riddle recently has embarked on another ambitious and timely project. We have created a University-public-private partnership called the "Airport of the Future." With our private partners, Lockheed Martin, Transtech, ENSCO, Sensis, Jeppesen, and Mosaic ATM and our public partners, Volusia County, Florida and the Daytona Beach International Airport (DBIA), we have created a cutting-edge national testbed for new air modernization technologies in the 10th busiest airspace in the county at a working commercial airport. In 2006, DBIA served over 526,000 passengers through five commercial airline services with an overall load factor of 85%. In addition, the airport has heavy general aviation traffic with an average of over 200 general aviation aircraft each day performing 708 daily operations.

The "Airport of the Future" is a four-phase project developed in response to the call for air traffic and airspace modernization. Each phase will focus on a different air modernization problem. The first phase of the project examines airspace and airport safety and security, including further testing of ADS-B implementation. Phase two focuses on airport capacity and efficiency issues via testing and integration of surface management technologies. Phase three examines ramp management technologies and point-to-point technology-enhanced arrivals and departures. Phase four tests solutions for all-weather airport operations.

The partners in the "Airport of the Future" project realize that new technologies must be tested prior to implementation. Technological solutions will come from many different companies and all will need to work together to provide the level of performance needed to fix out airspace issues. At the Daytona testbed, all of our private partners have entered into an agreement. They will bring their technologies to Daytona Beach International Airport, where they will be tested and integrated with other company's technologies. Embry-Riddle will collect and analyze data from the integrated systems. We will have the ability to use the data we collect at a real airport, in real airspace situations to enter into a simulation in which human participants in the airspace system, such as controllers, dispatchers and pilots will be able to engage in decision-making activities to test the newest technological solutions to air traffic management, safety and security problems. In addition, the data we collect can be used to provide financial estimates of the cost of these new

technological solutions – estimates that are crucial to the federal government and to every taxpaying citizen in the U.S.

On March 27th and 28th, 2007, we presented to the world, the first demo of our Airport of the Future project. We had over 100 individuals from all over the globe come to hear about the project. Representatives from the FAA, NASA, and even Germany recognized the potential importance of this project to successful airspace and air traffic modernization. In a short period of time, at DBIA we will have technologies installed such as FlightWinds from Lockheed Martin, and a millimeter wave radar based perimeter intrusion detection system from Transtech. We will show that these technologies can be integrated with systems such as a virtual tower from Mosaic ATM, or linked to the GPS mapping systems of Jeppesen. While some of these technologies have been tested singly at other airports, no other project has brought together multiple partners who have agreed to work together at one location for technology testing and integration. This project is unprecedented in both scope and scale. The "Airport of the Future" should be the national testbed for all NextGen technologies. Since our first demonstration, other companies have expressed interest in joining the team. We open up our partnership to other companies and agencies who want to be part of this unique and important vision.

Embry-Riddle's motto is "Leading the World in Aviation/Aerospace Education and Research". In all Embry-Riddle does, we look to the skies and lead the way to a stronger and safer future for aviation. Through our implementation of ADS-B in our own fleet to our development of cutting-edge curriculum for pilots and air traffic controllers, and our partnership in testing and integration of NextGen technologies in the "Airport of the Future", we are leading the way to a bright future for aviation.

We are asking Congress now to partner with us to make the "Airport of the Future" the national testbed for NextGen technologies. Embry-Riddle and its partners in the project estimate the cost of the project to be $50 million dollars over the next 5 years. Our private partners are contributing half of the cost of the project, along with technical support from Embry-Riddle and a facility provided to us at DBIA. We are requesting from Congress $25 million over 5 years to assist us in creating the testbed that will provide solutions for airspace modernization in the United States.

Thank you for your time today. Mr. Chairman this concludes my testimony.

STATEMENT BY DR. MICHAEL ROMANOWSKI
VICE PRESEDENT OF CIVIL AVIATION
AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA

Hearing on the Future of Air Traffic Control Modernization

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

May 9, 2007

Aerospace Industries Association of America, Inc.
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(703) 358-1000

Chairman Costello, Representative Petri, and Members of the Aviation Subcommittee: I appreciate this opportunity to testify on the critical need to modernize our nation's air transportation system as mandated by *Vision 100*, the FAA Reauthorization Act of 2003.

A safe, secure and efficient air transportation system is essential to the economic vitality of the United States. Approximately 10 percent of the U.S. economy is directly tied to aerospace and aviation. Aviation continues to drive our nation's economic growth, and it will do so increasingly as air traffic triples over the next 20 years. Transformational improvements to our nation's air transportation infrastructure are essential to address the capacity constraints in our current system. Since that system is operating close to the point of gridlock, it is crucial that our country develop and implement the Next Generation Air Transportation System (NGATS or NextGen) under the guidelines of *Vision 100.*

This impending crisis will impair the vitality not only of commercial air travel, but also all other existing and emerging sectors of aviation: the development of fixed wing and rotary wing general aviation as well as the emerging very light jet/air taxi and unmanned aerial systems (UAS) sectors. AIA strongly believes that the federal government must undertake this challenge with a significantly higher level of urgency than it has since the President signed *Vision 100* into law.

American aviation stands at an unprecedented point in history. Rising fuel prices, Internet-generated business, foreign trade, the September 11th attacks and the need for dramatically improved security impose new demands on an air transportation system designed more than 40 years ago. A 2004 report by the FAA revealed that in the next 20 years, 20 more U.S. airports will handle at least 500,000 arrivals and departures on an annual basis. Furthermore, aviation is a critical factor in our nation's trade picture, with aircraft now carrying 27 percent of the nation's imports and exports.

Lack of capacity directly results in delays, and in the aviation sector, lost time means lost money. The bipartisan *Commission on the Future of the United States Aerospace Industry* estimated that the cost of delays to the entire economy could exceed $30 billion each year. In 1994, 81 percent of all domestic flights took off on time yet NASA reported that those delays of 15 minutes or more still cost the aviation industry $2.3 billion dollars. By 2000, the on-time rate had deceased to 72 percent. Most recently, according to an April 17th Wall Street Journal article, flight cancellations and delays increased by 67 percent during the first three months of 2007 compared to the same period last year.

Members of the Aerospace Industries Association strongly support the mission of the *Vision 100*-created Joint Planning and Development Office (JPDO), the federal inter-agency organization responsible for the implementation of NextGen, and we remain constructively engaged to make this mission a reality. AIA represents almost 300 manufacturing companies with over 635,000 high-wage, highly skilled production employees. We operate as the largest

aerospace trade association in the United States across three sectors: civil aviation, space systems, and national defense. Our member companies export 40 percent of their total output, and we routinely post the nation's largest manufacturing trade surplus, a level that approached $55 billion last year. Aerospace companies also continue to invest heavily in R&D, spending more than $50 billion over the last 15 years.

The JPDO has steadily built a consensus around its vision for NextGen. This vision was initially expressed in its first two reports to Congress in 2004 and 2005. By summer, the JPDO should complete the vision building stage when it releases more detailed Concepts of Operations (ConOps) and Enterprise Architecture documents. Timely development and execution of an effective integrated NextGen plan is critical, especially since the current draft of the ConOps identifies 167 research issues and 77 policy issues that must be resolved to implement NextGen. These issues cross the disciplines and resources of all of the JPDO partner agencies.

The Administration and Congress must ensure that the appropriate levels of responsibility, accountability and urgency exist across the agencies so that they properly manage and conduct the full range of integrated NextGen activities. From our evaluation of JPDO's process, products, and progress to date, we find that action is needed in the following areas for JPDO to achieve its aviation safety, security, environmental and transformation missions. AIA urges the Subcommittee and Congress to explore options to rectify these persistent problems.

Lack of Urgency: Preliminary estimates provided by the JPDO indicate that in lost passenger revenue alone, the cost of *not implementing* NextGen will exceed $50 billion per year by 2025. This loss, however, is just the tip of the iceberg. It does not account for the associated economic harm that not having NextGen will create for general aviation, cargo transportation, and other air services components. Nor does it include the adverse impacts, such as lost productivity, that will occur in other areas such as the overall manufacturing sector.

The situation is even more urgent, however. Although flight disruptions temporarily subsided during the decrease in air travel following 9/11, news stories such as the Wall Street Journal piece that I previously cited now remind us of the inevitable disruptions in a system that has reached its capacity. We need to be more aggressive to take advantage of capabilities that already exist in the aircraft operating in today's civil aviation fleet. Even small, incremental improvements in operational efficiency can bring tremendous aggregated benefits in overall operational costs and environmental impact due to reduced fuel burn. For example, the use of Required Navigation Performance (RNP) procedures has clearly demonstrated significant efficiency, safety, and environmental improvements. AIA believes the FAA should not only aggressively accelerate its approval of RNP procedures, but it must also accelerate its approval of RNP operational authority using operationally-driven criteria. Furthermore, fully implementing RNP highlights the importance of providing adequate resources to FAA's Aviation Safety Organization. Many new regulations, policies, and certification approvals will be required for timely NextGen implementation. Congress should ensure FAA has sufficient resources to achieve the necessary results.

The FAA has publicly stated that by 2015 the system will be unable to handle the projected volume of traffic. Given the length of time required to conduct research, validate or prototype

concepts, create new rules and procedures, certify systems, and incorporate the necessary upgrades into our nation's infrastructure and operational fleet, we – and many others – question whether our country can meet this looming crisis.

So far, the JPDO partner agencies' actions do not seem to match the urgency of the situation. It is estimated that NextGen development and implementation will require at least $1 billion more per year, including an additional $200-$300 million annually for federal research. Unfortunately, the Administration's FY08 budget request fails to make these investments. The FAA's FY08 proposal for NextGen, for example, is only 3% higher than the FY07 requested levels[1]. Of this amount, the FAA dedicates only an additional $4.8 million for their research efforts. Similarly, the proposed funding level for NASA aeronautics research remains inadequate. Last year, NASA proposed reducing its aeronautics funding by $188 million. Congress soundly rejected this approach and instead provided $166 million over the FY07 request. Nevertheless, the Administration has once again proposed NASA aeronautics research funding comparable to the FY07 proposal.[2]

Under current timelines, the NextGen R&D of the JPDO partner agencies will not achieve full alignment until FY09 at the earliest. We cannot accept this protracted timeline. For each delay, the cost of NextGen development will increase and more disruptions will occur, posing greater risks to the nation's mobility and economic competitiveness.

Authority & Accountability: The *Vision 100* legislation tasks the JPDO with "creating and carrying out an integrated plan for a Next Generation Air Transportation System." The recently released National Aeronautics R&D Policy also recognizes the importance of the JPDO. On December 20, 2006, President Bush signed the Executive Order that requires the policy's implementation. According to the explicit language of the policy, the JPDO "should be responsible for planning, coordination, and oversight of both research and implementation for the NGATS to meet the nation's civil, military, and homeland security needs." The policy also highlights the critical importance of inter-agency alignment with JPDO goals, and instructs the JPDO partner agencies to "...integrate their operational mission-specific requirements into the NGATS plan," and to align their air transportation system-related R&D efforts "with NGATS objectives to the maximum extent practicable."

Creating and implementing a national plan that depends on systematic inter-agency cooperation is a challenging task, especially since the JPDO cannot provide or direct agency resources. While many debate whether the JPDO has sufficient authority to complete its objective, it is clear that there is a lack of agency accountability. Accountability must be increased to ensure that agencies fully engage JPDO and execute as necessary to meet the Vision 100 objective. The lack of effective memoranda of understanding (MOUs) between the JPDO and its partner agencies illustrates the situation. With the onset of the implementation phase, it is even more crucial that the agencies are held accountable for all of their respective roles in NextGen:

[1] FAA's Budget in Brief provides figures for NextGen-related funding levels: Total NextGen Transformational and Contributor Programs request: FY07 $1,152 billion, FY08 $1,188 billion; RE&D Contributor Programs: FY07 $57.9 million, FY08 $62.7 million.

[2] NASA proposed $724.8 million for aeronautics for FY07. Their FY08 proposal is $554 million. However, NASA's accounting system has changed due to a new scheme to handle facilities charges. In NASA's FY08 budget submission they note that the $554 million request equates to $731.8 million under the old accounting system.

conducting the research; defining and implementing the policies, requirements, and systems acquisitions that are needed. Clear, measurable, and visible performance metrics must be defined. Both the Administration and Congress must hold the agencies accountable to these performance metrics if NextGen is to become a reality.

On a more immediate level, insufficient accountability and authority is inherent in the current JPDO operational structure. None of the agency employees assigned to the JPDO (with a few exceptions) report to the JPDO Director, nor does he have direct input into their performance reviews. This lack of accountability to the JPDO Director and his inability to directly incentivize personnel makes a tough job even harder. Both the JPDO and other appropriate agency personnel should have all performance-based compensation that they receive linked to the achievement of NextGen milestones.

From our perspective, a partial solution to the lack of agency accountability could be the broader application of an anticipated DOD plan to designate a senior-level officer as the responsible individual for all military-related NextGen programs and the Pentagon's engagement with the JPDO. This is so simple, yet so efficient and effective, that we believe it should be required of all JPDO participating agencies. Then it will be clear, both within the Administration and to Congress, who is responsible for each agency's NextGen-related performance.

Program Alignment/Integration/Management: A lack of sufficient NextGen program integration across the various JPDO agencies poses a significant risk. For this reason, the relevant agencies must make every effort to complete the alignment of their activities and resources with the JPDO planning process now. Schedules and resource requirements must be realistic and reflect the input and capabilities of both government and industry stakeholders. Robust systems integration tools must be consistently used. Clearly visible and traceable alignment of federal funding must be established for this multi-agency effort. JPDO's coordination with the Office of Management and Budget (OMB) is a significant step in this direction: identifying existing partner-agency programs and funding that align with NextGen requirements. But the current timelines fail to address immediate needs.

