AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

S. HRG. 109–1142

OVERSIGHT OF THE JOINT PLANNING AND DEVELOPMENT OFFICE

HEARING

BEFORE THE

SUBCOMMITTEE ON AVIATION

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED NINTH CONGRESS

SECOND SESSION

JULY 25, 2006

Printed for the use of the Committee on Commerce, Science, and Transportation



U.S. GOVERNMENT PRINTING OFFICE

67–066 PDF WASHINGTON : 2011

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
Fax: (202) 512–2104 Mail: Stop IDCC, Washington, DC 20402–0001

SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED NINTH CONGRESS

SECOND SESSION

TED STEVENS, Alaska, *Chairman*

JOHN MCCAIN, Arizona
CONRAD BURNS, Montana
TRENT LOTT, Mississippi
KAY BAILEY HUTCHISON, Texas
OLYMPIA J. SNOWE, Maine
GORDON H. SMITH, Oregon
JOHN ENSIGN, Nevada
GEORGE ALLEN, Virginia
JOHN E. SUNUNU, New Hampshire
JIM DEMINT, South Carolina
DAVID VITTER, Louisiana

DANIEL K. INOUYE, Hawaii, *Co-Chairman*
JOHN D. ROCKEFELLER IV, West Virginia
JOHN F. KERRY, Massachusetts
BYRON L. DORGAN, North Dakota
BARBARA BOXER, California
BILL NELSON, Florida
MARIA CANTWELL, Washington
FRANK R. LAUTENBERG, New Jersey
E. BENJAMIN NELSON, Nebraska
MARK PRYOR, Arkansas

LISA J. SUTHERLAND, *Republican Staff Director*
CHRISTINE DRAGER KURTH, *Republican Deputy Staff Director*
KENNETH R. NAHIGIAN, *Republican Chief Counsel*
MARGARET L. CUMMISKY, *Democratic Staff Director and Chief Counsel*
SAMUEL E. WHITEHORN, *Democratic Deputy Staff Director and General Counsel*
LILA HARPER HELMS, *Democratic Policy Director*

SUBCOMMITTEE ON AVIATION

CONRAD BURNS, Montana, *Chairman*

TED STEVENS, Alaska
JOHN MCCAIN, Arizona
TRENT LOTT, Mississippi
KAY BAILEY HUTCHISON, Texas
OLYMPIA J. SNOWE, Maine
GORDON H. SMITH, Oregon
JOHN ENSIGN, Nevada
GEORGE ALLEN, Virginia
JOHN E. SUNUNU, New Hampshire
JIM DEMINT, South Carolina

JOHN D. ROCKEFELLER IV, West Virginia, *Ranking*
DANIEL K. INOUYE, Hawaii
BYRON L. DORGAN, North Dakota
BARBARA BOXER, California
MARIA CANTWELL, Washington
FRANK R. LAUTENBERG, New Jersey
BILL NELSON, Florida
E. BENJAMIN NELSON, Nebraska
MARK PRYOR, Arkansas

CONTENTS

	Page
Hearing held on July 25, 2006	1
Statement of Senator Burns	1
Statement of Senator Lott	50
Statement of Senator Rockefeller	11
Prepared statement	11
Statement of Senator Stevens	2
Statement of Senator Snowe	30
Prepared statement	30

WITNESSES

Blakey, Hon. Marion C., Administrator, Federal Aviation Administration	3
Prepared statement	6
Dillingham, Gerald L., Ph.D., Director Physical Infrastructure Issues, U.S. Government Accountability Office	17
Prepared statement	19
Dobbs, David A., Assistant Inspector General for Aviation and Special Program Audits, Department of Transportation	31
Prepared statement	33
Porter, Dr. Lisa J., Associate Administrator for Aeronautics Research, National Aeronautics and Space Administration	11
Prepared statement	13

APPENDIX

Aerospace Industries Association of America, prepared statement	61
Air Line Pilots Association, International, prepared statement	63
Bunce, Peter J., President/CEO, General Aviation Manufacturers Association (GAMA), prepared statement	64
Cote, Dave, Chief Executive Officer, Honeywell prepared statement	66
Inouye, Hon. Daniel K., U.S. Senator from Hawaii, prepared statement	61
Response to written questions submitted by Hon. Daniel K. Inouye to Hon. Marion C. Blakey	68

OVERSIGHT OF THE JOINT PLANNING AND DEVELOPMENT OFFICE

TUESDAY, JULY 25, 2006

U.S. SENATE,
SUBCOMMITTEE ON AVIATION,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Committee met, pursuant to notice, at 10:08 a.m. in room SR–253, Russell Senate Office Building, Hon. Conrad Burns, Chairman of the Subcommittee, presiding.

OPENING STATEMENT OF HON. CONRAD BURNS, U.S. SENATOR FROM MONTANA

Senator BURNS. We'll call the Committee to order. There are some folks on the way. It is a very busy morning this morning. I think there was a series of about 15 to 17 hearings this morning, all over the Hill and so people will be coming and going. Ranking Member is on his way and I think I'll get my statement out of the way before he gets here and then we'll start taking testimony.

I'd like to thank everybody for coming today and I'd like to welcome Senator Rockefeller back, if it—well, he has had a back operation and he is kind of struggling with his health right now, but he is a brave man and a strong man and we sure appreciate everything that he contributes to this committee and I'll talk to this empty chair for awhile. I won't pay him any compliments once he gets here. I accused—I don't think he has a watch in is office. He just runs his office with a calendar and today is Tuesday.

The Vision 100, the Century of Aviation Reauthorization Act of 2003, we directed the FAA to develop a comprehensive plan for the Next Generation Air Traffic Control Systems. That system needs to accommodate the growth in airline passengers as well as the innovation of unmanned aerial systems, among others. The JPDO, which I call "jump-do," was created to leverage the expertise and resources within the Department of Transportation, the Department of Defense, the Department of Commerce and Homeland Security, as well as NASA and the White House. The question is whether that leveraging is equating into an integrated, manageable pool of resources. Is it essential? The involved agencies and industry work together to solve the complex challenges involved in the next generation system.

The second question is, can it be done sooner than 2025, as currently planned? We have serious competition in Europe and it will be a race on time and resources to fully modernize and establish the future system. This topic will be especially important in the up-

coming months, as we work on the next FAA reauthorization bill. Congress is going to have to make some tough decisions in order to meet the projected increases in air traffic volumes, in hands of system safety infrastructure and increase the efficiency of the air traffic control system. I want the agencies involved, those on the panel and those in the audience, to be on notice that we'll be keeping your feet to the fire on modernizing this system. Every agency, from the FAA to the Department of Defense, needs to keep their eye on the ball, as this committee will keep a close eye on the progress. We can no longer afford to simply maintain the status quo. The economic importance and safety improvements associated with a modern and efficient air system are boundless. While the Committee understands this is an incremental process and not a turn-of-the-switch procedure, it will be turning its attention and spotlight your way in the coming year. Again, I want to thank everybody for coming today.

As I looked at this challenge that we have before us and of course, with the Chairman of the Full Committee here, knowing how important this is, that this is going to take many agencies, it is going to take probably a series of hearings that we've never seen before, to get Congress to move and to engage Congress, not just a little bit but also into the challenge that we have before us. We know that we've got to do things differently now. New technologies are here. New technologies will happen while we're in the process. We have to be very agile and very versatile in order to take advantage of those and it will take people, not only of vision but also courage before we really re-do this whole system and make it move us into a new era of air traffic control, for passenger safety, not only how it relates here on a terrestrial means, so to speak, but also how it interlaces with our travel in space. So it involves people that think big and broad and deep. So I thank you for coming this morning and now I turn to my good friend from Alaska and the Chairman of the Full Committee, Senator Stevens.

STATEMENT OF HON. TED STEVENS,
U.S. SENATOR FROM ALASKA

The CHAIRMAN. Thank you very much, Senator Burns. I'm pleased you are holding the hearing. I'm glad to see these witnesses here to discuss this office and nice to see you back, Administrator Blakey. We've discussed a lot—the situation in Alaska. Seventy percent of our cities can be reached only by air, year-round and we have to have a modern system to assure safety, not only for our people traveling but the medical evacuation process that we use is by air. When I first became Chairman of the Appropriations, the first hearing that I held was in Alaska on safety and I'm delighted that the FAA has been a partner in really improving the situation in Alaska. At that time, I found out that one out of every 11 pilots in our state was losing his or her life in commercial aviation. I think that programs like Capstone and the Five Star Medallion Program, which Administrator Blakey, you have participated in, have really helped a great deal in bringing us a new concept of safety. Now we have to make sure that we have planning for the development of new systems and staying ahead of the game as we go. So, I look forward to working with the Chairman and to listen

to your statements here this morning. I am delighted you took the time to be with us today, Marion. Thank you.

Senator BURNS. Thank you, Mr. Chairman. I appreciate you being here today and now we'll call on the Administrator of the FAA, the Hon. Marion Blakey. Thank you for coming this morning. I look forward to your comments.

STATEMENT OF HON. MARION C. BLAKEY, ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION

Ms. BLAKEY. Is the red light on? There we are, thank you. Thank you, Chairman Burns and Chairman Stevens, for all the ongoing attention you all give to these vitally important matters in aviation. I do appreciate the opportunity to testify about the future of aviation and how we are going to advance it. It is a pleasure to discuss the Joint Planning and Development Office and the Next Generation Air Transportation System. We have testified before this committee several times about the creation of the JPDO. I'll start thinking of it as "jump-do," Mr. Chairman, and its drive to create the NextGen System. To be sure, this is a very ambitious undertaking, requiring strong support from Congress as well as our stakeholders and our colleagues in the Executive Branch, if we are to be successful. We all know how important it is to modernize our aviation system but I'd like to leave you today with a clear sense of the progress we're making in achieving that goal. These two charts that I have up here on each side of the table, I think present a startling picture, not only of where we are but of what is certain to come.