Dependence on OMB for program integration, however, is not a long-term solution. The JPDO's system engineering and program management capabilities must continue to be strengthened. JPDO's pending reorganization of the office, which AIA applauds, will place an increased emphasis on systems engineering. At the same time, the JPDO requires additional resources to bring its system engineering, planning, and program management capabilities up to the level required to meet the *Vision 100* objectives. While Congress authorized up to $50 million per year for the JPDO in its authorizing legislation, JPDO's budget has never approached that level. The FAA's FY08 budget proposal would contribute only $14.3 million for JPDO operations.

Enhanced Engagement with Industry: Testifying before this Subcommittee last month, the DOT Inspector General characterized the overall NextGen program as "extremely high risk" and the Government Accountability Office (GAO) echoed this view. According to their assessment, some of the chief issues that have derailed programs in the past – such as underestimating complexity, requirements creep, and inadequate stakeholder input – will likely reoccur with

NextGen. Continuing to strengthen engagement with industry will help minimize these risks and promote more effective and timely implementation. Manufacturers in particular have significant expertise to offer in complex program development, risk management, systems engineering, and integration. Not only can industry bring valuable insights and expertise to the JPDO, but it will likely pay a substantial portion (approximately half) of NextGen implementation costs. By current estimates, industry's share of NextGen development and implementation expenditures will approach the $15-$20 billion range. Therefore, it is critical that industry stakeholders have a strong voice in setting the detailed system requirements and implementation timelines.

While industry has been involved with the JPDO's Integrated Product Teams for some time, the engagement must become more robust and effective. The JPDO's evolving reorganization should strengthen industry engagement on the critical elements of JPDO planning. With this planned reorganization that is patterned after the recommendations of the DOT Inspector General and the National Research Council for greater industry coordination, JPDO should have a sharpened product-driven focus and greater clarity regarding the tasks and deliverables of its working groups. This deeper private sector partnership will allow JPDO to enhance its productivity and focus on delivering realistic system requirements and plans. Yet engagement cannot end with the initial planning phases. As implementation activities begin throughout the agencies, the need for them to continue to engage both JPDO and industry remains crucial if critical planning and execution details are to remain aligned.

Closing the R&D Gap: We must ensure that sufficient transitional R&D is conducted so that technologies are sufficiently mature when implementation decisions are made or NextGen is likely to stray off course. Perhaps the most crucial challenge facing timely and effective NextGen development and implementation is the transitional R&D gap that exists between FAA and NASA. This gap has emerged from NASA's new focus on foundational aeronautics research. Foundational technologies must be properly assessed and validated before they can be implemented in either new standards or products. However, the FAA lacks the ability and resources to conduct the transitional research needed to mature NASA's foundational technologies. As a result, no agency claims responsibility for this critical research segment. AIA raised this issue last summer in testimony before the House Science Space & Aeronautics Subcommittee and the DOT Inspector General's office amplified the same concern in its February report.

The transitional research gap need not exist and it must be closed as soon as possible. On the issue of R&D cooperation between the JPDO, FAA and NASA, three provisions of the NASA Reauthorization Act of 2005 set the stage for addressing the transitional research gap. Increased fuel efficiency and decreased noise and emissions stand as vital enhancements that are necessary to meet NextGen goals. Section 422 of the Act set targets for NASA to develop and demonstrate critical aviation technologies related to environmental performance and other areas that can impact NextGen. Sections 423 and 424 require NASA to align its airspace systems and safety research to the JPDO's Next Generation Air Transportation System Integrated Plan within one year of enactment. Furthermore, the National Aeronautics R&D Policy highlights NASA's role in transitional research for public interest research (e.g., safety, environment), high-risk technology gaps, and government internal R&D, including support of the FAA and JPDO. It also calls for NASA to align its programs to NextGen objectives "to the maximum extent

practicable." However, the full, integrated aeronautics roadmap still needs to be developed and in our view NASA has yet to meet its obligations under sections 422 - 424.

In addition to providing critical direction on aeronautics, the FY07 Continuing Resolution allocated an additional $166 million for NASA's Aeronautics Research Mission Directorate. In AIA's July 2006 Space & Aeronautics Subcommittee testimony, we recommended that any additional aeronautics research funds NASA receives above the requested amount go towards NextGen-related transitional R&D. Congress has provided the necessary funds. Now it is up to NASA, working with JPDO and FAA, to jumpstart its research execution this year and close the research gap now. Our country cannot afford to wait. One point is certain: our entire nation will reap the benefits of NextGen success. Just as certainly, our entire nation will suffer the negative consequences if it is allowed to fail.

Thank you once again, Mr. Chairman, for this opportunity to testify.

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

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Actions Needed To Reduce Risk With the Next Generation Air Transportation System

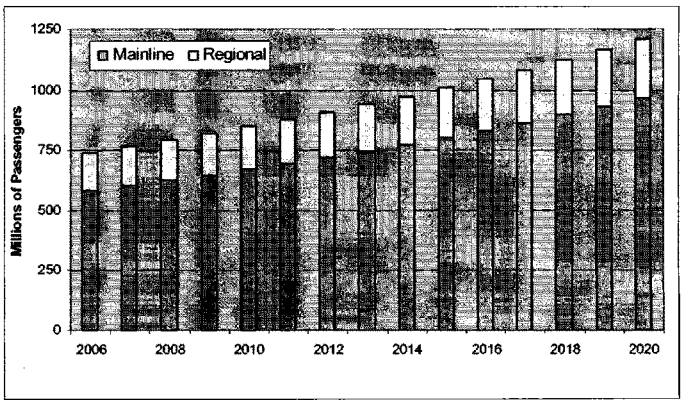
Statement of
The Honorable Calvin L. Scovel III
Inspector General
U.S. Department of Transportation

Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to testify on the Federal Aviation Administration's (FAA) efforts to develop and implement the Next Generation Air Transportation System (NextGen). FAA's Joint Planning and Development Office (JPDO) was established by law to begin advancing NextGen in the 2025 timeframe and coordinate diverse Federal research and development efforts.

As we have noted in previous reports and testimonies, there are compelling reasons for moving forward with NextGen. The current air traffic system (which operates largely on a ground-based infrastructure) has served the Nation well, but "business as usual" will not be sufficient to meet the anticipated demand for air travel or changes in the industry. Last year, U.S. airlines handled over 700 million passengers—this is forecasted to grow to over 1 billion by 2015 as illustrated in figure 1.

Figure 1. U.S. Commercial Air Carriers System Enplanements Fiscal Years 2006-2020



Source: FAA Forecast 2007-2020

With respect to delays, operational performance of the National Airspace System (NAS) slipped slightly in 2006 with one in four flights arriving late. This is the worst level since 2000 when aviation gridlock dominated the aviation agenda. We note that the average length of flight delays has increased from 51 minutes in 2000 to 53 minutes in 2006. Also, recent weather incidents that resulted in long, on-board delays have made the state of customer service a "front-and-center" issue once again; this was the subject of a hearing before this Subcommittee last month. It will be important for FAA and the JPDO to define solutions much sooner than 2025.

A driving force of FAA's reauthorization proposal is the financing of NextGen development. Much of the debate thus far has focused on the pros and cons of various financing mechanisms, such as user fees. This is understandable given the scope of the changes proposed by FAA. Nevertheless, FAA needs to focus greater attention on NextGen with respect to what capabilities will be delivered, when they will be delivered, and how the overall effort will be managed.

While there is considerable controversy about how best to finance FAA, there is general agreement on the need to modernize the NAS. FAA and the JPDO have established much needed goals to enhance capacity, reduce operating costs, and boost productivity. However, a multi-agency approach will be essential because FAA conducts very little long-term air traffic management research.

Our recent work shows that the development of and transition to NextGen are extraordinarily complex, high-risk efforts that will involve billion-dollar investments by both the Government and airspace users. Much work remains to establish requirements and align agency budgets to make the JPDO a truly effective multi-agency vehicle as set out by Vision 100.[1] Moreover, FAA is at a crossroads with respect to modernization; there are a wide range of actions that it must take to reduce risk and position the Agency to successfully deliver new capabilities.

As requested by this Subcommittee, my statement today will focus on:

- FAA's progress and problems with ongoing modernization projects—this is important because existing projects form the basic platforms for NextGen initiatives.
- JPDO's progress to date in coordinating and aligning agency budgets and plans for NextGen—much work remains to achieve this and truly make the JPDO a multi-agency effort.
- FAA actions needed to help the JPDO shift from planning to implementation and reduce risk with NextGen—a complex, multibillion-dollar effort.

FAA's Progress and Problems With Ongoing Modernization Projects

Since the 1980s, FAA has spent $46 billion on various capital programs, including radars, air-to-ground communication systems, and facilities. A clear understanding of the status of existing programs is important because the transition to NextGen will build upon these programs.

For fiscal year (FY) 2008, FAA is requesting $2.46 billion in capital funds, the majority of which ($2.3 billion) is for Air Traffic Organization (ATO) efforts to

[1] Vision 100 – Century of Aviation Reauthorization Act, Pub. L. No. 108-176 (2003).

modernize the NAS. Since FY 2005, capital funding requests have leveled off, falling within the range of $2.4 billion to $2.5 billion, well below the levels authorized in the Vision 100 Act.

Over the last several years, increasing operating costs have crowded out funds for the capital account. Another trend has been FAA's decision to cancel, defer, and segment acquisitions while the capital budget stayed essentially flat. Further, only about 50 percent of FAA's capital budget goes to air traffic systems; the remainder goes to personnel, mission support, and facilities (i.e., sustainment). Although a large portion of FAA's capital funds will go toward sustainment, FAA is requesting funds for key technologies for NextGen. These include the following:

- **Automatic Dependent Surveillance-Broadcast (ADS-B)**[2] is a satellite-based technology that allows aircraft to broadcast their position to others. FAA requested $80 million in FY 2007 for this satellite-based technology. For FY 2008, it is requesting $85.7 million. FAA expects to award a contract for the installation and maintenance of the ADS-B ground infrastructure in 2007. However, a number of challenges must be addressed. These include conducting human factors work and determining how air and ground elements will be certified as safe. FAA may have to rely on a rulemaking initiative to help speed ADS-B airspace user equipage. The current cost estimate for ADS-B is approximately $1.2 billion, and FAA is planning to re-baseline the ADS-B costs this summer.

- **System Wide Information Management (SWIM)** is a new information architecture that will allow airspace users to securely and seamlessly access a wide range of information on the status of the National Airspace System and weather conditions. It is analogous to an internet system for all airspace users. FAA requested $24 million for this program in FY 2007. For FY 2008, it is requesting $21.3 million. The cost to fully implement SWIM is unknown, and we note that SWIM is scheduled to be reviewed by FAA's Joint Resources Council this June.

In FAA's FY 2008 budget submission, the Agency is requesting funds for new NextGen initiatives, such as NextGen Data Communication ($7.4 million), NextGen Network Enabled Weather ($7 million), and a new NAS Voice Switch ($3 million). FAA is also requesting $50 million for demonstration and infrastructure projects.

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[2] The first phase of ADS-B implementation, known as *ADS-B out*, is expected to replace many ground radars that currently provide aircraft surveillance with less costly ground-based transceivers. Aircraft would be equipped with ADS-B out, which broadcasts a signal to these transceivers. However, implementing ADS-B out is just the first step to achieving the larger benefits of ADS-B, which would be provided by *ADS-B in*. ADS-B in would allow aircraft to receive signals from ground-based transceivers or directly from other aircraft equipped with ADS-B. This could allow pilots to "see" nearby traffic and, consequently, transition some responsibility for maintaining safe separation from the air traffic controllers to the cockpit.

FAA Needs To Keep Its Major Acquisitions on Track

At the request of this Subcommittee, we are updating our work on FAA's progress and problems with its major acquisitions and its efforts to move toward NextGen. We are tracking 18 programs with a combined acquisition cost of $17 billion. Our analysis shows that several programs (with combined capital costs of $6 billion) will require significant attention and oversight because of their size, diminishing benefits, potential cost and schedule problems, or importance to the NextGen transition.

En Route Automation Modernization (ERAM): This program is intended to replace the "Host" computer network—the central nervous system for facilities that manage high-altitude traffic. FAA requested $375.7 million for ERAM in FY 2007. For FY 2008, it is requesting $368.8 million. The first ERAM system is scheduled to be fielded by December 2009. While providing some enhancements, ERAM is essentially a one-for-one replacement for the existing "Host" computer system. As currently structured, ERAM will have two follow-on software releases (releases 2 and 3) valued at $83 million; these are still undefined. ERAM is expected to provide the basic platform for NextGen's automated capabilities.

With an acquisition cost of $2.1 billion and a monthly expenditure or "burn rate" of $31 million, this program continues to be one of the most expensive and complex acquisitions in FAA's modernization portfolio. While currently on track, considerable testing and integration work lies ahead. The next major milestone is completion of Factory Acceptance Testing,[3] which is planned for June 2007. Any ERAM cost increases or schedule slips will impact other capital programs and could directly affect the pace of the overall transition to NextGen.

Federal Aviation Administration Telecommunications Infrastructure (FTI): The FTI program is to replace seven FAA-owned and -leased telecommunications networks with a single network that will provide FAA with telecommunications services through 2017. FAA expects that FTI will significantly reduce its operating costs after the new network is completed. In FY 2007, FAA requested $28 million for the FTI program. For FY 2008, it is requesting $8.5 million. The vast majority of FTI, however, is funded out of the Operations Account as opposed to the Facilities and Equipment Account, which funds most acquisitions. For FY 2008, FAA estimates it will need $210 million to support FTI operations. Additionally, FAA is planning to request another $91 million to maintain legacy network operations until the FTI transition is complete.

[3] Factory Acceptance Testing is defined by FAA as formal testing conducted by the contractor to verify that the production item conforms to all contract specifications, is free from manufacturing defects, and meets all system requirements.

In April 2006, we reported[4] that FTI was a high-risk and schedule-driven effort that was unlikely to meet its December 2007 completion date. We found that FAA needed to improve management controls over FTI by developing a realistic master schedule and an effective transition plan. Since our report, the Agency has extended the FTI completion date to December 2008; this represents a 1-year schedule delay. In May 2006, we began a follow-up review of FTI. To its credit, FAA is making significant progress in delivering FTI services. As of March 31, 2007, 10,973 of about 21,820 services were operating on FTI.

As a result of the delay, FAA's Joint Resources Council approved a new cost baseline for FTI in August 2006. FAA increased its acquisition costs to develop the FTI network by an additional $8.6 million (from $310.2 to $318.8 million) and increased its overall operations costs to support FTI and legacy networks by about $100 million (from $3.0 to $3.1 billion).

We also continue to see an erosion of expected FTI cost savings. For example, in October 2005, the Program Office reported a reduction in the benefit estimate from $820 million to $672 million. By the end of FY 2006, we estimate that FTI cost savings decreased from $672 million to $442 million, including sunk costs. Moreover, since FAA has not yet validated the FTI cost and benefits estimates that were approved in August 2006—an action that we recommended and that FAA agreed to take—the true FTI costs and benefits remain unknown.

FAA continues to face challenges in making the transition to FTI. For instance, FAA currently has a large backlog of FTI services (averaging about 1,800 services over the last 3 months) that need to be addressed. The backlog includes transition failures, on-hold services, misconfigured [sic] equipment, and obsolete services. Additionally, transitioning digital services, such as critical radar and flight data, to FTI continues to be problematic. Some digital services were placed on "national hold" while engineering solutions could be developed.

In addition, FAA needs to ensure that it has an effective strategy to address FTI reliability and customer service problems. For example, many FTI services are not meeting reliability standards and are not being restored to service within contractual timeframes after outages. These problems led to unscheduled outages of both primary and back-up services, which led to flight delays. For example, on January 9, 2007, the Salt Lake City en route center experienced a 3-hour outage that caused 90 departure delays due to an FTI maintenance contractor trying to upgrade operational FTI equipment.

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[4] OIG Report Number AV-2006-047, "FAA Telecommunications Infrastructure Program: FAA Needs To Take Steps To Improve Management Controls and Reduce Schedule Risks," April 27, 2006. OIG reports and testimonies can be found on our website: www.oig.dot.gov.

Overall, key watch items for FTI include addressing the backlog of services, improving FTI reliability and customer service, stopping the erosion of expected cost benefits, and validating costs. Recently, FAA has completed negotiations with Verizon Business to extend LINCS[5] (FAA's largest and costliest existing network to be replaced by FTI), which expired in April 2007. FAA has agreed to a $92 million ceiling price to extend LINCS until April 2008. We will be reporting on the FTI program later in the year.

Airport Surface Detection Equipment-Model X (ASDE-X): ASDE-X is an important safety initiative planned to reduce the risks of accidents on runways. In FY 2007, FAA requested $63.6 million for the ASDE-X program. For FY 2008, it is requesting $37.9 million.

ASDE-X is FAA's latest effort designed to provide controllers with positive identification of aircraft and vehicle positions on the airport surface. It is planned to improve airport safety by operating in all-weather and low-visibility conditions (e.g., fog, rain, and snow) when controllers cannot see surface movement on ramps, runways, and taxiways.

ASDE-X was initially designed to provide a low-cost alternative to FAA's ASDE-3 radar systems for small- to medium-sized airports but has evolved into a different program. FAA made a significant change to the scope of the program in September 2005 and now intends to upgrade ASDE-3 systems with ASDE-X capabilities at 25 large airports and install the system at 10 other airports that currently lack any surface surveillance technology. In September 2005, FAA increased ASDE-X costs from $505.2 million to $549.8 million and extended the completion date from 2007 to 2011.

We are concerned about further cost increases and schedule delays with this important program since the cost to acquire and install some ASDE-X activities has increased by $94 million since the 2005 re-baseline. To stay within the revised baseline, FAA offset this cost by decreasing planned expenditures for seven other program activities, such as construction for later deployment sites.

We are also concerned that the ASDE-X schedule is not realistic. As of March 2007, FAA had commissioned only 8 of the 35 ASDE-X sites. Of the seven sites planned for FY 2006, FAA only commissioned four. Further, it is uncertain when key safety features will be delivered. For example, FAA has yet to commission an ASDE-X system that can alert controllers of potential collisions on intersecting runways or converging taxiways. Because of these issues, the program is at risk of not meeting

[5] In March 2007, about 43 percent of LINCS A-nodes had been decommissioned.

its current cost and schedule plans to deliver all 35 ASDE-X systems by 2011. We are reviewing ASDE-X and will issue a report later this year.

Air Traffic Management (ATM): ATM includes the Traffic Flow Management–Modernization (TFM-M) program and the Collaborative Air Traffic Management Technologies (CATMT) program. TFM-M modernizes the TFM system, which is the Nation's single source for capturing and disseminating air traffic information to reduce delays and make maximum use of system capacity. CATMT provides new decision support tools to deliver additional user benefits and increase effective NAS capacity. At a cost of $450 million, these are two key efforts for coordinating air traffic across the NAS and managing the adverse impacts of bad weather. In FY 2007, FAA requested $79 million for ATM programs. For FY 2008, it is requesting $91 million.

Although the TFM-M effort has not experienced cost increases or schedule delays, we are concerned about risks and what will ultimately be delivered. Our concerns are based on the fact that FAA and the contractor significantly underestimated the size and complexity of TFM-M software development. FAA was pursuing TFM-M through a cost-reimbursable agreement, meaning that all risk for cost growth rested with the Government. FAA has modified the contract and adjusted the scope of work. The current risks for TFM-M focus on developing complex software, integrating TFM-M with other NAS systems, and stabilizing requirements.

Terminal Modernization and Replacement of Aging Controller Displays: FAA's FY 2008 budget request calls for $40 million for efforts aimed at modernizing controller displays and related automation systems at terminal facilities. FAA's budget states that three-fourths of the FY 2008 funds will be used for the Standard Terminal Automation Replacement System (STARS) "technology refresh" (i.e., replacing obsolete components) and software enhancements.

FAA's past modernization efforts have focused exclusively on STARS. In 2004, faced with cost growth in excess of $2 billion for STARS, FAA rethought its terminal modernization approach and shifted to a phased process. FAA committed STARS to just 50 sites at an estimated cost of $1.46 billion as opposed to the original plan to deploy STARS at 172 sites at a cost of $940 million.[6] FAA renamed this modernization effort the Terminal Automation Modernization-Replacement (TAMR) initiative.

In 2005, FAA approved modernizing five additional small sites with STARS and replacing the aging displays at four large, complex facilities at a cost of $57 million. This leaves over 100 sites that still need to be modernized. Although FAA has not

[6] OIG Report Number AV-2005-016, "Terminal Modernization: FAA Needs To Address Its Small, Medium, and Large Sites Based on Cost, Time, and Capability," November 23, 2004.

decided how it will modernize these 100 sites, its budget submission indicates that this effort could cost over $1 billion.

There is no current defined "end state" for terminal modernization, and past problems with developing and deploying STARS leave FAA in a difficult position to begin transitioning to NextGen capabilities. Future costs will be shaped by (1) NextGen requirements, (2) the extent of FAA's terminal facilities consolidation, and (3) the need to replace or sustain existing (or legacy) systems that have not yet been modernized.

Without question, the most urgent concern facing terminal modernization is how quickly FAA can replace aging displays at the four large sites that are particularly critical to the NAS—Chicago, Illinois; Denver, Colorado; St. Louis, Missouri; and Minneapolis, Minnesota. FAA chose not to compete this work based on a joint proposal from two contractors and instead decided to modify the current STARS contract to include the work. Although this was expected to expedite replacement of the aging displays, the time spent revising the contract to establish cost, schedule, and design parameters caused FAA to lose the time advantage from foregoing competition. As a result, the aging displays will not be replaced until 2008. We recommended action on this matter over 2 years ago in November 2004.

Advanced Technology and Oceanic Procedures (ATOP): FAA requested $31.4 million in FY 2007. For FY 2008, it is requesting $53.1 million. ATOP is FAA's $548 million effort to modernize how controllers manage oceanic flights. FAA now has ATOP in use at Oakland, California; New York, New York; and Anchorage, Alaska.

Since September 2005, FAA controllers have experienced recurring failures (loss of data-link communication with aircraft and aircraft position jumps) with the new ATOP system at the Oakland site. These problems directly limit the potential capacity and productivity benefits from the new automation system. This could impact FAA's plans for using ATOP to demonstrate NextGen capabilities.

According to controllers, these incidents represent potentially hazardous safety conditions that need to be resolved. The larger separation distances required between aircraft over the oceans than for those in domestic airspace have allowed controllers to manage these problems. However, benefits from the new automation system, such as reduced separation, have not been fully realized. Problems persist in ATOP as evidenced by two operations bulletins (on aircraft altitude changes and detecting conflicts between aircraft) issued by the Oakland facility in April. FAA needs to resolve the problems that it has identified with communication service providers and aircraft avionics and adjust ATOP software as needed to realize expected benefits.

Perspectives on FAA's Metrics for Measuring Progress With Major Acquisitions

FAA reports in its FY 2007 Flight Plan and the most recent Performance and Accountability Report that 100 percent of its critical acquisitions were within 10 percent of budget estimates and 97 percent were on schedule for 2006. FAA is currently tracking about 29 acquisitions, such as the acquisition of new radars.

FAA's cost and schedule metrics are worthwhile tools for Agency management and oversight of major acquisitions—a step we called for a number of years ago. However, these metrics have limitations that need to be understood by decision makers in order to properly assess the overall status of FAA's acquisition portfolio.

First, FAA's cost and schedule metrics are *snapshots* in time. They are not designed to address changes in requirements, reductions in procured units, or shortfalls in performance that occur over time. Second, FAA's budget metrics involve comparisons of cost estimates taken during the fiscal year. These estimates involve the updated, "re-baselined" cost figures—not estimates from the original baseline. This explains why the Wide Area Augmentation System (a satellite-based navigation system) is considered "on budget" even though costs have grown from $892 million to over $3 billion since 1998.

"Re-baselining" a project is important to get realistic cost and schedule parameters and is consistent with Office of Management and Budget (OMB) guidance and the Agency's own Acquisition Management System. The revised baselines are used for justifying budgets and making investment decisions, i.e., ensuring that major acquisitions are still cost beneficial. We note that OMB allows FAA to measure deviations from the new baselines once they have been approved. Nevertheless, such comparisons of revised program baselines—absent additional information—fail to provide an accurate picture of a program's true cost parameters.

Finally, FAA's schedule metrics used for assessing progress with several programs in 2006 were generally reasonable but focused on interim steps or the completion of tasks instead of whether systems met operational performance goals. For example, ASDE-X metrics focused on delivery of two systems. This metric does not relate to whether systems entered service or met operational performance expectations. We note that there are no written criteria for selecting or reporting the milestones. The table below provides information on some of the metrics used for measuring progress with acquisitions in FY 2006.

Table. Metrics Used To Measure Programs in 2006

Program	Metric	Planned Date	Actual Date
Airport Surface Detection Equipment Model-X	Deliver two systems	Feb. 2006	Feb. 2006
Standard Terminal Automation Replacement System	Deliver to one site	Feb. 2006	Jan. 2006
Air Traffic Management	Conduct detailed design review	August 2006	March 2006
Precision Runway Monitor	Complete factory acceptance testing for Atlanta	April 2006	April 2006
Wide Area Augmentation System	Complete initial installation of two reference stations	September 2006	May 2006

Source: FAA ATO-F Capital Expenditures Program Office

As FAA's former chief operating officer stated, measuring cost and schedule may not be sufficient in evaluating NextGen initiatives. We agree and believe it will be important to focus on the promised capability and benefits of new initiatives, particularly those associated with the goals of enhancing capacity, boosting productivity, and reducing Agency operating costs. Therefore, FAA should explore a wider range of metrics to measure—and report on—progress with NextGen efforts.

JPDO's Progress to Date in Coordinating and Aligning Research—Much Work Remains To Truly Make the JPDO a Multi-Agency Effort

FAA's JPDO was specifically mandated by Congress in the Vision 100 Act to develop a vision for NextGen and coordinate diverse agency research efforts. The office was established within FAA to coordinate research efforts underway at the National Aeronautics and Space Administration (NASA), Department of Commerce, Department of Defense (DOD), and Department of Homeland Security (DHS). The JPDO's mission is critical because FAA conducts very little long-term air traffic management research. FAA requested $18 million in FY 2007 for the JPDO. For FY 2008, it is requesting $14 million.[7]

The majority of the JPDO's work is done through eight integrated product teams (IPT) that focus on specific strategies, such as how to use weather information to improve the performance of the National Airspace System. The teams are composed of personnel from FAA, other Federal agencies, and the private sector.

[7] The JPDO is funded through FAA's Research, Engineering, and Development account. In FY 2008, JPDO officials expect to also rely on $3.5 million from the capital account for risk reduction activities.

In our February 2007 report,[8] we found that much remains to be done for the JPDO to truly become a multi-agency organization as set out in Vision 100. Specifically, we found that there was considerable coordination among JPDO participating agencies but little or no alignment of research and development plans—this is still the case today. Further, individual IPT leaders had no authority to commit their parent agencies' resources, and we concluded that a more product-driven approach would be a step forward.