These charts are Exhibits A and B and they tell the tale of why we must modernize, and what will happen if we fail to.

[Senator Rockefeller enters.]

Ms. BLAKEY. Good morning, Senator Rockefeller. I'm just illustrating the charts that we have on each side as to why we have a case for modernization. These graphics essentially show the density of traffic. They highlight operational hotspots when congestion can lead to inefficiencies and frankly, not just inefficiencies but genuine safety concerns across the national airspace system. The chart on the left represents today. It is your left, my right here. The right shows 2025, with three times the traffic level we have now. The warmer colors, as you would expect, yellow and red, show the busiest, most complex flows of traffic. Cooler colors—green, blue, gray—represent flows that are less congested. In 20 years it is pretty obvious: the hotspots dominate. Bottom line? If we fail to modernize, we can't handle the traffic density you're looking at. The red and to some degree, the yellow, literally cannot be handled by human intervention. That is only going to be handled through automation and obviously, we are going to have to be able to move ahead and avoid that.

The FAA and the JPDO are tackling this challenge on two fronts: focusing on the 2025 end state while delivering near term operational benefits. Using advanced technology to make existing capacity work more efficiently, we can provide relief today while helping to lay the foundation for the NextGen System.

Last year, we accelerated the development of some of the key building blocks for the NextGen System. These include Automatic

Dependent Surveillance Broadcast or ADS–B band network-enabled operations. ADS–B you all have heard me talk about before. I'm a true believer. It is a revolutionary technology that uses GPS to transmit real-time surveillance data to controllers and to pilots, substantially improving situational awareness and allowing smaller separate distances between aircraft while maintaining the highest level of safety.

As Chairman Stevens knows all too well, it has been very successfully demonstrated in Alaska through the Capstone Program and we are moving forward now with nationwide deployment. Aircraft equipped with ADS–B have had a consistently lower accident rate than non-equipped aircraft. In fact, in the years from 2000 to 2005, the rate of accidents for ADS–B-equipped aircraft in Alaska, dropped by almost 50 percent. Network-enabled operations—they also show similar promise, especially in making our NextGen System more secure. As the demand for aviation continues to increase, it is clear that everyone in the system must have clear lines of communication. With NEO, as we call it, the left hand always knows what the right hand is doing and we are able to minimize duplication so that everyone pulls in the same direction. This is especially important when we are thinking about security in the sensitive airspace around the Capitol, where the concept has already been demonstrated successfully. We showed how you could connect seven systems from a series of Federal agencies, including FAA, DOD and DHS and how sharing information—and this is from Legacy Systems, I would point out—in real-time, helps agencies respond to a security incident much more quickly and effectively. When you are justifying an expense to the taxpayer, it just makes good business sense to show how the major players are pooling their brainpower and developing and deploying together. The JPDO, of course, is not an implementing or an executing agency so the FAA is working closely with our counterparts to develop an implementation schedule for the operational changes required as these NextGen technologies are deployed. Rather than starting from scratch, we will use the FAA's highly successful Operational Evolution Plan, the OEP as it is known, as a framework. The OEP was created long before the NextGen initiative began as a 10-year rolling plan to develop new capacity for our busiest airports. It has helped to add runways and redesign airspace in areas where the taxpayer would get the biggest bang for the buck. And, I'm happy to say, over the years, time and again, it has worked. We've deployed 12 new runways since 1999 and I want to repeat that because 12 new runways since 1999 is huge by any standards and there are more on the way. We are now, therefore, expanding the focus of this very successful plan, the OEP, to include the NextGen System so we will have a seamless approach. Now we are calling it the Operational Evolution Partnership—the bridge from the OEP today to the NextGen System of tomorrow. But the label, of course, is honestly unimportant. What is important—the bottom line, is that this is a successful way to deploy and its new construct will serve as the roadmap from today's NAS to tomorrow's NextGen System.

Over the last few years, we have gone to great lengths to operate the FAA like a business and I know you all have heard me talk about this time and again. That does mean setting very specific

goals and measuring our success. For the first time this year, we will be incorporating progress toward the NextGen System into our flight plan in a much more robust way. The current 5-year business plan for the FAA was released just last week for public comment, as we do every year and it includes several major initiatives to support the NextGen transformation. Progress reports on each goal and milestone are posted monthly to the web and we've linked the bonuses for the FAA employees to the achievement of these goals. When you tie success to a paycheck, success tends to happen and I'm confident it will continue to do so.

So how do you tie all these pieces together? One of the major deliverables for the JPDO include one of the critical elements in defining the NextGen System itself. It is the development of an agreed concept of operations, CONOPS. This document will provide the basic operational description of how the NextGen System will work. It will help us develop the requirements and capabilities associated with the air transportation system of 2025. It is essentially a sketch of things to come and underscores how the new system will improve upon what we have today. Make no mistake; the concept of operations will guide investment decisions, both in research and systems deployment.

I am pleased to announce that the first phase of the Concept of Operations was released yesterday. It is on our website, of course, that is the primary way to access it but I did bring a copy of the document with me today as well. We're looking for comment. We're looking for stakeholders to provide additional input, although they have provided substantial input already on other phases. As we receive their comments, they will be released over the next several months. We expect to complete it by early next year in a final form.

The importance of developing a modernized system is also quite clear to policymakers in Europe, where a comparable effort, as you all well know, is underway. I am also happy to say that last week at Fernborough, where Chairman Stevens and I were both over there for various activities having to do with our European counterparts, we were able to reach an agreement with the European Commission, to coordinate our modernization programs. This agreement provides the framework for developing a more effective, performance-based air navigation system between the United States and Europe. It is the right thing for safety. It is the right thing for efficiency and if we've learned anything, a seamless sky can supercharge our economy and Europe knows that as we do. So, we both have a great deal of energy behind that and in signing this agreement with Jacques Barrot, I think he was as pleased as I was.

With all of this said, let me emphasize that cost is going to be a vital factor in all of this. We cannot create the Next Generation System that is unaffordable. We are working, therefore, with the Next Generation Institute, which represents all of the commercial sector, all of our stakeholders, to hold several workshops, from their vantage point as well as ours, so that the critical assumptions and uncertainties underlying any cost benefit analysis, can be scrutinized and validated by the industry. The first of these workshops, focusing on commercial aviation, I'd have to say was surprisingly helpful to all involved. It set the stage for collaborative develop-

ment of our assumptions about operations and equipage. We will also be meeting with the general aviation community and with the airport communities in the next couple of months.

Today, we are making technological advancements and laying the groundwork for the NextGen System. No question about it, a lot of challenges remain. We know, for example, if we are to see the benefits of the Next Generation System fully realized, the FAA's financing system is going to have to be reformed. Nevertheless, we remain focused, knowing that our plan for the Next Generation System must succeed.

Aviation continues to expand at an exponential rate. You can see that from these charts and we have no choice but to be ready. So with that, Mr. Chairman, I am concluding my testimony. Thank you for this opportunity.

[The prepared statement of Ms. Blakey follows:]

PREPARED STATEMENT OF HON. MARION C. BLAKEY, ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION

Good morning Chairman Burns, Senator Rockefeller, and members of the Subcommittee. Thank you for the opportunity to testify today about the multi-agency Joint Planning and Development Office (JPDO) and the work we are doing together to develop and deploy the Next Generation Air Transportation System (NextGen) while providing operational and safety enhancements that deliver benefits to our customers today.

Our Nation's air transportation system has become a victim of its own success. We created the most effective, efficient and safest system in the world. But we now face a serious and impending problem, one that the FAA and this committee are well aware of. Demand for air services is rising, and could as much as triple over the next two decades. While the industry downturn following the attacks of September 11 temporarily slowed the growth in the aviation industry that began in the late 1990s, demand is growing rapidly. And we have to be ready to meet it.

The warning signs are everywhere. Flight delays and cancellations have reached unacceptable levels. Other issues, ranging from environmental concerns to the complexities of homeland security are placing additional stresses on the system.

If we fail to address issues such as increased capacity in a deliberate and focused way, we will suffocate the great engine of economic growth that civil aviation has become.

The FAA and the JPDO have taken a dual track yet complementary approach, keeping our eyes focused on the NextGen Vision while using existing technology to provide important and tangible operational benefits now and in the future to users of the National Airspace System (NAS). We are finding ways to make existing capacity work more efficiently through advanced technology and operational improvements, with many of these efficiencies not only providing relief today but helping to lay the foundation for the Next Generation System.

The JPDO now serves as a focal point for coordinating the research related to air transportation for agencies across the Federal Government, including the Departments of Transportation, Commerce, Defense and Homeland Security, as well as NASA and the Office of Science and Technology Policy. The initiative achieved important milestones in 2005 toward designing the NextGen system. The JPDO completed its internal organization and created eight government/industry Integrated Product Teams (IPTs) to break this large and complex project into manageable strategies. These strategies focus on those aspects of aviation that hold the keys to capacity and efficiency improvements—airport infrastructure, security, a more agile air traffic system, shared situational awareness, safety, environmental concerns, weather and global harmonization of equipage, and operations. The Teams work closely with our stakeholders to ensure that they have an early window into the planning process and that we take full advantage of their expertise every step of the way. Further accomplishments to date are highlighted in the recently published "2005 Progress Report to the NGATS Integrated Plan" that was transmitted to Congress on March 10 as required by Vision 100.

We need the best minds in America across both the public and private sectors working on the task of creating a NextGen system. To achieve this, we have established a Next Generation Air Transportation System Institute (the NGATS Insti-

tute) that allows stakeholders to get directly involved in the transformation process. And, while the Aerospace Industries Association (AIA) is the host for the Institute, it is co-chaired by the presidents of the Air Line Pilots Association and the Air Transport Association and open for participation by all segments of the industry.