The JPDO has announced a number of changes, including the formation of a council to examine regulatory issues. We also understand that the JPDO will refocus the IPTs as "working groups." The most notable changes are the dissolution of the Agile Air Traffic System IPT and the establishment of two new working groups for aircraft and air navigation services. The IPT restructuring plan has been approved by FAA management but is still in the process of being implemented. Therefore, we have no opinion on whether the changes will have the desired affect of shifting JPDO planned efforts toward implementation.

Progress in Developing Mechanisms for Alignment

It is still not clear to what extent FAA can leverage the wide range of research and development being conducted at other Federal agencies to help reduce NextGen costs. The JPDO is developing an inventory of other Federal agencies' research, and its preliminary analysis suggests that about $300 million in FY 2008 research dollars could benefit NextGen. We note that the JPDO's research inventory is still a work in progress. JPDO is planning to have a more detailed assessment for the FY 2009 budget cycle.

To help decision makers address whether FAA is leveraging the right research, we recommended that the JPDO include information on specific research projects it is leveraging in progress reports to Congress and how that research supports NextGen. FAA concurred with our recommendation.

Central to the JPDO mission—and to making it an effective multi-agency vehicle—is the alignment of agency resources. This is a complex task, and the law provides no authority for the JPDO to redirect agency resources. To its credit, the JPDO has released a concept of operations for NextGen, but considerable work remains to effectively align Federal research dollars for NextGen. There are four key efforts in process for aligning agency resources.

- **NextGen Enterprise Architecture:** The JPDO's efforts to develop an enterprise architecture (or overall blueprint for the next generation system) will help in setting goals, supporting decisions, adjusting plans, and tracking agency

[8] OIG Report Number AV-2007-031, "Joint Planning and Development Office: Actions Needed To Reduce Risks With the Next Generation Air Transportation System," February 12, 2007.

commitments. It will also show requirements from FAA, DOD, and DHS and where various agency efforts fit in NextGen. Moreover, it will help resolve difficult policy decisions in the future, such as which agencies pay for what. However, considerable work remains to link current systems with future capabilities and develop technical requirements, particularly for new automation concepts. The architecture documents we have reviewed to date are essentially templates that lack sufficient detail to support capital investment decisions. The JPDO expects to complete another version this month.

- **NextGen R&D Plan:** The JPDO does not yet have a Research and Development (R&D) plan that can guide various agency research efforts over the next several years. This is important because the JPDO concept of operations has identified over 70 research or policy question areas that need attention. Coordinated and integrated research planning will be a critical element in the development of NextGen, and it is difficult to fathom how the JPDO has functioned without an R&D plan thus far. The JPDO is in the process of developing an R&D plan that will document NextGen research needs and the organizations that will perform the work and expects to publish this plan in August.

- **NextGen Memorandum of Understanding (MOU) for JPDO efforts:** For more than a year, the JPDO has been working to reach agreement on an MOU with the participating agencies. The MOU will not guarantee coordination and alignment but can be helpful in setting expectations, roles, and responsibilities. To date, this agreement has not been signed by all participating agencies. According to JPDO officials, DHS and DOD have not yet signed but are expected to do so soon.

- **NextGen Integrated Budget document:** The JPDO is developing an integrated budget document that provides a single business case in a document similar, but not identical, to the Office of Management and Budget "Exhibit 300." As we noted last year, this will help ensure that various agency efforts are indeed aligned. The JPDO has been working with OMB and is targeting to submit an OMB Exhibit 300 by September 2007, which will be in time for the FY 2009 budget submission.

The Role of NASA

A key, short-term cost driver for NextGen is the role that NASA will play. Historically, FAA's R&D efforts have focused on short-term research, with NASA conducting the majority of long-term air traffic management research, including automated controller tools and human factors work. NASA requested $529 million in FY 2007 for aeronautical R&D and is requesting $554 million for FY 2008.[9] Not all

[9] NASA has changed the way it reports and presents its budget. This makes doing year-to-year comparisons difficult. The numbers presented in our testimony are from NASA's FY 2008 budget request and represent NASA's full-cost simplification method, which reallocates overhead costs.

of NASA's Aeronautics budget is directly linked to NextGen. Of particular interest to NextGen automation efforts is NASA's investment in "airspace systems," which is funded at about $100 million annually. The JPDO is looking to NASA to develop automated aircraft metering and sequencing and dynamic airspace reconfiguration—key elements of NextGen.

NASA is planning to spend less on aeronautical research than it has in the past and is restructuring its aeronautical research portfolio. In discussing progress with the JPDO, NASA's Associate Administrator for Aeronautics told us that NASA no longer plans to develop prototypes and that research would be restricted to "fundamental research"[10] and proof of concept experiments. This is in sharp contrast to the support it gave FAA with the Free Flight Phase 1 program (a previous modernization effort that introduced, among other things, new automated controller tools at select locations).

FAA's Research, Engineering, and Development Advisory Committee (REDAC)[11] has raised concerns about NASA's efforts to restructure its aeronautics program and its potential impact on NextGen.[12] The REDAC is concerned that changes to NASA's aeronautical research efforts will place uncertainty on the ability of NASA to deliver development efforts at the same level of technological maturity that it has in the past. As a result, FAA would have to assume a larger burden and the associated costs to complete development and bring new systems to fruition. To accommodate changes in NASA investments and to address this gap, the REDAC estimated that approximately $100 million would be needed annually.

As we noted in our February 2007 report, it will be important for FAA and NASA to come to a clear understanding of the level of technical maturity that NASA projects will have. This has cost and schedule implications for NextGen, particularly new automated systems for controllers. If NASA is unable to provide projects at a level that FAA can transition to prototypes, the JPDO and FAA will have to determine how this R&D will be completed, managed, and paid for.

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[10] NASA officials define "fundamental research" as continued long-term, scientific study in areas such as physics, chemistry, materials, experimental techniques, and computational techniques that lead to a furthering of understanding of underlying principles that form the foundation of the core aeronautics disciplines as well as research that integrates the knowledge gained in these core areas to significantly enhance capabilities, tools, and technologies at the disciplinary (e.g., aerodynamics, combustion, and trajectory prediction uncertainty) and multidisciplinary (e.g., airframe design, engine design, and airspace modeling and simulation) levels.

[11] FAA's Research, Engineering and Development Advisory Committee, established in 1989, advises the Administrator on research and development issues and coordinates the FAA's research activities with industry and other Government agencies.

[12] Federal Aviation Administration Research, Engineering, and Development Advisory Committee draft report, "Financing the Next Generation Air Transportation System," August 22, 2005.

The Role of the Department of Defense

An active role by DOD in the development of NextGen would be beneficial because it is both a provider and a consumer of air traffic services and has national security missions that require it to utilize the NAS. As we noted in previous reports and testimonies, DOD's experiences and lessons learned in sharing data (from air and ground systems) in actual operations will prove invaluable in reducing cost and technical risk with NextGen.

To date, DOD has participated in several IPTs, most notably the Weather IPT, and it had a leadership role in the Shared Situational Awareness IPT, which was coordinating work on a net-centric system to share data. However, the position of the Director of Shared Situational Awareness IPT—a DOD official—has been vacant since June 2006. This has limited DOD's influence and presence at the JPDO strategic planning level.

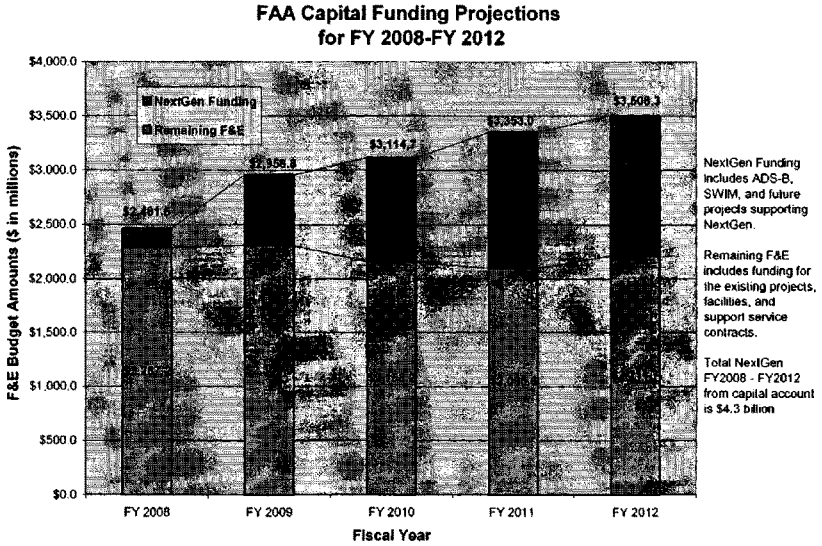
We understand that DOD is planning to designate the Secretary of the Air Force as the Department's executive agent for NextGen. There is also discussion about establishing an office within the Air Force (under the Electronics Systems Center at Hanscomb Air Force Base) to specifically interface with JPDO. This would enable the JPDO and DOD to approach NextGen in a more coordinated way—something that has been missing. It would also establish formal lines of funding for DOD's engagement in NextGen efforts and facilitate technology transfer. These plans need to be finalized; if implemented, they will help the JPDO become a more effective, multi-agency effort.

FAA Actions Needed To Help the JPDO Shift From Planning to Implementation and Reduce Risk With NextGen

The transition to NextGen is an extraordinarily complex, high-risk effort involving billion-dollar investments by the Government and airspace users. We have made a series of recommendations specifically aimed at reducing risk and facilitating the shift from planning to implementation.

FAA needs to develop realistic NextGen cost estimates, quantify expected benefits, and establish a road map for industry to follow. A central question in the current debate on financing FAA is what the costs associated with developing and implementing NextGen will be. Figure 2 illustrates FAA's most recent cost estimates.

Figure 2. FAA Capital Funding Projections for FY 2008 to FY 2012



Source: FAA National Airspace System Capital Investment Plan FY 2008 – FY 2012

FAA estimates suggest that the Agency will require $15.4 billion for capital projects from FY 2008 to FY 2012. This includes $4.6 billion for NextGen initiatives ($4.3 billion from the capital account and $300 million from the Research, Engineering, and Development [RE&D] account).

We note that the bulk of NextGen funds will be allocated to *developmental efforts*, including demonstration projects. There are unknowns with respect to performance requirements for new automation systems and data-link communications. The development of new automation systems is a particular concern given their complexity and the fact that almost flawless performance will be required. FAA will not have a firm grasp on costs until it has a mature enterprise architecture and a NextGen R&D plan that clearly indicates the contributions of other agencies.

The costs for airspace users to equip with new avionics will be significant. The JPDO's most recent progress report estimates the cost for airspace users to be between $14 billion and $20 billion for the long term. This underscores the need for FAA to have a clear understanding of complex transition issues and what will be required to get expected benefits.

Another cost driver focuses on the extent to which FAA intends to consolidate facilities based on modern technology. We recommended that when FAA reports

NextGen costs to Congress, it should do so along three vectors—research and development needed, adjustments to existing projects, and costs for new initiatives. FAA agreed and stated that it will build a comprehensive cost estimate this year.

More work remains to set expectations, requirements, and milestones—or *"transition benchmarks"*—for developing when new procedures, new ground systems, and aircraft need to be equipped to realize benefits. During an April 2006 workshop, industry participants asked FAA for a "service roadmap" that (1) specifies required aircraft equipage in specific time increments, (2) bundles capabilities with clearly defined benefits and needed investments, and (3) uses a 4- to 5-year equipage cycle that is coordinated with aircraft maintenance schedules. Once concepts and plans have matured, it will be important for FAA to provide this information to industry.

FAA and the JPDO need to develop approaches for risk mitigation and systems integration. FAA and the JPDO must articulate how they will do things differently to avoid problems that affected modernization efforts in the past (such as cost growth, schedule slips, and performance shortfalls). Developing and implementing NextGen will be an enormously complex undertaking. As the JPDO notes in its December 2004 Integrated Plan,[13] "there has never been a transformation effort similar to this one with as many stakeholders and as broad in scope." The central issue focuses on what will be done differently from past modernization efforts with NextGen initiatives (other than conducting demonstration projects) to ensure success and deliver much needed benefits to FAA and airspace users.

FAA's decision to use the Operational Evolution Plan (the Agency's blueprint for capacity) to help implement NextGen is a good first step. Nevertheless, the transition to NextGen will pose complex software development and integration problems and require synchronized investments between FAA and airspace users over a number of years.

To maintain support for NextGen initiatives, we recommended that the JPDO and FAA articulate how problems that affected past modernization efforts will be mitigated and what specific skill sets with respect to software development and system integration will be required. This will help reduce cost and schedule problems with NextGen initiatives. FAA concurred with our recommendation and stated that it will form a panel of experts to examine the issues we raised.

FAA is requesting $50 million in its FY 2008 budget for demonstration projects, which are important opportunities to reduce risk. In the past, FAA has experienced problems with certifying systems as safe, which led to cost growth and schedule slips. Therefore, we recommended, and FAA agreed, that planned NextGen demonstration

[13] JPDO "Next Generation Air Transportation System – Integrated Plan," December 2004.

projects develop sufficient data to establish a path for certifying new systems and identify the full range of adjustments to policies and procedures needed for success.

FAA needs to review ongoing modernization projects and make necessary cost, schedule, and performance adjustments. As FAA's budget request points out, approximately 30 existing capital programs serve as "platforms" for NextGen. We recommended that FAA review ongoing modernization programs to determine what adjustments in cost, schedule, and performance will be required. This is critical because NextGen planning documents suggest that billions of dollars will be needed to adjust ongoing programs, like ERAM and TFM-M.