What truly sets this new structure apart is that it minimizes duplication of effort and resources among Federal agencies and maximizes the input of the private sector toward a common goal—the creation of a NextGen system.

One of the common misconceptions about the NextGen initiative, however, is that we have to wait until 2025 to start seeing the benefits. FAA is currently implementing a system known as Required Navigation Performance (RNP). RNP uses onboard technology that allows pilots to fly more direct point-to-point routes reliably and accurately. RNP is extremely accurate, and gives pilots not only lateral guidance, but vertical precision as well. RNP reaches all aspects of the flight—departure, en route, arrival, and approach. For example, in January 2005, in partnership with Alaska Airlines, we implemented new RNP approach procedures at Palm Springs International Airport, which is located in very mountainous terrain. Under the previous conventional procedures in use at Palm Springs, planes could not land unless the ceiling and visibility were at least 2,300 feet and three miles. With these new RNP procedures, air carriers with properly equipped aircraft can now operate with a ceiling and visibility as low as 734 feet and one mile. This lower landing minima has allowed Alaska Airlines to "save" 27 flights between January and November, 2005—flights which would have otherwise had to divert to Ontario, California—an added distance of at least 70 miles. Given the current state of fuel prices, savings such as this can mean a great deal to an airline's bottom line, to say nothing of passengers' schedules and convenience.

Establishing an initial Network-Enabled Operations (NEO) capability is a high priority for the JPDO and its member agencies, given its fundamental importance to the success of the NextGen System. Current efforts focus on identifying the network architecture and enacting standards for information and safety data sharing. The Department of Defense (DOD) has already invested considerable resources in information technology and telecommunication research focused on NEO and information access and sharing. FAA, as well as the Departments of Homeland Security (DHS) and Commerce, are committed to developing network-centric information architectures that draw on the lessons learned by DOD. The opportunity now exists to synchronize these efforts, especially in the areas of data interoperability and compatible network-to-network interface mechanisms, and two on-going DOD initiatives—the synchronization of DOD and DHS classified networks and DOD's development of its Net-Centric Enterprise Services—will serve as templates for this effort.

The benefits of this technology are clear. In 2005, the JPDO, FAA and an industry team showed how network-enabled concepts developed for military customers can be applied to Air Traffic Management. The Joint Network-Enabled Operations Security Demonstration connected seven existing Air Traffic Management and security systems distributed over 12 different locations. It showed how sharing information in real time across air traffic, air defense, and law enforcement domains could improve coordination and help agencies respond to a security incident more efficiently—thereby lessening the need for evacuations and scrambling fighter jets. The exciting part of the NEO demonstration is that it enabled communication between agencies' current networks, eliminating the need to throw out all the individual legacy systems and create a brand new mega-system, which would be prohibitively expensive. As a part of the "spiral development process" for NEO, an approach to systems development that makes continuous improvements and changes throughout the development process, the JPDO is planning a second joint agency NEO demonstration. In Fiscal Year 2007, the FAA will participate in the second NEO demonstration under the System Wide Information Management (SWIM) program. The President's budget proposal for Fiscal Year 2007 requests $24 million for SWIM. FAA's investment in the second NEO demonstration will allow us to apply lessons learned to the acquisition phase of SWIM. SWIM will provide a secure NAS-wide information web to facilitate a transition toward network-based air traffic operations and allow the FAA to lead and participate system-wide in network-enabled operations with system users, global air navigation service providers and other government agencies.

In its Fiscal Year 2007 budget request, the Administration proposed targeted investments, in addition to SWIM, to promote early implementation of core elements of the NexGen system. Additional initiatives that will serve as building blocks of the new system will be added to the mix as the Enterprise Architecture is fully developed and system requirements are established.

One of our most promising initiatives with potential for broad operational applications is Automatic Dependent Surveillance-Broadcast (ADS–B), a technology that

could replace ground-based radar systems and revolutionize air navigation and surveillance by providing radar-like separation procedures in remote areas that cannot currently be served by radar; by providing near real-time, in-the-cockpit, aeronautical information such as weather and notices to airmen; by enabling capacity gains by reducing existing separation standards in all domains and airspace classifications; by supporting increased capacity through user-executed airborne spacing, sequencing and separation operations; and by providing improved information for traffic flow management and fleet management—all while reducing our infrastructure costs. ADS–B uses GPS satellites and ground-based transmitters to allow aircraft to broadcast their positions with greater frequency and accuracy than our legacy radar systems. Moreover, with ADS–B, future pilots will see exactly what the air traffic controller sees. For Fiscal Year 2007, the President's budget includes $80 million for the FAA for the ADS–B program to begin moving toward nationwide deployment.

The ADS–B system was the key enabling technology for the Capstone demonstration program in Alaska. Capstone is a technology-focused safety program that seeks near-term safety and efficiency gains in aviation by accelerating implementation and use of modern technology, in both avionics and ground system infrastructure, with the goal of reducing the exceedingly high accident rate in Alaska for small aircraft operations, which was nearly five times greater than the national average. Through 2005, the program achieved significant safety and efficiency results. The use of ADS–B information by the Bethel Airport Traffic Control Tower continues to provide benefits to all Bethel operators by enhancing the ability to better balance arrival flows and demand when weather conditions at the airport deteriorate below visual flight rules conditions. Aircraft equipped with ADS–B have had a consistently lower accident rate than non-equipped aircraft. From 2000 through 2005, the rate of accidents for ADS–B-equipped aircraft dropped significantly—by 49 percent. That is real progress, and we will build on this success as we expand the use of ADS–B elsewhere in the country.

One of the first uses of ADS–B technology outside of Alaska will be in the Gulf of Mexico. We have recently 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 unprecedented Air Traffic Control services in the Gulf. This technology will also develop new air routes with improved separation standards for high altitude airspace.

These new technologies and procedures are vital both to improving our air traffic system today and to building the NextGen system of 2025. To ensure we deliver these benefits as quickly as possible, FAA is incorporating NextGen goals and targets into the agency's strategic planning process in a much more comprehensive way. The draft FAA Flight Plan for 2007–2011, released for public comment just last week, includes several major initiatives that support the transformation to the NextGen system. And we've added the NextGen symbol in the Flight Plan to easily identify each initiative that supports the modernization of the National Airspace System.

As a result, the Flight Plan will now capture explicitly what we must do in the near term through the Integrated Product Teams to achieve the NextGen vision. In other words, it helps us to identify the pipeline and funding to implement new technologies and incorporate the operational concepts that will serve as the foundation for the NextGen system. This will provide both an internal process for ensuring commitments are met and an external process for communicating the FAA's progress to our stakeholders.

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. We intend to use the construct of our existing Operational Evolution Plan (OEP) to help us. However, we will expand the scope of the OEP from a ten-year rolling plan focused exclusively on capacity to a plan that will take us from the configuration of today's National Airspace System (NAS) to tomorrow's NextGen system. In the new Operational Evolution Partnership (OEP), JPDO transformational operating concepts will be identified, rigorously evaluated, prototyped, and tested so they can be ready for transition into the NAS. Required operational implementation schedules will be tracked, as well as dates by which initiatives must be funded in order to meet those schedules.

The NAS and NexGen 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 inform our owners, customers, and aviation community of our plans and progress toward 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 NexGen system that is not affordable. We are working with the NGATS Institute to hold several workshops with our stakeholders so that the critical assumptions and uncertainties underlying any cost benefit analysis can receive scrutiny and validation for future use. The first of these workshops, focusing on the commercial aviation sector, was very helpful and has set the stage for a collaborative development of our assumptions on such issues as operations and equipage. We expect similar such engagement as we meet with representatives from other segments of the industry, such as the General Aviation Community. Of course, even after we develop the basic assumptions, we will continue to work closely with the industry as we develop the cost models.

Our vision of the NextGen system is not limited to increased airspace capacity. Rather, it is one which encompasses the whole air travel experience—from the moment the passenger arrives at the curb of his departure airport to his or her exit from their destination airport. The NextGen system includes security, safety, and efficiency of passenger, cargo and aircraft operations. Technology will change the way America flies, and aircraft will be able to use information technology in a more robust way, with enhanced cockpit, navigation and landing capabilities, and far more comprehensive and accurate knowledge of real-time weather and traffic conditions.

The NextGen system will be more flexible, resilient, scalable, adaptive, and highly automated. The NextGen operational vision is not just related to the air traffic management system alone, but also includes the preservation and growth of airports, heliports, and other future landing and departure facilities to incorporate fully the emerging system's benefits. This system will be built on a far more robust information network than anything we have seen to date, ensuring that the right information gets to the right person at the right time, while keeping the Nation safe and the flow of traffic running smoothly. Finally, we will put more information directly into the cockpit of intelligent aircraft through sensors and satellites linked together through network communications.

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 and the Enterprise Architecture. These documents define each NextGen function, what the requirements will be, and how it will evolve. They are absolutely essential to the future development of the NextGen system.

The Concept of Operations is a document that provides the basic operational description of how the NextGen system will actually function. This kind of explanation, offered in one document, will be critical to developing the specific requirements and capabilities for our national air transportation system in 2025. In a sense, the Concept of Operations is like an architect's preliminary drawings—it outlines what the system will look like, how it will function, and what its capabilities will be.

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 represents the actual plan for how the NextGen system will be developed, much like a set of blueprints. This includes the systems that will be needed, the timing for their deployment, and how they will work together.

Both of these documents, the Concept of Operations and the Enterprise Architecture, 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 has made considerable progress on both products, and I am pleased to say that the first phase of the Concept of Operations was released this week on the JPDO website. It is now available for review and comment by our stakeholders, and we are anxious to receive their feedback. Other phases of the Concept of Operations will be released in the next few months, along with the Enterprise Architecture. We expect the completed versions of each set of documents to be complete by early next year.