During FY 2007 through FY 2008, over 25 critical decisions must be made about ongoing programs. These decisions will directly impact how quickly new capabilities can be deployed and will involve establishing requirements for future ERAM software releases, making investments to support existing radars, and incorporating weather information into SWIM.

FAA needs to develop a strategy for technology transfer. Technology transfer—the movement of technology from one organization to another—is a central issue for the JPDO because the law requires that new capabilities developed by other Federal agencies (or the private sector) be transitioned into the NAS. The JPDO will have to pay greater attention to this matter as it moves forward to reduce development times with NextGen initiatives.

Our past work shows that FAA has experienced mixed results in transitioning systems developed by others into the NAS. For example, FAA ultimately abandoned work on a promising new controller tool developed by NASA (the Passive Final Approach and Spacing Tool) for sequencing and assigning runways to aircraft because of complex software development (including site-specific customization) and cost issues and because the benefits were unlikely transferable to other airports.

As we noted in our review of FAA's Free Flight Phase 1 Program,[14] the use of "technology readiness levels"[15] could be useful to help assess the maturity of systems and ease issues associated with technology transfers. Stated simply, these are the problems associated with efficiently transitioning a new technology from concept to viable product in the shortest possible time and at the least cost. JPDO progress reports and planning documents we have reviewed do not use technology readiness levels. We recommended that the JPDO use technology readiness levels in assessing the maturity of research conducted in other agencies.

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[14] OIG Report Number AV-2002-067, "Free Flight Phase 1 Technologies: Progress to Date and Future Challenges," December 14, 2001.

[15] Technology Readiness Levels – DOD and NASA use a nine-point scale to differentiate the maturity of technologies Level 1 (Basic Principles Observed and Reported) to Level 9 (Actual System, Proven Through Successful Mission Operations).

Both NASA and DOD have experience with categorizing technology maturity, which could help reduce cost, schedule, and technical risks with implementing JPDO initiatives. FAA partially concurred with our recommendation to use technology readiness levels but pointed out that efficient transition of new technologies will also require close cooperation between researchers and users of existing systems. We agree overall technology transfer efforts could be buttressed by the establishment of "transition" or "maturation" teams to create a developmental pipeline for new systems.

FAA needs to conduct sufficient human factors research to support anticipated NextGen changes. The JPDO is planning to make fundamental changes in how the NAS operates and how controllers manage traffic to accommodate three times more aircraft in the system. Additionally, changes must address cultural issues within FAA that could potentially inhibit the implementation of NextGen; this will require doing business differently than the way it is done now.

History has shown that insufficient attention to human factors can increase the cost of acquisition and delay much needed benefits. For example, problems in the late 1990s with FAA's Standard Terminal Automation Replacement System were directly traceable to not involving users early enough in the process.

The need for focused human factors research extends well beyond the traditional, computer-machine interface (such as new controller displays) and has important workforce and safety implications. For example, FAA expects the controller's role to change from direct, tactical control of aircraft to one of overall traffic management. There also will be significant human factors concerns for pilots as they will be expected to rely more on data-link communications.

A key issue for human factors research is what can reasonably be expected of new automation systems and cockpit displays. In its concept of operations for NextGen, FAA identified the following issues that will require additional human factors work:

- How will increased automation and new technologies affect flight crew workload?
- What effect do the changing roles and responsibilities have on safety?
- What alerts and information displays does a pilot need to safely oversee conflict detection and resolution when no one on the ground is responsible for tactical separation?
- If automation fails, what is the back-up plan in terms of people, procedures, and automation?

To address these important questions, FAA will have to prioritize its ongoing human factors work and ensure that it is targeted to address critical issues affecting controllers and pilots. This will also require close cooperation with NASA, which also conducts human factors research. We agree with the JPDO that simulations and modeling will be important to gain a full understanding of the human factors issues and corresponding requirements for NextGen initiatives. We recommended that the JPDO conduct sufficient human factors analyses and studies to ensure that the changes envisioned for NextGen can be safely accomplished. FAA concurred and is developing a plan that identifies roles and responsibilities for JPDO partner agencies, including human factors research.

Mr. Chairman, that concludes our testimony. I would be pleased to answer any questions that you or other Members of the Subcommittee might have.

STATEMENT OF DR. AGAM N. SINHA
BEFORE THE HOUSE COMMITTEE ON TRANSPORTATION
AND INFRASTRUCTURE, SUBCOMMITTEE ON AVIATION
HEARING ON THE FUTURE OF AIR TRAFFIC CONTROL MODERNIZATION

MAY 9, 2007

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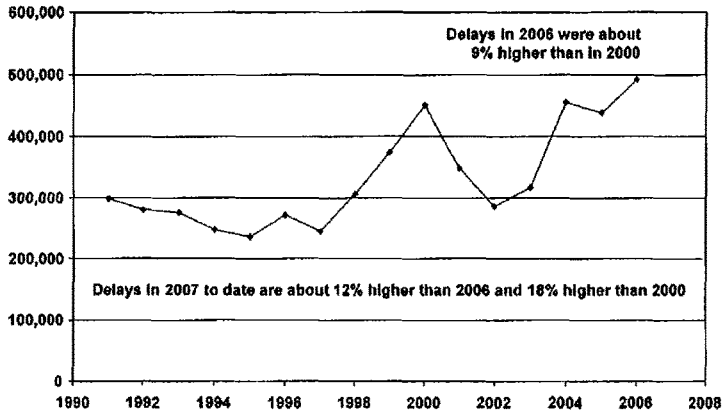
Good morning Chairman Costello and Members of the Subcommittee. Thank you for inviting me to participate in today's hearing on the Future of Air Traffic Control Modernization. My name is Agam Sinha and I am a Senior Vice President at the MITRE Corporation. I am also the General Manager of MITRE's Center for Advanced Aviation System Development (CAASD), which is the FAA's Federally Funded Research and Development Center (FFRDC).

We all remember the Summer of 2000, when delays in the system were at a very high level and were the subject of frequent stories in the popular press and on the evening news. Terms like "gridlock" and "crisis" were often used to describe the state of the system both by people inside and outside the aviation community.

The impact of September 11, 2001 events led to lower demand levels and during the next few years there was a significant reduction in delays. Demand has returned. It is at or above where it was in 2000 in many locations, and so are delays. Total delays in the National Airspace System (NAS) were 9 percent higher in 2006 than in 2000, and 2007 is worse. Through April, total



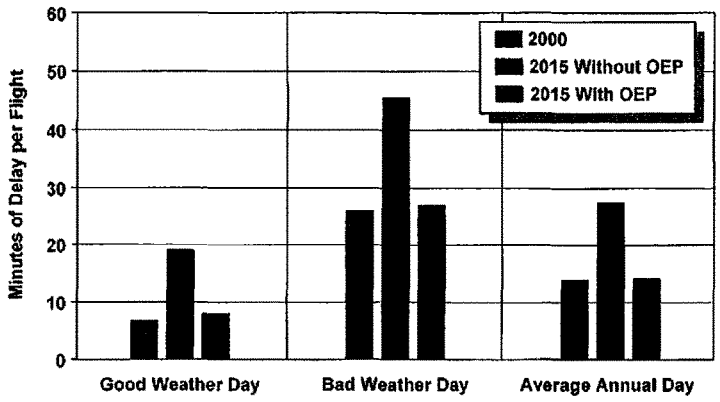
Source: OPSNET Delays, FAA, Aviation Policy, Planning & Environment

Total Systemwide Delays Annually

delays systemwide are 12 percent higher than in the corresponding period in 2006 and 18 percent higher than in 2000, and nearly 75 percent of all airport delays occur at just seven airports:

- Chicago – O'Hare International Airport
- Newark – Liberty International Airport
- Atlanta – William B. Hartsfield International Airport
- New York – LaGuardia Airport
- Philadelphia – Philadelphia International Airport
- New York – John F. Kennedy International
- Houston – George Bush Intercontinental Airport

There have been many significant improvements in the National Airspace System since 2000. Most significant with respect to increased system capacity is the addition of 13 new operational runways together with the necessary airspace changes. New procedures such as Area Navigation (RNAV) departures at Atlanta are saving users $30-40 million annually. These RNAV procedures are based on the ability of aircraft to navigate prescribed paths accurately and reliably. There are today over 100 such RNAV arrival and departure procedures authorized at over 30 airports, and more are being implemented in 2007. The next level in this process is called Required Navigation Performance (RNP) procedures, which is one of the key elements of the future system. RNP allows aircraft to fly even more precise paths with assurance. In Alaska, RNP procedures are used today to fly instrument approaches safely in some of the most challenging geographical terrains. These illustrate just some of the improvements in the system since 2000.



Source: MITRE/CAASD analysis for the Operational Evolution Plan (OEP), 2006

Average Delays at the 35 OEP Airports

The nation's aviation system and the air traffic management system that serves it are facing serious challenges in the years ahead. The demand for air transportation service will lead to an increase in the number of flights by passenger airlines, cargo carriers, and general aviation that will outstrip the ability of the existing NAS to accommodate them safely and efficiently. A MITRE study for the FAA analyzed capacity and delay impacts of the Operational Evolution Plan. It showed that the growth in air traffic demand is projected to lead to a doubling of delays at the nation's busiest airports and in the airspace that serves them in 2015 compared to 2000 if none of the planned improvements are made to the NAS. Currently planned improvements, however, are projected to maintain average delays nationwide at 2000 levels, assuming these improvements are implemented on schedule. Nevertheless, delays at many key congested locations across the NAS will continue to be a challenge (similar to the seven airports experiencing 75% of the delays today).

Looking ahead to 2015 and beyond to 2025, it is imperative for the growth of our national economy that the NAS be able to accommodate the projected growth in a safe an efficient manner. While the specifics of various forecasts may differ in their exact projections of traffic levels, they all agree that:

- Traffic in the future will be much more diverse than today with new aircraft such as A380, B787, very light jets, and unmanned aerial systems operating in the NAS.

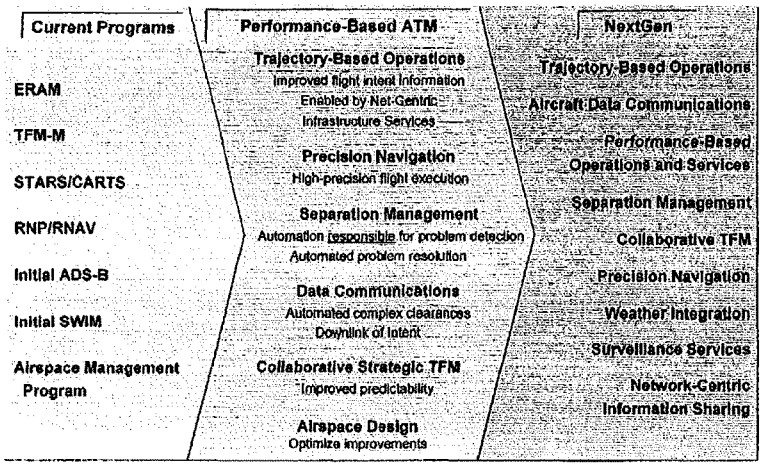
- Delays will not be distributed uniformly across the country. There will continue to be pockets of greater congestion reflected by people's desire to fly to certain destinations (e.g., the northeast corridor, New York/Philadelphia area, San Francisco and Los Angeles areas, to name a few).

The FAA and the Joint Planning and Development Office (JPDO) working in partnership with the aircraft operators, and industry, have developed an operational concept for the future air transportation system. The JPDO has identified the next generation system (NextGen) capabilities beyond those in current FAA plans and budgets, and the research required to develop them. Some of these NextGen improvements are changes to existing airspace and procedures that do not require major capital investments and can be implemented relatively quickly (e.g., RNAV/RNP routes to and from congested airports that capitalize on the capabilities of aircraft's existing flight management systems). Others are NAS improvements that do require capital investment but are well understood, mature, and ready for implementation soon (e.g., improved automation aids for pilots, air traffic controllers and traffic flow managers). While still others are less mature, but appear to be quite promising, and require further research to develop them and to assess whether, when, and how they might be implemented (e.g., advanced applications of cockpit displays that can permit aircraft to separate themselves from one another).

The FAA's Operational Evolution Partnership (OEP) will provide the mechanism that the FAA will use to manage the transition to NextGen. It builds on the experience and success of the Operational Evolution Plan. The new Operational Evolution Partnership has a much more expanded view and will provide the executive level view and oversight to ensure that the full range of activities come together at the right time to achieve the operational benefits that NextGen is to provide.

In the future, aircraft will be key nodes of the system and will have advanced capabilities in communication, navigation, and surveillance. Automation systems (on the ground and in the aircraft) will be playing an increased role in providing a number of routine functions, which will enable pilots and controllers to focus on the more critical activities in handling the higher traffic levels. NextGen is being designed to be human-centric but automation-intensive system with great emphasis on aircraft-centric operations. While some of the operational capabilities needed for NextGen require research, the good news is that the fundamental technologies and procedures (e.g., satellite navigation, Automatic Dependent Surveillance-Broadcast (ADS-B), air-to-ground digital data link, RNP procedures) are known and are available to build a scalable system that can help mitigate congestion in the mid-term (circa 2015) and be a stepping stone to achieve NextGen capabilities.

FAA and MITRE/CAASD have developed and conducted human-in-the-loop experiments of a portfolio of NAS improvements of particular note, targeted around the middle of the next decade and termed Performance-based Air Traffic Management (P-ATM). The idea behind this concept is to start changing the roles of flow managers, controllers, aircraft operators, flight planners, and dispatchers. It will require additional automation capabilities in the ground system, new avionics capabilities in the aircraft, air-ground data communications, and common situational awareness such as that provided by System Wide Information Management (SWIM).