The importance of developing this system of the future is also quite clear to policymakers in Europe, where a comparable effort 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.

We are working to avoid that future by seeking out partnerships with our international counterparts. This year we have established steering groups with China, Japan, Canada and Mexico to facilitate cooperative activities on the design of the NextGen system. These groups are moving forward to pursue joint initiatives, such as ADS–B, SWIM, and Enterprise Architecture which are aligned with the required performance-based systems.

In addition, I just returned from the Farnborough Air Show, where I concluded an agreement with Jacques Barrot, the Vice President of the European Commission, which formalizes cooperation between the NextGen initiative and its European counterpart, the Single European Sky Air Traffic Management Research (SESAR) program. The FAA and the EC intend to identify opportunities and establish 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 overarching goal in the NextGen initiative is to develop a 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. Research will continue to help us find the right balance between a centralized satellite and ground system and a totally distributed system, where aircraft "self-manage" their flight with full knowledge of their environment.

The current technological and operational improvements are positive steps down the road to building the NextGen system. If we are to see the benefits fully realized, however, it is absolutely imperative that we reform the financing system for the FAA. Over the next few years we will work to achieve better cost management; determine the best solution for our aging and deteriorating facilities; and, conduct research on convective weather to reduce flight delays associated with summer storms. We strive to improve efficiency, while searching for innovative ways to provide safer services even more efficiently. However, we need to establish the financing of our current and future operations based on actual costs and investment requirements that will realize tangible benefits and increasing efficiency. As we decide how to wisely invest in our future, we will continue to work closely with our customers, our employees, and of course, Members of Congress.

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

Senator BURNS. Thank you and I would caution—you know, all the things that you took us to. Are these charts available to members of this committee?

Ms. BLAKEY. They are.

Senator BURNS. They are?

Ms. BLAKEY. Yes.

Senator BURNS. Today?

Ms. BLAKEY. I hope we have them up there in color for you. We intended to.

Senator BURNS. It would help because I think there are probably a lot of Members of Congress that are not aware of the challenges that we face and these are pretty stark realities as we look here. Also, everything that you mentioned in there—let me warn that everything we do as we take off on this expedition is going to have to include the private sector. We can sure experience paralysis by analysis and we don't want to get into that kind of a situation either, because we know that we have to make progress.

Senator Rockefeller has joined us today and I would assume that you have a statement and we would look forward to that before we call on Dr. Porter.

STATEMENT OF THE HON. JOHN D. ROCKEFELLER IV, U.S. SENATOR FROM WEST VIRGINIA

Senator ROCKEFELLER. Mr. Chairman, thank you for your usual courtesy. I do have a statement. I worked on it last night. It is quite long. I think the mood in the room would decline as I continued although it is a very positive statement and I also cannot stay all that long. I have to hear my favorite FAA Administrator, so I will decline your invitation with thanks.

Senator BURNS. Well, we've got the room leased for all day if you want to—no matter how—if you still wanted to make a statement.

Senator ROCKEFELLER. We'll just put it in the record.

[The prepared statement of Senator Rockefeller follows:]

PREPARED STATEMENT OF HON. JOHN D. ROCKEFELLER IV, U.S. SENATOR FROM WEST VIRGINIA

We all recognize that the U.S must significantly expand the capacity of our Nation's air transportation system to make sure that we continue to have the most effective, safe and secure aviation system in the world. The Administrator understands the great importance of meeting the challenge to modernize our airspace system, and I want to commend her for her continued leadership in this effort.

This year is critical with the scheduled completion of needed roadmaps that will provide the blueprint for the future National Airspace System. As we head into FAA Reauthorization, the FAA and entire Administration must continue to communicate closely so that Congress can properly assist this effort in the coming months.

I will be watching as the Next Generation Air Traffic System architecture is completed and the business case for this effort is developed. Too many times in the past, we have spent recklessly on the FAA's modernization efforts—often with exploding budgets providing mixed results at best. Adequate funding continues to be a major concern and we cannot afford to shortchange this effort. You must make clear what steps need to be taken and all of the stakeholders have to work together to make these plans become a reality.

Furthermore, it is my understanding that the Administration will not be providing Congress with a proposal to change the financing of the agency's operations this year. I know that the Administrator has been working very hard to finalize this proposal, and I hope that the Administration decides very early next year on this or Congress will not have time to review this proposal.

The improved efficiencies to be gained through airspace modernization will provide billions of dollars in increased productivity to U.S. and global businesses. Air carriers will see fuel costs reduced—aiding their bottom lines, and more direct routing will certainly lead to additional environmental and economic benefits.

It is vital to our position as the global leader in the aviation industry that our modernization initiatives are a success, and I look forward to doing what I can to help you meet this goal.

Senator BURNS. Thank you very much, Senator. I appreciate that very much and I look forward to working with you as we work on this huge undertaking.

We have with us this morning, Dr. Lisa Porter, Associate Administrator of Aeronautics Research, National Aeronautics and Space Administration. Thank you for coming this morning.

STATEMENT OF DR. LISA J. PORTER, ASSOCIATE ADMINISTRATOR FOR AERONAUTICS RESEARCH, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Dr. PORTER. Thank you, Mr. Chairman and members of the Subcommittee. I appreciate this opportunity to appear before you today to discuss the status of the NGATS, the Next Generation Air Transportation System. NASA is committed to working with our partners at the JPDO to provide the high quality, cutting edge research and technical excellence required to develop the NGATS.

The future air traffic management system must be scalable to support increased capacity as well as flexible to accommodate the wide variety of air vehicles that will fly within the system. New concepts and technologies must be conceived and developed that will completely transform the over-arching structure that will coordinate thousands of vehicles operating in the national air space at any given time. NASA's air space systems program will therefore focus on developing revolutionary concepts, capabilities and technologies that will enable significant increases in the capacity, efficiency and flexibility of our national air space system. We will develop and explore fundamental concepts and integrated solutions that will address the optimal allocation of ground and air automation technologies necessary for the NGATS. We will also develop and validate algorithms, concepts and technologies to enable high-capacity efficient and safe air portal systems for the ground and terminal area domains.

However, it is critical to recognize that the challenges we face in developing the future air transportation system, are not limited to air traffic management alone. Increasing the capacity of the ATM system by factors of two or three will be nothing more than a theoretical exercise if we do not simultaneously address the substantial noise emissions efficiency and performance challenges facing the air vehicles of the future. These are issues that cannot be worked in isolation. A holistic approach to vehicle design will be required in order to address multiple and often conflicting design requirements. Therefore, a key focus of NASA's fundamental aeronautics program will be the development of physics-based, predictive design tools that will enable the rapid evaluation of new concepts and technologies and it will accelerate their application into a wide variety of future air vehicles. This capability will only be possible if we are dedicated to both the pursuit of cutting-edge research across the core aeronautics disciplines and the integration of that research to enable multidisciplinary tools and technologies. The noise emissions efficiency and performance of air vehicles are all interrelated through core disciplines, such as materials, structures, aerodynamics, acoustics, combustion and controls. Furthermore, as we look toward the future at the projected increases in air traffic and future system capabilities, we must make a firm commitment to conduct the research necessary to ensure that our high safety standards are not compromised. NASA's aviation safety program will therefore focus on developing cutting edge tools, methods and technologies intended to improve the intrinsic safety attributes of aircraft that will be operating in the evolving NGATS. We will conduct research that focuses on improving the inherent resiliency, life cycle durability and maintenance of modern aircraft and associated onboard systems. We will also pursue flight deck related technologies that will ensure that crew workload and situation awareness are both safely optimized and adapted to the future NGATS' operational environment.

Finally, taking into account the advanced automation and autonomy capabilities envisioned by NGATS, we will pursue methodologies to enable an aircraft to automatically detect, avoid and/or safely recover from an off-nominal condition that could lead to a loss of control. NASA has interacted closely with the JPDO during the

past several months to ensure proper alignment of our research plans with the needs of the NGATS. We have solicited input from the JPDO during both our preliminary technical planning last fall and our rigorous review process this past spring. We have employed a research program formulation process that put our researchers in charge of writing technical proposals with input from other government agencies and from the private sector, through a Request for Information, commonly referred to as a RFI. These proposals were reviewed by panels of government subject matter experts, including JPDO members, who evaluated the proposals based on their technical, management, resource and partnership plans. Our thorough proposal review process ensured that the proposed research plans were technically credible and well aligned with the NGATS vision. This level of coordination and cooperation will remain an ongoing element of our strategic partnership with the JPDO.

Now, obviously a vision as revolutionary and ambitious as that of the NGATS will face some significant challenges in the coming months and years. Technically, the most important near-term challenge is the development of the enterprise architecture. While each agency has been able to vector its research portfolio in the right direction according to the goals articulated in the NGATS vision, the establishment of detailed system requirements that flow from enterprise architecture, will allow each member agency to better refine its R&D plans. Given that every agency has budget constraints and always will, the establishment of an enterprise architecture will be critical to ensure that each agency can prioritize its R&D investments in the manner that provides the maximum return on investment for the JPDO. The JPDO intends to provide a preliminary enterprise architecture by the fall of 2006.

In conclusion, NASA's Aeronautics Research Directorate is investing in high-quality, cutting-edge research in areas that are appropriate to NASA's unique capabilities in order to enable the NGATS vision. We have aligned our research portfolio to meet this challenge with an efficient allocation of resources in an unwavering commitment to technical excellence.

Once again, thank you for the opportunity to testify today. Mr. Chairman, members of the Subcommittee, I would be pleased to answer any questions that you may have.