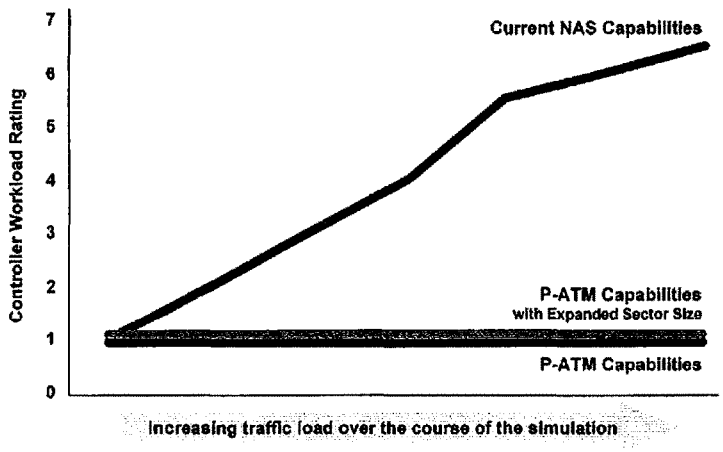
Relationship of P-ATM to NextGen

A key element of the challenges of implementing operational improvements on the road to NextGen is that the implementation must be done from a portfolio perspective (i.e., all the necessary components must be in place). For example, air-ground communications is a key element of using the automation capabilities of the aircraft and the ground system.

The improvements simulated in the P-ATM experiment are key elements of the OEP and provide an important step toward NextGen. These improvements are:

- Necessary: They will permit the NAS to accommodate demand growth and the diverse operational needs of airspace users.
- Desirable: They will reduce FAA and airspace user costs, leverage aircraft capabilities, integrate promising technologies, provide scalability to accommodate increasing demand in later years, and lay a foundation and path toward NextGen.
- Achievable: They rely on capabilities that have been researched and evaluated for many years, are well understood, and are within reach of current technology.

A key element of the P-ATM concept focuses on improving controller productivity to permit controllers to handle additional traffic as demand grows and to provide better service to airspace users both in en route airspace and in busy terminal areas. FAA and MITRE/CAASD have conducted simulations that have demonstrated significant workload reductions under the P-ATM concept compared with today's system. This improvement can translate to lower long-term costs for both the FAA and the airspace users it serves.



Workload Ratings from En Route Controller Simulations: P-ATM Capabilities and Current NAS Capabilities

The evolution of the NAS must not focus exclusively on FAA ground system capabilities. The future NAS needs to consider and capitalize on the role that the aircraft can play and the capabilities it can provide. Air/ground data communications capabilities can permit ground

automation systems to communicate with onboard flight management systems (e.g., to reroute flights around thunderstorms or congestion) and can reduce controller and pilot workload at the same time. Improved navigation and flight management systems can enable aircraft to fly with greater precision and can increase airport, terminal area and en route airspace capacity. Advanced cockpit displays and automation aids may permit aircraft to separate themselves from one another safely and efficiently, possibly at closer separations. Many air traffic service providers internationally are implementing integrated ground and airborne capabilities, and some are using creative approaches to acquire and finance their implementation to overcome some of the historical impediments associated with the evolution of avionics capabilities. The evolution of the system must be viewed in an *integrated* manner, and careful consideration must be given to the most appropriate role that aircraft and pilots can play in providing safe and efficient services and the possible approaches that can be taken to realize the system capacity that the nation needs and the quality of service airspace users want in a cost effective manner.

As the JPDO and FAA together with their government partners (DOD, NASA, DOC, DHS, DOT, and the White House OSTP) continue to develop the necessary details of the 2025 NextGen concept of operations and the integrated roadmap, it is important for the aviation community to move ahead with the implementation of the known fundamental technologies and procedures. This needs to be truly a community effort because it requires changes in aircraft and air traffic systems together with procedures and airspace changes. Only through moving ahead now can we meet the challenges of the mid-term and be well on our way to having the full capabilities of NextGen by 2025.

Mr. Chairman, this concludes my testimony. I would be happy to answer any questions the Committee may have.

JOINT STATEMENT OF ROBERT STURGELL, DEPUTY ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION, AND CHARLES LEADER, DIRECTOR, JOINT PLANNING AND DEVELOPMENT OFFICE, BEFORE THE COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE, SUBCOMMITTEE ON AVIATION ON THE FUTURE OF AIR TRAFFIC CONTROL MODERNIZATION

May 9, 2007

Good morning Chairman Costello, Congressman Petri, and Members of the Subcommittee. I am Robert Sturgell, Deputy Administrator of the Federal Aviation Administration, and interim Chief Operating Officer for the Air Traffic Organization. With me is Charles Leader, Director of the multi-agency Joint Planning and Development Office (JPDO). We thank you for the opportunity to testify today about modernization of FAA's Air Traffic Control System (ATC), and the work we are doing to develop and deploy the Next Generation Air Transportation System (NextGen) while providing operational and safety enhancements that deliver benefits to our customers today.

Reforming FAA's financing system will better enable the modernization of the FAA's Air Traffic Control System and transformation to NextGen. Congress mandated in Vision 100 the establishment of the Air Traffic Organization (ATO). Since the establishment of the ATO in 2003, we have required air traffic leadership to establish metrics for performance. These metrics are also reflected in our budget preparation and execution, and are based on the cost of doing business. We need to continue these practices as we establish the financing of our current and future operations- based on actual costs and investment requirements that will translate to tangible benefits and increasing efficiency for our nation's air transportation system. The NextGen Financing Act of 2007, as proposed by the Administration, provides the necessary reforms to our

financing to allow for a reliable funding stream as we continue on the path towards the implementation of the NextGen system.

And implementing that system is imperative. Our nation's air transportation system has become a victim of its own success. Administrator Blakey and the FAA have taken many steps to delay this gridlock. Since FY 2000, 13 new runways have opened, and we've worked with operators—through forums like Growth Without Gridlock—to find ways to squeeze extra capacity from our system. In addition, we've kept our modernization projects on schedule—2006 is the third straight year that we produced good results. As we reported in our Flight Plan, in FY 2006, 100 percent of our critical acquisitions were within 10 percent of budget and 97.4 percent were on schedule.

To get to the future, we need to prepare now. The actions of today are necessary for us to continue on a progressive path of solutions to address the current and future demands of the aviation industry and the flying public.

We have created the most effective, efficient and safest system in the world. But we now face a serious and impending problem: today's system is at capacity. While the industry downturn following the attacks of September 11 temporarily slowed the growth in the aviation industry that began in the late 1990's, demand is growing rapidly. And we have to change if we a going to be ready to meet it.

Flight delays have increased each of the last three fiscal years, and cancellations remain at an unacceptable level. Other issues, ranging from environmental concerns to the complexities of homeland security are placing additional stresses on the system. A MITRE study done for FAA concludes that the current system cannot handle the projected traffic demands expected by 2015 – absent modernization.

NextGen is a steady, deliberate, and highly collaborative undertaking, aimed at the long-term transformation of our air transportation system. It focuses on leveraging new technologies, such as satellite-based navigation, surveillance and network-centric systems. The FAA is not waiting for 2025 to implement technologies to promote safer, more efficient operations, and increase capacity. We are moving forward now with technologies and procedures which have two purposes; one, to improve efficiency, increase capacity and reduce congestion in the present system; and, two, to provide the foundation to build upon for further improvements in NextGen. The FAA is currently expanding the use of procedures like Area Navigation (RNAV) and Required Navigation Performance (RNP), which collectively result in improved safety, access, capacity, predictability, and operational efficiency, as well as reduced environmental impacts.

RNAV operations remove the requirement for a direct link between aircraft navigation and a ground-based navigational aid, thereby allowing aircraft better access and permitting flexibility of point-to-point operations. By using more precise routes for take-offs and landings, RNAV enables reductions in fuel burn and emissions and increases in capacity. FAA is expanding the implementation of RNAV procedures to additional

airports. The FAA has authorized 128 RNAV procedures at 38 airports for FY2005 and FY2006. We will publish at least 50 additional procedures in FY2007.

An example of how we better use the airspace is our introduction of Domestic Reduce Vertical Separation Minimums (DRVSM) in 2005. We reduced separation minimums from 2000 feet to 1000 feet, effectively doubling the high altitude airspace, and saving airlines close to $400 million per year in fuel.

Another FAA initiative is implementing Required Navigation Performance (RNP) on a greater scale. RNP is RNAV with the addition of an onboard monitoring and alerting function. This onboard capability enhances the pilot's situational awareness providing greater access to airports in challenging terrain. RNP takes advantage of an airplane's onboard navigation capability to fly a more precise flight path into an airport. It increases access during marginal weather, thereby reducing diversions to alternate airports. RNP reduces the overall noise footprint and aggregate emissions. The FAA has authorized a total of 40 RNP procedures at 18 airports. We plan to publish at least 25 RNP approach procedures in FY2007.

Enabling any far-reaching, systematic and long-term transformation requires a vision of what you want and need to achieve, and plans for how to get there from here. For NextGen, the Concept of Operations, the Enterprise Architecture, and the Integrated Work Plan provide us with that picture and the plans for how to achieve it. We will be discussing the Concept of Operations, the Enterprise Architecture, and the Integrated

Work Plan later in this statement. We are setting the stage for the long-term development of an air transportation system that will be scalable to a growing demand and the need for safer and more flexible aviation business models. It is a new approach to the way we view the future of the system, and it demands a new level of collaboration, planning and vision.

The unique structure of the NextGen initiative, setting up an inter-agency office to coordinate the efforts of the federal partners, while also bringing in the private sector as a full partner from the very beginning, will be instrumental in the success of NextGen. Indeed, it is our expectation that this new structure will help us avoid some of the problems that FAA has experienced in previous modernization efforts.

NextGen, while representing a continuum of research, investment and implementation activities, can be broken out into three major phases. Each one represents a key period in NextGen's development. The first phase focuses on the development and implementation of certain key NextGen foundational technologies and capabilities. These initiatives represent our current programs. This phase also includes the essential research and development needed to support the next two phases. The second phase builds upon this foundation to begin critical implementation of NextGen capabilities. This is when many aircraft in the fleet will begin to operate using on-board NextGen tools. This will allow greater expansion of RNP/RNAV procedures, net-enabled weather, advanced data communications, and the development of critical infrastructure for Trajectory-Based Operations. The third phase will be maturation of our core NextGen

capabilities into an operational nationwide system. This will allow aviation services to be managed and operated in a way that achieves the NextGen transformation across the entire air transportation system.

FAA and JPDO are beginning to move from planning to implementation. In fact, the FAA's FY 2008 – 2012 Capital Investment Plan (CIP) includes $4.6 billion in projects and activities that directly support NextGen. The CIP is a 5-year plan that describes the National Airspace System modernization costs aligned with the projects and activities that the Agency intends to accomplish during that time. Several key NextGen technologies and programs have already been identified and are funded in the FAA's FY08 budget request. These technologies and programs are: Automatic Dependent Surveillance-Broadcast (ADS-B); System Wide Information Management (SWIM); NextGen Data Communications; NextGen Network Enabled Weather; NAS Voice Switch; and, NextGen Demonstrations and Infrastructure Development.

These technologies are essential to begin the transition from today's air traffic control system to the NextGen system of 2025. One important transformational technology is Automatic Dependent Surveillance-Broadcast or ADS-B. ADS-B is, quite simply, the future of air traffic control. A key element of the NextGen system, it uses GPS satellite signals to provide air traffic controllers and pilots with much more accurate information on aircraft position that will help keep aircraft safely separated in the sky and on runways. Aircraft transponders receive GPS signals and use them to determine the aircraft's precise position in the sky, which is combined with other data and broadcast out

to other aircraft and controllers. When properly equipped with ADS-B, both pilots and controllers will, for the very first time, see the same real-time displays of air traffic, thereby substantially improving safety.

ADS-B has been successfully demonstrated through the FAA's Capstone program in Alaska, where GA accidents have been reduced by more than 40 percent for ADS-B equipped aircraft. And UPS has been working with us on a demonstration program in Louisville using ADS-B to conduct continuous descent arrivals, where they have been able to reduce noise by 30 percent and emissions by 34 percent as a result. One of the first uses of ADS-B technology outside of Alaska and Louisville will be in the Gulf of Mexico. The FAA signed a Memorandum of Agreement (MOA) with the Helicopter Association International (HAI), helicopter operators, and oil and gas platform owners in the Gulf of Mexico to improve service in the Gulf. Using ADS-B technology, helicopter operators will transmit critical position information to the Houston Center, enabling enhanced Air Traffic Control services in the Gulf.

The FAA is considering a rulemaking that would mandate the avionics necessary for implementing ADS-B in the national airspace system, and is working closely with stakeholders to determine a timeline.

In today's NAS, there are a myriad of systems with custom-designed, developed, and managed connections. The future, however, demands an infrastructure that is capable of flexible growth, and the cost of expanding today's point-to-point system is simply

prohibitive. System Wide Information Management (SWIM) responds to that need. As many major national and international corporations have done with their own technological systems, SWIM will provide for NextGen the infrastructure and services to deliver network-enabled information access across air transportation operations, and high quality, timely data to many users and applications. By reducing the number and types of interfaces and systems, SWIM will better facilitate multi-agency information-sharing, eliminating redundant information and providing information where it is needed. When implemented, the efficiencies provided by SWIM will contribute to expanded system capacity, improved predictability and operational decision-making, and reduced cost of service. In addition, SWIM will improve coordination to allow transition from tactical conflict management to strategic trajectory-based operations. It will also allow for better use of existing capacity en-route. While transparent to the flying public, these are efficiencies that will benefit the consumer and the aviation industry.