[The prepared statement of Dr. Porter follows:]

PREPARED STATEMENT OF DR. LISA J. PORTER, ASSOCIATE ADMINISTRATOR FOR AERONAUTICS RESEARCH, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Mr. Chairman and members of the Subcommittee, thank you for this opportunity to appear before you today to discuss the status of the Next Generation Air Transportation System (NGATS). NASA is committed to working with our partners at the Joint Planning and Development Office (JPDO) to provide the high-quality research and technical excellence that is required to develop the NGATS.

NASA's Aeronautics Research Mission Directorate (ARMD) is currently undergoing a comprehensive restructuring to ensure that we have a strategic plan in place that enables us to pursue long-term, cutting-edge research for the benefit of the broad aeronautics community. The three principles guiding this restructuring are as follows: (1) We will dedicate ourselves to the mastery and intellectual stewardship of the core competencies of aeronautics in all flight regimes; (2) We will focus our research in areas appropriate to NASA's unique capabilities; and (3) We will directly address the fundamental research needs of the NGATS while working closely with our agency partners in the JPDO.

Regarding the third principle, one of the research challenges that NASA will directly address will be that of Air Traffic Management (ATM). While our current ATM system has served the country well, there are critical shortcomings that prevent it from meeting anticipated future demands. The future ATM system must be scalable to support increased capacity as well as flexible to accommodate the wide variety of air vehicles that will fly within the system. New concepts and technologies must be conceived and developed that will completely transform the overarching structure that will coordinate thousands of vehicles operating in the national airspace at any given time.

However, it is important to recognize that the challenges we face in developing the NGATS are not limited to ATM alone. For our air transportation system to continue to function, future air vehicles will need to address substantial noise, emissions, efficiency, and performance challenges. These are issues that cannot be worked in isolation—a holistic approach to vehicle design will be required in order to address multiple and often conflicting design requirements. Furthermore, as both the vehicles and the airspace system become increasingly complex, we must make a commitment to conduct the research necessary to ensure that our high safety standards are not compromised.

Therefore, NASA's ARMD will conduct the long-term, cutting edge research that will be necessary to ensure revolutionary capabilities for both the air vehicles of the future as well as the air transportation system in which they will fly. Gone are the days when one can design innovative vehicles without consideration of the airspace, and the converse is, of course, equally true. We have four major programs—the Airspace Systems Program, the Aviation Safety Program, the Fundamental Aeronautics Program, and the Aeronautics Test Program—each of which contributes to the research needs of the future air transportation system, as described in more detail below. NASA has constructed a balanced research portfolio that draws upon our NASA-unique capabilities to address ATM, vehicle, and safety-related research challenges—all of which must be worked in order for NGATS vision to be realized. Funding levels among the programs have been balanced to ensure that our intellectual stewardship of the core competencies of aeronautics is not compromised.

ARMD has interacted closely with the JPDO during the past several months to ensure proper alignment of our research plans with the needs of the NGATS. Specifically, we have solicited input from the JPDO during both our preliminary technical planning last fall and our rigorous review process this past spring. ARMD has employed a research program formulation process that put NASA researchers in charge of writing technical proposals with input from other government agencies and the private sector through a Request for Information (RFI). These proposals were reviewed by panels of government subject matter experts, including JPDO members, who evaluated the proposals based on their technical, management, resource, and partnership plans. The researchers were provided detailed feedback from these reviews and used this feedback to further refine their proposals. The proposals then underwent a second review. Our thorough proposal review process ensured that the plans were technically credible and well-aligned with the NGATS vision. This level of coordination and cooperation will remain an ongoing element of the ARMD strategic partnership with the JPDO. In the final step, we used a NASA Research Announcement (NRA) as the means to solicit research proposals for foundational research in areas where NASA needs to enhance its core capability. The competition for the NRA awards is open to both academia and industry. The NRA was released on May 24th, and the initial proposals were due July 7th. The NRA will remain open to enable us to conduct an additional round of proposal evaluations later in the year.

Finally, in addition to conducting research that directly addresses NGATS challenges, we have placed a strong emphasis on active participation in the JPDO, providing personnel, analysis tools, and funding to directly support its functions and activities. NASA is actively involved in all the organizational elements of the JPDO, from the Integrated Product Teams (IPTs) and the Evaluation and Analysis Division (EAD) up through the Senior Policy Committee (SPC), which oversees the work of the JPDO and is chaired by the Secretary of Transportation.

Airspace Systems

The objective of the Airspace Systems Program (ASP) is to develop revolutionary concepts, capabilities, and technologies that will enable significant increases in the capacity, efficiency and flexibility of our National Airspace System (NAS)—an objective that is clearly aligned with the JPDO's vision of the NGATS. The ASP consists of two projects: the NGATS ATM: Airspace Project and NGATS ATM: Airportal Project.

The Airspace Project will develop and explore fundamental concepts and integrated solutions that address the optimal allocation of ground and air automation technologies necessary for the NGATS. The project will focus NASA's technical expertise and world-class facilities on addressing the question of where, when, how, and the extent to which automation can be applied to moving aircraft safely and efficiently through the NAS. Research in this project will address Four-Dimensional (4–D) Trajectory Operations including advances in the science and applications of multi-aircraft trajectory optimization that solves the demand/capacity imbalance problem and manages the separation assurance requirement. We also will conduct research to explore Dynamic Airspace Configurations that address the technical challenges of migrating from the current structured, static homogenous airspace to a dynamic, heterogeneous airspace that adapts to user demand and changing constraints of weather, traffic congestion, and a highly diverse aircraft fleet. Ultimately, the roles and responsibilities of humans and automation touch every technical area and will be addressed thoroughly.

Working in close collaboration with the Airspace Project, the Airportal Project will develop and validate algorithms, concepts, and technologies to enable high-capacity, efficient and safe airportal systems for the ground and terminal area domains of the National Airspace System (NAS). Currently, the growth of air traffic demand and fleet diversity is causing the operational volume at hub airports to rapidly approach their maximum capacity. The research in this project will develop solutions that safely integrate surface and terminal area air traffic optimization tools and systems with 4–D trajectory operations. These tools and systems will be aimed at mitigating the growing constraints at the Nation's hubs (adverse weather, noise, emissions, wake vortex hazards, etc.) and will contribute toward significant increases in airport throughput.

Substantial leveraging of research across the two projects will occur in areas such as computational science and engineering, applied mathematics for system optimization, trajectory design and conformance, automation design, and adaptive air/ground automation. Ultimately, the results of the two projects will be integrated to ensure gate-to-gate solutions that are aligned with the NGATS needs.

Aviation Safety

Through the vigilance of industry and government, the U.S. Air Transportation System is widely recognized as one of the safest transportation systems worldwide. Looking toward the future at the projected increases in air traffic and future system capabilities, this vigilance must continue to meet both public expectations for safety and the full realization of the NGATS. The Aviation Safety Program (AvSP) will help meet these future challenges by developing cutting-edge technologies intended to improve the intrinsic safety attributes of aircraft that will operate in the evolving NGATS. There are four projects in the AvSP: Integrated Vehicle Health Management (IVHM), Aircraft Aging and Durability (AAD), Integrated Intelligent Flight Deck (IIFD), and Integrated Resilient Aircraft Control (IRAC).

The IVHM and the AAD projects will focus on improving the inherent resiliency, life-cycle durability, and maintenance of modern aircraft and associated onboard systems. The IVHM project will conduct research to advance the state of highly integrated and complex flight critical health management technologies and systems. Potential benefits include reduced occurrence of in-flight system and component failures, and onboard systems capable of self-detecting and self-correcting anomalies during a flight that could otherwise go unattended until a critical failure occurs. The AAD project will develop advanced diagnostic and prognostic capabilities for detection and mitigation of aging-related hazards. The research and technologies to be pursued will decrease the susceptibility of current and next generation aircraft and onboard systems to premature deterioration and failures, thus greatly improving vehicle safety and mission success.

New capabilities envisioned for the NGATS such as Super Density Operations, Aircraft Trajectory-Based Operations, and Equivalent Visual Operations pose potential safety challenges for ensuring optimum crew workload distribution and application of advanced flight critical automatic and autonomous systems. The AvSP will conduct research on advanced vehicle-based capabilities to address potential unintended consequences that could compromise vehicle or system safety. The IIFD project will pursue flight deck related technologies that will ensure that crew workload and situation awareness are both safely optimized and adapted to the NGATS future operational environment. A key component of this research will be investigating methods to automatically monitor, measure, and assess the state of the crew awareness to their assigned task. The IRAC project will conduct research to advance the state of aircraft flight control automation and autonomy in order to prevent loss-of-control in flight, which is the accident category that currently has the

highest number of aircraft accidents. Taking into account the advanced automation and autonomy capabilities as envisioned by NGATS, the research will pursue methodologies to enable an aircraft to automatically detect, avoid, and/or safely recover from an off-nominal condition that could lead to a loss of control. A key component of the research will be to develop technologies that would enable an aircraft control system to automatically adapt or reconfigure itself in the event of a failed or damaged component.

Fundamental Aeronautics

The Fundamental Aeronautics Program (FA) is dedicated to the mastery and intellectual stewardship of the core competencies of aeronautics across all flight regimes. These regimes span rotorcraft and subsonic fixed wing vehicles, supersonics, and hypersonic flight.

Future aircraft in the NGATS will need to be quiet and clean to meet stringent noise and emissions regulations. Additionally, these air vehicles will need to meet challenging performance requirements to make them economically viable alternatives to the existing fleet. A holistic approach to vehicle design will therefore be required in order to address multiple and often conflicting design requirements. This in turn requires substantial improvements in our current ability to predictively design aircraft.

Today's design tools can be used for incremental improvements to existing engines and airframes. However, because they are based on empirical knowledge obtained over a long history of small design improvements, they cannot be used to design truly innovative engines and air vehicles. A key focus of FA will be the development of physics-based Multidisciplinary Design Analysis and Optimization (MDAO) tools that will provide the ability to evaluate radically new vehicle designs. They will also enable the ability to assess, with known uncertainties, the potential systems impact of innovative technologies and concepts. Advancements at the system level will continue to be incremental without them. The development of such tools requires a firm commitment to both the pursuit of long-term, cutting-edge research across the core aeronautics disciplines and the integration of that research to enable multidisciplinary tools and technologies. The noise, emissions, efficiency and performance of air vehicles are all interrelated through core disciplines such as materials, structures, aerodynamics, acoustics, combustion, and controls.

We must acknowledge that these future challenges are so substantial that we cannot falter in our commitment to conduct high-quality, cutting-edge research to address fundamental scientific and engineering issues in such areas as noise source characterization, combustion chemistry, alternative fuel chemistry, turbulence modeling, materials design, and active flow control. Only by taking a strategic and comprehensive approach to air-vehicle research will we be able to ensure the future of air transportation in this country.

Aeronautics Test Program

NASA has established the Shared Capability Asset Program (SCAP), which includes the Aeronautics Test Program (ATP). The ATP ensures the long-term availability and viability of the set of aeronautics test facilities, working with the Department of Defense (DOD) and the U.S. aircraft industry, considers being of national strategic importance. Several of these facilities will be critical in supporting research that directly addresses the research needs of the NGATS. These include ground test facilities that are used to simulate adverse weather conditions, to measure engine and airframe noise, and to measure engine emissions.

Evaluation and Analysis

In addition to conducting research that directly addresses the challenges of the NGATS, NASA provides a direct role in evaluating and analyzing proposed systems-level NGATS concepts and architectures. NASA personnel are key members of the JPDO Evaluation and Analysis Division (EAD), which is now an inherent entity within the JPDO. Many of the sophisticated simulations and models being used by the EAD to evaluate concepts to ensure that we will be developing a system that will most efficiently and effectively meet the needs of tomorrow's air transportation system have been developed by NASA. Likewise, NASA employs these tools to evaluate the impacts of its own research program upon the national objectives for transformation.

Challenges for the JPDO and the Way Ahead

The JPDO's vision for the NGATS is revolutionary and ambitious, and therefore faces some significant challenges. Programmatically, the most obvious challenge is that of preserving the strong cooperation that currently exists among the member agencies for the next twenty years. Such cooperation is often personality-driven, but

it must be sustained as individuals in each organization come and go. It is therefore imperative that the JPDO remains focused on close cooperation at all levels. Currently, this is accomplished at the technical level through the multi-agency IPTs and the joint architecture council. From an oversight perspective, a senior interagency board is in place to support the SPC and ensure that high-level leadership is engaged in all critical aspects of the NGATS development. All member agencies of the JPDO must remain committed to supporting these processes, and the processes themselves must continue to evolve as the NGATS development matures.

A perhaps less obvious but equally important challenge is the necessity to not compromise technical integrity as the JPDO faces the reality of maintaining "advocacy" among stakeholders. In other words, the JPDO must be willing to adjust technical goals and milestones if research results determine that it is necessary to do so. The JPDO cannot succumb to political pressures of overselling or overstating system-level goals that are found to be technically or economically infeasible. A commitment to technical integrity will be critical to the long-term success of the JPDO.

Technically, the most important near-term challenge is the development of the Concept of Operations and the Enterprise Architecture. This step is necessary to establish system-level requirements that are clear, verifiable, and attainable. While the capabilities articulated in the JPDO's NGATS vision have enabled each agency to vector its research portfolio in the right direction, the establishment of detailed system requirements will allow each member agency to better refine its R&D plans. Given that every agency has budget constraints, and always will, the establishment of an Enterprise Architecture will be critical to ensure that each agency prioritizes its R&D investments in the manner that provides the maximum return on investment for the JPDO. The JPDO intends to provide a preliminary Enterprise Architecture by the fall of 2006.

Conclusion

In conclusion, NASA's ARMD is investing in long-term, cutting-edge research in areas that are appropriate to NASA's unique capabilities in order to enable the NGATS vision. We have aligned our research portfolio to meet this challenge with an efficient allocation of resources and an unwavering commitment to technical excellence.

I would be happy to respond to any questions.

Senator BURNS. Thank you very much, Dr. Porter. We've been joined by Senator Lott, who has joined the Committee and is very active on this committee. Do you have a statement at this time or——

Senator LOTT. Not at this time, Mr. Chairman. I would like to hear the witnesses and then I'll have some questions.

Senator BURNS. Thank you very much. We are joined today also by Mr. Gerald Dillingham, Director of Civil Aviation Issues, U.S. Government Accountability Office, GAO. Gerald, thank you for coming today. We look forward to your testimony.

STATEMENT OF GERALD L. DILLINGHAM, PH.D., DIRECTOR, PHYSICAL INFRASTRUCTURE ISSUES, U.S. GOVERNMENT ACCOUNTABILITY OFFICE

Mr. DILLINGHAM. Thank you, Mr. Chairman, Senator Rockefeller, Chairman Stevens, Senator Lott, Senator Snowe. My testimony this morning focuses on the preliminary results of our study of JPDO's efforts to plan the Next Generation Air Transportation System and the challenges associated with that planning effort. I will also identify some key challenges related to implementation of the Next Generation System. As you've heard from the previous witnesses, the JPDO has made notable progress in carrying out its mandate to plan the Next Generation System. We generally agree with that assessment. Mr. Chairman, there are, however, some critical challenges that need to be addressed. High on the list is the appointment of a director for JPDO and a chairman of the Senior

Policy Committee. JPDO has been without a permanent director for nearly 6 months and the recent departure of Secretary Mineta leaves another senior-level policymaking unit of JPDO without permanent leadership. We think a permanent and stable leadership is critical to maintaining program momentum and stakeholder commitment.

Another challenge is that the JPDO lacks any real authority over agency budgets and generally relies on part-time volunteers. This situation could become a serious problem in the very near future, as the JPDO's need for staff and fiscal resources increases. Technology development presents another challenge. At this point, it is unclear which government or private sector organization will plan, conduct, and pay for the research to advance technologies that will be needed for the Next Generation from a fundamental level to a level that could be demonstrated in the national airspace system.

Another challenge is one that the Administrator mentioned in her testimony, as well as Dr. Porter, that is the critical nature of the timing of the development and refinement of the enterprise architecture. The enterprise architecture is the blueprint for the Next Generation System that will determine the technologies that will make up and be used in the system as well as their development and implementation sequence. Mr. Chairman, the development of the enterprise architecture is also the first challenge I want to point out with regard to the implementation of the Next Generation System. The architecture will be an important element used in determining what the transformation to the Next Generation will cost. To date, only very preliminary cost estimates are available. One of these estimates indicates that the cost to both continue to operate the current national airspace system and transition to the Next Generation will require an increase of about $1 billion dollars a year between now and 2025, over FAA's current appropriations. Mr. Chairman, this estimate is considered by some analysts as a low estimate and the need comes at a time of severe resource constraints for the entire Federal budget. Our work on the current modernization program has shown that if an ATC technology received fewer resources than called for in the planning documents and those resources were not made available when needed, it was a contributing factor to delays in getting those technologies into the National AirSpace System as well as significant cost increases.

Another challenge for the Next Generation implementation is for FAA to institutionalize the progress that it has made with regard to managing and acquiring major ATC systems. Although there is more work to be done, for the first time in over a decade, the agency met its acquisition performance goals for the past 2 years in a row. To its credit, FAA has also made cost control a key component of its management philosophy. FAA will be challenged to continue to find ways to cut operating costs. Mr. Chairman, we believe that based on well-designed business and safety cases, the cost savings initiatives that FAA has already identified could be expanded. For example, Congress and FAA could consider an independent mechanism, such as a BRAC-like commission, to re-examine the usefulness and cost effectiveness of FAA's existing infrastructure assets. This kind of initiative has the potential to identify significant cost

savings opportunities without compromising system safety or efficiency—savings that could be used to offset the cost of the Next Generation System.

Finally, FAA must insure that it has access to the personnel and skills that will be necessary to implement the Next Generation. This will be one of the government's most comprehensive and technically complicated initiatives in recent times. To ensure that it has the necessary expertise to implement the Next Generation, FAA should continue to explore options, including the use of lead systems integrators. Mr. Chairman, Senator Rockefeller, and members of the Subcommittee, these are all very difficult challenges but this transformation to the Next Generation is critical to the Nation's economic well-being. Failure or significant delays in implementation cannot be an option. Thank you.

[The prepared statement of Mr. Dillingham follows:]

PREPARED STATEMENT OF GERALD L. DILLINGHAM, PH.D., DIRECTOR, PHYSICAL INFRASTRUCTURE ISSUES, U.S. GOVERNMENT ACCOUNTABILITY OFFICE

Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to participate in today's hearing to discuss the status of efforts by the Joint Planning and Development Office (JPDO) to plan for and coordinate the transformation of the Nation's current air traffic control (ATC) system to the "next generation air transportation system" (NGATS)—a system intended to safely accommodate an expected tripling of air traffic by 2025. Authorized in 2003, JPDO is housed within the Federal Aviation Administration (FAA), whose Air Traffic Organization (ATO) is responsible for modernizing and operating the Nation's current ATC system.[1] According to Vision 100,[2] the legislation that authorized JPDO, the transformation to NGATS will be completed by 2025 with the assistance of seven organizations that make up JPDO's senior policy committee: 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. As JPDO plans the transformation to NGATS and coordinates the related efforts of its partner agencies, FAA will be responsible for both implementing the transformation and safely operating the current ATC system 24 hours a day, 7 days a week.