The heart of the NextGen advanced airspace management concepts lies within the digital data communications infrastructure of the future. In the current system, all air traffic communications with airborne aircraft is by voice communications. NextGen transformation cannot be realized through today's voice-only communications, especially in the areas of aircraft trajectory-based operations, net-centric and net-enabled information access. Data communications enabled services, such as 4-D trajectories and conformance management, will shift air traffic operations from short-term, minute-by-minute tactical control to more predictable and planned strategic traffic management. Eventually, the majority of communications will be handled by data communications for

appropriately equipped users. It is estimated that with 70 percent of aircraft data-link equipped, exchanging routine controller-pilot messages and clearances via data can enable controllers to safely handle approximately 30 percent more traffic.

Approximately 70 percent of annual national airspace system delays are attributed to weather. The NextGen Network Enabled Weather will serve as the backbone of the NextGen weather support services, and provide a common weather picture across NextGen. The goal of this investment is to cut weather-related delays at least in half by improving the integration and dissemination of aviation weather information. The benefits will be uniform real-time access to key common weather parameters, common situational awareness, improved utilization of air space across all flight domains, and reduced flight delays.

The NAS Voice Switch will provide the foundation for all air/ground and ground/ground voice communications in the air traffic control environment. The switches today are static, and our ability to adjust the airspace for contingencies is limited. Under the current system it is very difficult and time consuming to coordinate and redesign the airspace. In the future, the impacts of bad weather could be responded to in real-time, thereby minimizing its disruptions to air traffic. The new voice switch allows us to replace today's rigid, sector-based airspace design and support a dynamic flow of traffic. Voice communications capabilities and network flexibility provided by the NAS Voice Switch are essential to the FAA's ability to implement new NextGen services that are necessary to increase efficiency and improve performance.

At this early stage of NextGen, it is critical to better define operational concepts and the technologies that will support them. For the first time, FAA is requesting funding for these defining activities in the FY08 budget. This funding will support two demonstrations and a series of infrastructure development activities. The primary purposes of these demonstrations are to refine aspects of the trajectory-based operations concept, while lowering risk by phasing in new technologies. One demonstration will test trajectory-based concepts in the oceanic environment. The ultimate goal is to increase predictability on long-duration international flights and improve fuel efficiency. The other demonstration will accelerate the first integrated test of super density operations. Procedures for increasing capacity at busy airports will be explored. The demonstration should achieve near-term benefits at the test airport, and give us the tools to implement the same procedures at other locations.

It is important to understand that NextGen is a portfolio program. The technologies described above, and those that will be defined over the next several years, are interdependent, creating a series of transformations that will truly modernize today's system. Let me provide a few examples of this.

In the future, trajectory-based operations will enable many pilots and dispatchers to select their own flight paths, rather than follow the existing system of flight paths, that are like a grid of interstate highways in the sky. In the high performance airspace of the future, each airplane will transmit and receive precise information about the time at which it and

others will cross key points along their paths. Pilots and air traffic managers on the ground will have the same precise information, transmitted via data communications. Investments in ADS-B, SWIM and Data Communications are critical to trajectory-based operations.

The NextGen system will enable collaborative air traffic management. The increased scope, volume, and widespread distribution of information that SWIM provides will improve the quality of the decisions by air traffic managers and flight operators to address major demand and capacity imbalances. SWIM and NAS Voice Switch are instrumental in achieving this collaborative air traffic management.

With NextGen the impact of weather is reduced through the use of improved information sharing, new technology to sense and mitigate the impacts of weather, improved weather forecasts, and the integration of weather into automation to improve decision-making. New capabilities in the aircraft and on the ground, coupled with better forecasts and new automation, will minimize airspace limitations and traffic restrictions. Network Enabled Weather and SWIM are vital investments for these improvements.

We recognize that there are many challenges in converting the JPDO's vision of the NextGen system into reality. Because the JPDO is not an implementing or executing agency, the FAA and the other JPDO partner agencies must work closely with the JPDO to develop an implementation schedule for the operational changes required as new technologies are deployed to realize the NextGen vision. The FAA is using the

Operational Evolution Partnership, the new OEP, to guide their transformation to NextGen. In the past the Operational Evolution Plan successfully provided a mid-term strategic roadmap for the FAA that extended ten years into the future. The new OEP will include strategic milestones through 2025. JPDO representatives will participate along with the FAA in OEP development and execution.

FAA will use the OEP to plan, execute and implement NextGen in partnership with private industry. Required operational implementation schedules will be tracked, as well as dates by which initiatives must be funded in order to meet those schedules.

OEP will provide a single entry point for new NextGen initiatives, jointly developed by the JPDO and the FAA, to enter the FAA capital budget portfolio. It ties these initiatives directly to the FAA budget process. Beginning in fiscal year 2008 and continuing in 2009, the FAA worked closely with the JPDO in budget formulation utilizing JPDO budget guidance. For the fiscal year 2009 budget formulation, the FAA is using a Review Board under the auspices of the OEP Associates Group, which includes the Director of JPDO, to review and prioritize NextGen initiatives based on the JPDO Concept of Operations, JPDO roadmaps, and the NAS Enterprise Architecture.

The NAS and NextGen Enterprise Architectures will provide the backbone of this new OEP by specifying roadmaps for system and certification requirements, operational procedures, program phasing, and prototype demonstrations. This Operational Evolution Partnership will be the mechanism by which we hold ourselves accountable to our

owners, customers, and the aviation community for the FAA's progress towards the JPDO vision, while assuring that the JPDO and the FAA are jointly on-track to deliver the NextGen system.

Cost will be a vital factor: we cannot create a NextGen system that is not affordable. Requirements for the first ten years range from $8 billion to $10 billion. Preliminary estimates by FAA, JPDO and the Research, Engineering, and Development Advisory Committee (REDAC) suggest that the investments necessary to achieve the end state NextGen system range from $15 billion to $22 billion in FAA funding. We are working with our users to continuously refine these estimates.

MITRE, working with FAA, has developed a preliminary estimate of the NextGen avionics costs. It concludes that a wide range of costs are possible, depending on the bundling of avionics and the alignment of equipage schedules. MITRE concluded that the most probable range of total avionics costs to system users is $14 billion to $20 billion. This range reflects uncertainty about equipage costs for individual aircraft, the number of very light jets that will operate in high-performance airspace, and the amount of time out of service required for equipage installation.

The importance of developing this system of the future is also quite clear to policymakers in Europe, where a comparable effort known as Single European Sky Air Traffic Management Research (SESAR) is well underway. This presents both a challenge and an opportunity to the United States. Creating a modernized, global system that provides

interoperability could serve as a tremendous boost to the aerospace industry, fueling new efficiencies while creating jobs and delivering substantial consumer benefits. Alternatively, we could also see a patchwork of duplicative systems and technologies develop, which would place additional cost burdens on an industry already struggling to make ends meet.

Last year, Administrator Blakey signed a Memorandum of Understanding with her European counterpart that formalizes cooperation between the NextGen initiative and the SESAR program. The FAA and the EC are identifying opportunities and establishing timelines to implement, where appropriate, common, interoperable, performance-based air traffic management systems and technologies. This coordination will address policy issues and facilitate global agreement within international standards organizations such as ICAO, RTCA and Eurocontrol, and contribute greatly to the success of this critical initiative.

Our European counterparts have released a preliminary cost estimate for SESAR. SESAR is conceived as a system that, while smaller in scope and size, has similar air traffic management goals as NextGen. They consider different system scenarios and a range of total costs of $25 billion to $37 billion in US dollars through the year 2020. SESAR, like NextGen, has a lot of work remaining to refine assumptions and better define the system. However, there is an important difference in scope between SESAR and NextGen. While SESAR focuses almost exclusively on air traffic management, NextGen takes what's called a "curb-to-curb" approach, and includes not only air traffic

control, but also airports, airport operations, security and passenger management, and DoD and DHS NAS requirements.

One of the major products for the JPDO, and indeed, one of the critical elements in defining the NextGen initiative itself, is the development of the Concept of Operations, the Enterprise Architecture, and the Integrated Work Plan. These documents define each NextGen transformed state and how to evolve to it. They are absolutely essential to the future development of the NextGen system.

The Concept of Operations is a text description of the transformed state of NextGen. This kind of explanation, offered in one document, is critical to developing the specific requirements and capabilities that will be necessary for our national air transportation system in 2025. In a sense, the Concept of Operations is like an architect's blueprints.

However, to adequately lay the groundwork and basic plans for the NextGen system requires another step in the process, developed concurrently with the Concept of Operations, and that's the Enterprise Architecture. The Enterprise Architecture provides the technical details of the transformed NextGen system, much like a builder's plumbing and wiring diagrams, specifying how the house will get its power, water, sewage, cable and internet connections to the rest of the community. The Integrated Work Plan is the equivalent of the general contractor's work plan. It specifies the timing and interdependencies of multi-agency activities required to achieve the NexGen system vision.

These documents, the Concept of Operations, the Enterprise Architecture, and the Integrated Work Plan are essential to defining the NextGen system and will guide the future investment and capabilities, both in terms of research and systems development. The JPDO released the NextGen Concept of Operations for public comment on February 28th. It is now available on the JPDO website for review and comment by our stakeholders, and we are anxious to receive their feedback. The NextGen Enterprise Architecture and the Integrated Work Plan should be released within the next few months.

Our overarching goal in the NextGen initiative is to develop a more automated system that will be flexible enough to accommodate a wide range of users -- very light jets and large commercial aircraft, manned and unmanned aircraft, small airports and large, business and vacation travelers alike, while handling a significantly increased number of operations with a commensurate improvement in safety, security and efficiency.

Mr. Chairman, this concludes our testimony. We would be happy to answer any questions the Committee may have.

U.S. House of Representatives
Committee on Transportation and Infrastructure

James L. Oberstar
Chairman

David Heymsfeld, Chief of Staff
Ward W. McCarragher, Chief Counsel

Washington, DC 20515

John L. Mica
Ranking Republican Member

James W. Coon II, Republican Chief of Staff

May 17, 2007

Mr. Charles A. Leader
Director, Joint Planning and Development Office
Next Generation Air Transportation System
1500 K Street, N.W., Suite 500
Washington, D.C. 20005

Dear Mr. Leader:

On May 9, 2007, the Subcommittee on Aviation held a hearing on **The Future of Air Traffic Control Modernization.**

Attached is a question to answer for the record submitted by Representative Ellen Tauscher. I would appreciate receiving your written response to these questions within 14 days so that they may be made a part of the hearing record.

Sincerely,

Jerry F. Costello
Chairman
Subcommittee on Aviation

May 9, 2007
Subcommittee on Aviation
HEARING on
"The Future of Air Traffic Control Modernization"

Questions for the Record
To:

Mr. Charles A. Leader,
Director, Joint Planning and Development Office
Next Generation Air Transportation System

➢ I understand that ADS-B is a transformational technology for NextGen, and as such, that it was be around until at leaser 2025. We also understand that the FAA is reconsidering its 2002 link decision which was based on years of studies and demonstrations done by the FAA, RTCA and Eurocontrol. The FAA concluded that two links were required for ADS-B because the 1090ES frequency alone would have too much congestion within a ten year timeframe. Has the FAA commissioned a new study to confirm that the single 1090ES link can indeed handle projected 2025 traffic in busy terminal areas, or will the airlines be required to potentially do costly avionics upgrades twice between now and 2025 in order to take advantage of NextGen capabilities?

Question for the Record
Representative Ellen Tauscher
June 11, 2007

Question:

I understand that ADS-B is a transformational technology for NextGen, and as such, that it would be around until at least 2025. We also understand that the FAA is reconsidering its 2002 link decision which was based on years of studies and demonstrations done by the FAA, RTCA and Eurocontrol. The FAA concluded that two links were required for ADS-B because the 1090 ES frequency alone would have too much congestion within a ten year timeframe. Has the FAA commissioned a new study to confirm that the single 1090ES link can indeed handle projected 2025 traffic in busy terminal areas, or will the airlines be required to potentially do costly avionics upgrades twice between now and 2025 in order to take advantage of NextGen capabilities?

Answer:

New Technologies Make a Single Link Feasible
The primary reason for the ADS-B dual link decision in 2002 was that the 1090 link could not support applications, like weather and airspace status, that were not strictly air traffic surveillance services. Since that time, however, other technologies that can send high-bandwidth information have become available. For example, commercial satellite links such as XM and Sirius, as well ground-based links, can be used to send data to aircraft.

The current strategy does not plan for performing "costly avionics upgrades twice". The agency does not believe this will be necessary for the air transport aircraft or general aviation.

The FAA has asked the vendor teams to be innovative in their proposals. One vendor has proposed 1090 as the single link for ADS-B surveillance data with a second commercial link for data like weather and airspace status. While it is too early to say whether this proposal will be selected, we can say that the contract will be awarded to the vendor whose proposal offers the most benefits to users of the national airspace system and the FAA. Regardless of the proposal selected, 1090 will play a primary role since it is the International Civil Aviation Organization's global standard for ADS-B surveillance. No matter which link strategy is selected for ADS-B, the net effect on the 1090 MHz spectrum for surveillance will be the same.

FAA Is Managing the 1090 MHz Spectrum
Since the 1090 MHz spectrum is used for radar, TCAS, ADS-B, and other technologies, managing its use is very important. The agency is developing a holistic approach for spectrum management to ensure availability for all frequency users through 2025 and beyond. The FAA is evaluating the effects various technologies have on the spectrum, and using models and simulations to determine the impact of ADS-B. In addition,

techniques, such as managing radar interrogation rates and locking out unneeded transponder replies, are being examined to greatly reduce the interference environment. Spectrum management controls will be used regardless of whether the ADS-B architecture employs a terrestrial dual link or terrestrial and satellite dual link strategy.