My statement today focuses on three key questions. (1) What is the status of JPDO's efforts to plan for NGATS? (2) What key challenges does JPDO face in moving forward with its planning efforts? (3) What key challenges does FAA face in transitioning from the current ATC system and in implementing NGATS? My statement is based on our analysis of documents provided by JPDO and its partner agencies; the perspectives of agency officials and stakeholders with whom we have spoken; the results of a panel of experts that we convened; and our review of relevant literature, including JPDO's December 2004 integrated plan and March 2006 progress report. The statement also draws on our prior work on FAA's program for modernizing the national airspace system, which we have listed as a high-risk program since 1995.[3] To assess JPDO's framework for facilitating coordination among its partner agencies, obtaining the participation of non-federal stakeholders, and conducting technical planning for NGATS, we compared JPDO's practices with those that we have found to be effective in facilitating Federal interagency collaboration and enterprise architecture[4] development.[5] We also reviewed the National Research Council's 2005 report on JPDO, which provided a technical assessment of the research, development, and technology components of JPDO's integrated plan. Later this year, we expect to issue a report on our assessment of the status of JPDO's efforts to plan for the development of NGATS. We are performing our work in accordance with generally accepted government auditing standards.

The following summarizes our findings to date:

- JPDO has developed a framework for planning and coordination with its partner agencies and non-federal stakeholders that is consistent with the requirements of Vision 100 and with several practices that our previous work has shown can facilitate Federal interagency collaboration and enterprise architecture development. Vision 100 established JPDO as a planning and coordinating body and outlined elements for creating NGATS and managing the related

work. These elements, which make up JPDO's framework, include an integrated plan that provides a vision for NGATS, an organizational structure and processes for leveraging the resources and expertise of Federal and non-federal stakeholders, and an enterprise architecture that defines the specific requirements for NGATS.

- JPDO faces leadership, leveraging, and commitment challenges as it moves forward with planning for NGATS. Currently, two leadership positions critical to JPDO's success are vacant: JPDO has not had a permanent director for over 6 months, and since the Secretary of Transportation resigned, the senior policy committee has been without a permanent chairperson. In addition, despite early successes in leveraging its partner agencies' resources and expertise for NGATS initiatives, JPDO may have difficulty continuing to do so because its partner agencies have a variety of missions and priorities in addition to NGATS, and JPDO does not yet have formal, signed agreements with the agencies on their respective roles and responsibilities. JPDO also faces the challenge of convincing non-Federal stakeholders that the government is fully committed to NGATS because, in the past, the government has discontinued work on new technologies for the National Airspace System, including one technology in which a non-federal stakeholder had already invested.
- FAA faces challenges in institutionalizing recent improvements in its management and acquisition processes, as well as in obtaining the expertise and resources needed to implement NGATS. First, the successful implementation of NGATS will depend on FAA's incorporating the improved processes into its organizational structure and culture. Second, FAA may not have the expertise needed to manage the NGATS implementation effort. Our work has identified, and FAA is considering, two approaches for addressing this challenge—contracting with a lead systems integrator and obtaining technical advice from federally funded research and development corporations. Third, FAA will need resources to implement NGATS, some of which may have to come from savings in operating and maintaining the current ATC system.

Background

In late 2003, recognizing that the current approach to managing air transportation is becoming increasingly inefficient and operationally obsolete, Congress created JPDO to plan NGATS, a system intended to accommodate the threefold increase in air traffic demand expected by 2025. JPDO's scope is broader than that of traditional ATC modernization in that it is "airport curb to airport curb," encompassing such issues as security screening and environmental concerns. Additionally, JPDO's approach will require unprecedented collaboration and consensus among many stakeholders—Federal and non-federal—about necessary system capabilities, equipment, procedures, and regulations. Each of JPDO's partner agencies will play a role in the transformation to NGATS. For example, the Department of Defense has deployed "network centric" systems,[6] originally developed for the battlefield, that are being considered as a conceptual framework to provide all users of the National Airspace System—FAA and the Departments of Defense and Homeland Security—with a common view of that system.

Vision 100 required the Secretary of Transportation to establish JPDO within FAA to manage work related to NGATS. The Director of JPDO reports to the FAA Administrator and to the Chief Operating Officer within ATO. JPDO began operating in early 2004.

JPDO Has Made Progress in Planning for NGATS

JPDO has developed a framework for planning and coordination with its partner agencies and non-federal stakeholders that is consistent with the requirements of Vision 100 and with several practices that our work has shown can facilitate Federal interagency collaboration and enterprise architecture development. This framework includes an integrated plan, an organizational structure, and an enterprise architecture.

As Required by Vision 100, JPDO Developed an Integrated Plan and Reported on the Progress of That Plan

Vision 100 calls for the development of an integrated plan for NGATS and annual updates on the progress of that plan. JPDO's partner agencies developed an integrated plan and submitted it to Congress on December 12, 2004. The plan includes a vision statement for meeting the predicted threefold increase in demand for air transportation by 2025 and eight strategies that broadly address the goals and objectives for NGATS. In March 2006, JPDO published its first report to Congress on the progress made in carrying out the integrated plan.

The integrated plan is consistent with effective collaboration practices we have identified. According to our research on Federal interagency collaborations, agencies must have a clear and compelling rationale for working together to overcome significant differences in their missions, cultures, and established ways of doing business. In working together to develop JPDO's integrated plan, the partner agencies agreed on a vision statement to transform the air transportation system and on broad statements of future system goals, performance characteristics, and operational concepts.

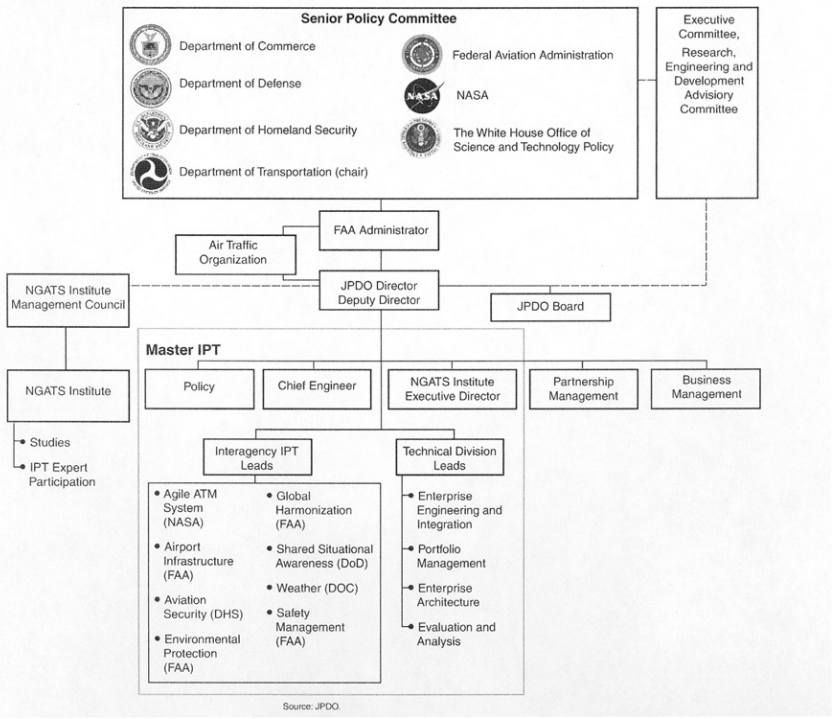
JPDO Developed an Organization for Involving Federal and Non-Federal Stakeholders

Vision 100 includes requirements for JPDO to coordinate and consult with its partner agencies, private sector experts, and the public. Accordingly, JPDO established an organizational structure to involve Federal and non-federal stakeholders throughout the organization. This structure includes a Federal interagency policy committee, an institute for non-federal stakeholders, and integrated product teams (IPT) that bring together Federal and non-federal experts to plan for and coordinate the development of technologies that will address JPDO's eight broad strategies.

- JPDO's senior policy committee was formed and is headed by the Secretary of Transportation, as required in Vision 100. The committee includes senior-level officials from JPDO's partner agencies and has met three times since its inception.
- The NGATS Institute (the Institute) was created by an agreement between the National Center for Advanced Technologies [7] and FAA to incorporate the expertise and views of stakeholders in private industry, state and local governments, and academia. The NGATS Institute Management Council, composed of top officials and representatives from the aviation community, oversees the policy and recommendations of the Institute and provides a means for advancing consensus positions on critical NGATS issues. In March 2006, the Institute held its first public meeting to solicit information from the public and other interested stakeholders who are not involved in the council or the IPTs. These types of meetings are designed to address the Vision 100 requirement that JPDO coordinate and consult with the public.
- The IPTs are headed by representatives of JPDO's partner agencies and include more than 190 stakeholders from over 70 organizations, whose participation was arranged through the Institute.

Figure 1 shows JPDO's position within FAA and the JPDO structures that bring together Federal and non-federal stakeholders, including the Institute and the IPTs.

Figure 1: Organization of JPDO



Source: JPDO.

JPDO's organizational structure incorporates some of the practices we have found effective for Federal interagency collaborations. For example, our work has shown that mutually reinforcing or joint strategies can help align partner agencies' activities, core processes, and resources to accomplish a common outcome. Each of the eight IPTs is aligned with one of the eight strategies outlined in JPDO's integrated plan, and each is headed by a partner agency that has taken the lead on a specific strategy. Our research has also found that collaborating agencies should identify the resources needed to initiate or sustain their collaborative effort. To leverage human resources, JPDO has staffed the various levels of its organization—including JPDO's board, the IPTs, and technical divisions—with partner agency employees, many of whom work part time for JPDO. Finally, our work has shown that involving stakeholders can, among other things, increase their support for a collaborative effort. The Institute provides for involving non-federal stakeholders, including the public, in planning NGATS.