ADS-B Link Architecture Will Be Validated

The Request for Offer that was released March 30, 2007 details the specifications and requirements vendors must follow, in addition to information-security and safety risk management practices. Vendors must discuss the design of critical and essential service applications, focusing on key requirements, like latency, position validation, update interval, capacity, operation in interference environments, and target loading. The vendors also must identify methods they will use to ensure data integrity, and testing strategies to validate that their proposed link strategies meet requirements.

While the vendors must follow FAA specifications, safety management, and testing requirements in their designs, the agency also has plans to validate the selected vendor's design, operation, and maintenance program. In addition, as with all new technology introduced into the national airspace system, the FAA will first test the system at key sites before it is used operationally, and then test it operationally before it is declared to be "commissioned" for the national airspace system. With every stage, the FAA will follow safety management system practices to mitigate risks and assure operational acceptability.

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U.S. House of Representatives
Committee on Transportation and Infrastructure

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David Heymsfeld, Chief of Staff
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Washington, DC 20515

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May 14, 2007

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Director, Joint Planning and Development Office
Next Generation Air Transportation System
1500 K Street, N.W., Suite 500
Washington, D.C. 20005

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Attached are questions to answer for the record. I would appreciate receiving your written response to these questions within 14 days so that they may be made a part of the hearing record.

Sincerely,

Jerry F. Costello
Chairman
Subcommittee on Aviation

Question for the Record
From the May 9, 2007 Subcommittee on Aviation Hearing on "The Future of Air Traffic Control Modernization."

Question

Mr. Leader, regarding Next Generation Air Transportation System (NextGen) benefits, you stated in your opening remarks:

"NextGen applications on the ground, in surface operations, represent benefits ranging from $328 million to $1.3 billion a year.

Terminal area benefits, as NextGen moves to maturity, could range from $6.5 billion to $19.7 billion a year, and benefits accrued through NextGen based operation in the Enroute environment could yield benefits of between $5.5 billion to $11.1 billion.

In other words, according to your testimony, NextGen annual user cost savings and benefits could range from $12.3 billion to $32.1 billion.

Please break these estimated benefits down by national airspace system user group.

- What percentage of these benefits would airlines receive and how much would that translate into dollars?
- What percentage of these benefits would other NAS users receive and how much would that translate into dollars?

Answer:

Based on our current estimates we expect that commercial airlines will receive 85% of the NextGen benefits, while general aviation will receive 15%.

In the context of fuel savings, commercial airlines will realize 93% of the benefits and general aviation 7%.

Developing accurate benefit estimates is an important part of the JPDO's work and a valuable guide to directing future resources and initiatives. To assist the committee in their analysis of this issue we are attaching a briefing package that illustrates the nature and character of NextGen benefits.

U.S. House of Representatives
Committee on Transportation and Infrastructure

James L. Oberstar
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Washington, DC 20515

John L. Mica
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May 17, 2007

Mr. Robert Sturgell
Deputy Administrator and Interim Chief Operating Office
for the Air Traffic Organization
Federal Aviation Administration
800 Independence Avenue, SW
Washington, D.C. 20591

Dear Mr. Sturgell,

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Sincerely,

Jerry F. Costello
Chairman
Subcommittee on Aviation

May 9, 2007
Subcommittee on Aviation
HEARING on
"The Future of Air Traffic Control Modernization"

Questions for the Record
To:

Mr. Robert Sturgell,
Deputy Administrator and Interim Chief Operating Office for the Air Traffic Organization, Federal Aviation Administration

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COMMITTEE ON ARMED SERVICES
CHAIRMAN,
SUBCOMMITTEE ON STRATEGIC FORCES
SUBCOMMITTEE ON AIR AND LAND
SUBCOMMITTEE ON OVERSIGHT
AND INVESTIGATIONS

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TRANSPORTATION AND INFRASTRUCTURE
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HIGHWAYS, TRANSIT AND PIPELINES
SUBCOMMITTEE ON
WATER, RESOURCES AND THE ENVIRONMENT
SUBCOMMITTEE ON AVIATION

CHAIR, NEW DEMOCRAT COALITION

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May 9, 2007

The Honorable Jerry Costello, Chairman
Aviation Subcommittee
House Transportation & Infrastructure Committee
Washington, D.C. 20515

Mr. Chairman,

I respectfully request that the following question be submitted to Deputy Administrator Robert Sturgell and Mr. Charles Leader, Director of the Joint Planning and Development Office for answer in written form.

Question:

I understand that ADS-B is a transformational technology for NextGen, and as such, that it will be around until at least 2025. We also understand that the FAA is reconsidering its 2002 link decision which was based on years of studies and demonstrations done by the FAA, RTCA and Eurocontrol. The FAA concluded that two links were required for ADS-B because the 1090ES frequency alone would have too much congestion within a ten year timeframe. Has the FAA commissioned a new study to confirm that the single 1090ES link can indeed handle projected 2025 traffic in busy terminal areas, or will the airlines be required to potentially do costly avionics upgrades twice between now and 2025 in order to take advantage of NextGen capabilities?

Thank you for the opportunity.

Sincerely,

Ellen O. Tauscher

ELLEN O. TAUSCHER
Member of Congress

PRINTED ON RECYCLED PAPER

Question for the Record
Representative Ellen Tauscher
June 11, 2007

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May 15, 2007

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Deputy Administrator and Interim Chief Operating Office
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May 9, 2007
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"The Future of Air Traffic Control Modernization"

Questions for the Record
To:

Mr. Robert Sturgell,
Deputy Administrator and Interim Chief Operating Office for the Air Traffic Organization, Federal Aviation Administration

- Mr. Sturgell, it is my understanding that the FAA has 4 on-site terminal tower simulator (TSS) systems at O'Hare; Miami; Ontario, CA and Phoenix and that the FAA is planning to procure more of these TSS. Please provide to this Subcommittee a schedule for moving forward on this procurement and when and where we can expect to see deployment. Will potential bidders need to clearly demonstrate that their product will perform as well as the systems currently being tested?

Question from Representative Costello:

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Answer:

The FAA released a Screening Information Request to Industry on 27 June and plans to award a contract by the end of September 2007. A minimum of 6 systems are planned for deployment in fiscal year 2008. The specific sites will be determined prior to contract award.

The functionality detailed in the TSS Requirements Document meets or exceeds the functionality presently required of the systems now in the field. Each bidder will have to demonstrate the capability of their system during the evaluation.

Statement for the Record
Airports Council International-North America

before the

House Transportation and Infrastructure Committee
Subcommittee on Aviation
The Future of Air Traffic Control Modernization

May 9th, 2007

Chairman Costello, Ranking Member Petri, members and staff of the House Transportation and Infrastructure Committee, thank you for allowing Airports Council International-North America (ACI-NA) the opportunity to participate in this important hearing regarding Air Traffic Control modernization. ACI-NA member airports enplane more than 95 percent of the domestic and virtually all the international airlines passenger and cargo traffic in North America. Nearly 400 aviation-related businesses are also members of ACI-NA.

As you know, this year is critical for aviation in the United States. The expiration of the Federal Aviation Administration's (FAA) programs, taxes and fees provides and historic opportunity to make the needed changes that enhance and strengthen our national transportation system for decades to come.

The need for air traffic modernization should be a priority in this year's FAA Reauthorization legislation. Maximizing the safe and efficient use of the airspace and airports is critical to accommodating future aviation demand. If the aviation industry is to meet the challenge of FAA's forecasts that predict one billion passengers by 2015 and a doubling of today's passenger levels by 2025, it will require substantial improvements and investments in the air traffic control system, just as it will require federal and local capital investments in airport infrastructure. Airports believe that these investments require that the FAA have a stable and predictable funding system to ensure sufficient capital resources are available.

The Next Generation Air Transportation System (NextGen) would increase capacity in the enroute and terminal environments, particularly in weather conditions that today cause enroute and terminal airspace capacity to drop, resulting in delays and cancellations and less than desirable passenger experiences. If investments are not made, and the full benefits of NextGen are not realized, airspace capacity will be insufficient to meet forecasts and system disruptions will become routine. Airport safety, airspace, and airport capacity are three areas where air traffic modernization and NextGen can play important roles.

Airport Safety: As aircraft traffic increases, surface movements of aircraft and other vehicles on the airfield grows significantly. This raises the potential for accidents and equipment damage on runways and taxiways as well as for traffic gridlock on the airfield. It is vital that both air traffic controllers and air crews have updated information available to them that accurately determines

the position and identification of aircraft and surface vehicles so that safety and airfield throughput can be maintained.

Airspace: Today, much of the airspace surrounding our nation's most intensively used airports is congested, limiting system capacity. Without modernization, this challenge will only increase as the projected numbers of commercial and general aviation aircraft accessing congested airspace is forecast to grow significantly. By safely reducing aircraft spacing and separation requirements and better managing traffic in, out and within busy terminal airspace, NextGen will safely permit more aircraft to operate in these areas and be routed to the appropriate airports in the region.

Airport Capacity: Many of busiest airports today have runway configurations that do not permit independent arrival and departure streams when aircraft are operating under Instrument Meteorological Conditions (IMC) and flight minimums must be raised. As a result under IMC conditions aircraft spacing and separation must be increased, airport arrival and departure rates drop, and the system is forced to queue, divert, delay or cancel flights. By enabling pilots and controllers to more accurately identify the exact position of aircraft, more precise routes in and out of airports can be flown, increasing throughput during almost all weather conditions.

There are a number of NextGen priorities and programs that are critical for U.S. airports and the aviation system. These range from projects that are being deployed now and can be in the near future, as well as those that are in development and/or being tested for future deployment. FAA identifies several programs as key elements to NextGen that are currently in their budget. They include programs to enable better data and voice exchange among controllers and users in the system, enhanced information on national and local weather conditions, conduct research and pilot operational programs into wake turbulence detection, among others.

The most important FAA initiatives for airports are the following: Airport Surface Detection Equipment-Model X (ASDE-X), Automatic Dependent Surveillance-Broadcast (ADS-B), Performance Based Navigation, and Wake Vortex Detection and Avoidance.

ASDE-X reads signals from aircraft transponders using multilateration and determines the position of aircraft and vehicles on the airport's runways and taxiways as well as the airport's approach corridors. By creating a constantly updated map of the airport movement area-at night and in all weather conditions-it provides a key tool for controllers to maintain safe distance

margins, increase throughput and avoid potential collisions. First deployed in 2003, ASDE-X is operational at approximately 10 airports and scheduled to be deployed at 27 others by 2011

To further enhance safety, ACI-NA encourages the FAA to develop technology to allow the installation of ASDE-X transponders in airport ground vehicles. According to the National Transportation Safety Board (NTSB), the risk of a crash on the ground represents the greatest threat in aviation. In fact, FAA data shows that collisions between vehicles and planes were narrowly averted 26 times from 2003 though January of 2007. While there have been concerns that vehicle transponders could interfere with broadcasts from similar transponders on planes, airports believe the technology is available to resolve this issue. Several airports, including Milwaukee and Providence, have successfully tested the system by installing transponders in airport vehicles.

ADS-B uses the signals of Global Positioning Satellites (GPS) to provide pilots and air traffic controllers with much more accurate information on the position of aircraft in the sky and on the ground than is available today. When pilots and controllers are properly equipped they will be able to see real-time displays of nearby air traffic, both on air traffic control (ATC) displays and in the cockpit. ADS-B deployment is beginning in Philadelphia, Louisville and Juneau. ACI-NA supports FAA's request for over $500 million for the program over the next five years.

Additionally, Performance Based Navigation (PBN) provides a basis for the design and implementation of automated flight paths which assure aircraft separation and obstacle clearance. Among other benefits to airports and communities, these flight paths improve access to airport and airspace in nearly all weather conditions, have the potential to permit operations to closely spaced runways and reduce emissions and noise. While these procedures are being used at airports such as Atlanta, Dallas/Fort Worth, Juneau, Palm Springs, and Reagan-National today, such use is still limited compared to procedures that continue to rely on ground-based navigation aids (NAVAIDS). Aircraft that use ground-based NAVAIDS must fly restrictive flight procedures that do not efficiently use airspace and airport capacity. In contrast, performance based navigation, such as RNAV (Area Navigation) and Required Navigation Performance (RNP) operations enable much greater operational flexibility that is a key component of NextGen. Performance based navigation also allows air crews to precisely track the aircraft's location, it navigation performance and provides an alert in case the required performance is not met during

an operation. FAA now needs to begin development of RNP procedures that will permit independent operations to runways spaced as closely as 750 feet apart.

The FAA reports that 63 procedures were approved in Fiscal Year 2006. Furthermore, it expects to approve an additional 300 each year between now and 2015. However, most of these procedures are simple overlays of existing procedures that do not improve upon the performance of ground-based NAVAIDS. Airports support the technologies, procedures and FAA staffing to enable the widespread use of performance based navigation that improve upon the safety and functional performance of ground-based NAVAIDS.

As for Wake Vortex Detection and Avoidance, FAA has been conducting extensive research in this area. ACI-NA supports developing high quality in-service demonstration programs, similar to the very successful CAPSTONE program that validated ADS-B, to assess the potential for safely minimizing the wake vortex separation requirements. Promising developments on the use of displaced flight paths in Europe, coupled with field evaluations of the several laser wake detection systems being commercially developed in the U.S., are needed to determine the correct technological solution to this pressing capacity problem.

In closing, ACI-NA and its member airports thank you for the opportunity to share our views on this important matter. We look forward to working with you, as we successfully transition to the Next Generation Air Transportation System.

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