JPDO Has Begun to Leverage the Resources of Its Partner Agencies for NGATS

Vision 100 requires JPDO to coordinate NGATS-related programs across the partner agencies. To address this requirement, JPDO conducted an initial interagency review of its partner agencies' research and development programs during July 2005 to identify work that could support NGATS. Through this process, JPDO identified early opportunities that could be pursued during Fiscal Year 2007 to coordinate and minimize the duplication of research programs across the partner agencies and produce tangible results for NGATS. For example, one identified opportunity is to align aviation weather research across FAA, NASA, and the Departments of Commerce and Defense; develop a common weather capability; and harmonize and incorporate into NGATS those agency programs designed to seamlessly integrate weather information and aircraft weather mitigation systems. In addition, the Automatic Dependent Surveillance-Broadcast (ADS–B)[8] and System Wide Information System (SWIM)[9] programs at FAA were identified as opportunities for accelerated funding to produce tangible results for NGATS. JPDO is currently working with the Office of Management and Budget to develop a systematic means of reviewing the partner

agencies' budget requests so that the NGATS-related funding in each request can easily be identified. Such a process would help the Office of Management and Budget consider NGATS as a unified Federal investment, rather than as disparate line items distributed across several agencies' budget requests.

JPDO's effort to leverage its partner agencies' resources for NGATS demonstrates another practice important to sustaining collaborations. Our work on collaborations has found that collaborating agencies, by assessing their relative strengths and limitations, can identify opportunities for leveraging each others' resources and thus obtain benefits that would not be available if they were working separately. JPDO's first interagency review of its partner agencies' research and development programs has facilitated the leveraging of technological resources for NGATS. The budget process under development with OMB provides a further opportunity to leverage resources for NGATS.

Consistent with Vision 100, JPDO Is Developing an Enterprise Architecture

Vision 100 requires JPDO to create a multiagency research and development roadmap for the transition to NGATS. To comply with Vision 100, JPDO has been working on an enterprise architecture and expects to complete an early version of the architecture by September 2006. Many of JPDO's future activities will depend on the robustness and timeliness of this architecture development. The enterprise architecture will describe FAA's operation of the current national airspace system, JPDO's plans for NGATS, and the sequence of steps needed for the transformation to NGATS. 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 has taken several important steps to develop the enterprise architecture—one of the most critical planning documents in the NGATS effort. For example, JPDO has drafted a concept of operations—a document that describes the operational transformations needed to achieve the overall goals of NGATS. JPDO has used this document to identify key research and policy issues for NGATS. For example, the concept of operations identifies several issues associated with automating the ATC 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. As the concept of operations matures, it will be important for air traffic controllers and other affected stakeholders to provide their perspectives on this effort so that needed adjustments can be made in a timely manner. JPDO officials recognize the importance of obtaining stakeholders' comments on the concept of operations and are currently incorporating stakeholders' comments into the concept of operations. JPDO expects to release its initial concept of operations by the end of July.

Another step that JPDO has taken to develop the enterprise architecture is to form an Evaluation and Analysis Division (EAD), composed of FAA and NASA employees and contractors. This division is assembling a suite of models to help JPDO refine its plans for NGATS and iteratively narrow the range of potential solutions. For example, EAD has used modeling to begin studying how possible changes in the duties of key personnel, such as air traffic controllers, could affect the workload and performance of others, such as airport ground personnel. According to JPDO officials, the change in the roles of pilots and controllers is the most important human factors issue involved in creating NGATS. JPDO officials noted that the Agile Airspace and Safety IPTs include human factors specialists and that JPDO's chief architect has a background in human factors. However, EAD has not yet begun to model the effect of the shift in roles on pilots' performance because, according to an EAD official, a suitable model has not yet been incorporated into the modeling tool suite. According to EAD, addressing this issue is necessary, but will be difficult because data on pilot behavior are not readily available for use in creating such models. Furthermore, EAD has not yet studied the training implications of various NGATS-proposed solutions because further definition of the concept of operations for these solutions is needed. As the concept of operations and enterprise architecture mature, EAD will be able to study the extent to which new air traffic controllers will have to be trained to operate both the old and the new equipment.

To develop and refine the enterprise architecture for NGATS, JPDO is following an effective technology development practice that we identified and applied to enterprise architecture development. This phased, "build a little, test a little" approach is similar to a process we have advocated for FAA's major system acquisition programs. This phased approach will also allow JPDO to incorporate evolving market forces and technologies in its architecture and thus better manage change. Con-

sequently, additional refinements are expected to be made to the enterprise architecture.

As Required by Vision 100, JPDO Has Begun Efforts to Estimate the Costs of NGATS

Vision 100 requires JPDO to identify the anticipated expenditures for developing and deploying NGATS. To begin estimating these expenditures realistically, JPDO is holding a series of investment analysis workshops with stakeholders to obtain their input on potential NGATS costs. The first workshop, held in April 2006, was for commercial and business aviation, equipment manufacturers, and ATC systems developers. The second workshop is planned for August for operators of lower-performance aircraft used in both commercial and noncommercial operations. The third workshop, planned for early September, will focus on airports and other local, state, and regional planning bodies.

Although these workshops will help JPDO develop a range of potential costs for NGATS, a mature enterprise architecture is needed to provide the foundation for developing NGATS costs. Several unknown factors will drive these costs. According to JPDO, one of these drivers is the technologies expected to be included in NGATS. Some of these technologies are more complex and thus more expensive to implement than others. A second driver is the sequence for replacing current technologies with NGATS technologies. A third driver is the length of time required for the transformation to NGATS, since a longer period would impose higher costs. JPDO's first draft of its enterprise architecture, expected in September 2006, could reduce some of these variables, thereby allowing improved, albeit still preliminary, estimates of NGATS' costs.

Although the enterprise architecture for NGATS is not yet complete, both FAA and its Research, Engineering and Development Advisory Committee (REDAC) have developed preliminary cost estimates, which officials of both organizations have emphasized are not yet endorsed by any agency. FAA estimates that the facilities and equipment cost to maintain the ATC system and implement the transformation to NGATS will be about $66 billion, or about $50 billion in constant 2005 dollars. The annual cost would average $2.7 billion per year in constant 2005 dollars from Fiscal Year 2007 through Fiscal Year 2025, or about $200 million more each year than FAA's Fiscal Year 2006 facilities and equipment appropriation.

REDAC's Financing NGATS Working Group has developed a $15 billion average annual cost estimate for NGATS that includes costs not only for facilities and equipment but also for operations; airport improvement; and research, engineering, and development—the remaining three components of FAA's appropriation. As table 1 indicates, the working group began with FAA's facilities and equipment estimate and went on to calculate the remaining costs for FAA to maintain the current ATC system and implement the transformation to NGATS. REDAC's estimate for NGATS's total cost averages about $1 billion more annually than FAA's total appropriations for Fiscal Year 2006.

Table 1: FAA's and REDAC's Cost Estimates for NGATS

(Dollars in billions)

	FAA		REDAC[a]	
	Total NGATS cost	Average annual cost	Total NGATS cost	Average annual cost
Facilities and equipment	$50.5	$2.7	$50.5	$2.7
Operations	[b]	[b]	$162.1	$8.5
Airport improvement	[b]	[b]	$67.5	$3.6
Research, engineering, and development	[b]	[b]	$12.4	$0.7
Total	[b]	[b]	$292.5	$15.5

Source: GAO analysis of FAA and REDAC information.

a This is the working group's estimate under its "base case" scenario, which assumes that FAA's operations cost would increase between 2006 and 2010, but then become constant through 2025 as productivity increases offset the higher cost of increased demand. The working group also calculated a lower-cost "best case" scenario and a higher-cost "worst case" scenario using differing assumptions of productivity gains.

b FAA did not estimate these costs.

Besides being preliminary, these estimates are incomplete—FAA's more than REDAC's because FAA's does not include any costs other than those for facilities and equipment. An FAA official acknowledged that the agency would likely incur additional costs, such as for safety certifications or operational changes responding

to new NGATS technologies. Additionally, FAA's facilities and equipment cost estimate assumes that the intermediate technology development work, performed to date by NASA, has been completed. As I will discuss shortly, it is currently unclear who will now perform this work, but if FAA assumes responsibility for the work, REDAC has estimated additional FAA funding needs of at least $100 million a year. Furthermore, neither FAA's nor REDAC's estimate includes the other partner agencies' costs to implement NGATS, such as those that the Department of Homeland Security might incur to develop and implement new security technologies. Finally, these estimates treat NGATS's development and implementation period as an isolated event. Consequently, the costs drop dramatically toward 2025. In reality, officials who developed these estimates acknowledge that planning for the subsequent "next generation" system will likely be underway as 2025 approaches and the actual modernization costs could therefore be higher in this timeframe than these estimates indicate.

JPDO Faces Leadership, Resource, and Commitment Challenges as It Moves Forward with Planning for NGATS

JPDO faces several challenges in planning for NGATS, including addressing leadership vacancies, leveraging resources and expertise from its partner agencies, and convincing non-federal stakeholders that the government is fully committed to NGATS.

Two Key JPDO Leadership Positions Are Vacant

JPDO has not had a permanent director since January 2006 and, with the recent resignation of the Secretary of Transportation, the senior policy committee is without a permanent chairperson. Our work has shown that, to overcome barriers to interagency coordination, committed leadership by individuals at the top of all involved organizations is critical. Leadership will also be important to provide a "champion" for JPDO and to sustain the partner agencies' focus on and contributions to the transformation to NGATS. Moreover, without a chairperson of the senior policy committee, no one within JPDO is responsible for sustaining JPDO's collaboration and overseeing its work.

These vacancies raise concerns about the continued progress of JPDO and NGATS. After ATO was authorized, we reported that without a chief operating officer, FAA was unable to move forward with the new air traffic organization—that is, to bring together the ATC system's acquisition and operating functions, as intended, into a viable performance-based organization (PBO).[10] This PBO was designed to be part of the solution to the chronic schedule delays, cost overruns, and performance shortfalls in FAA's ATC modernization program. We believe that filling the two vacant positions is critical to ensure continued progress for JPDO and NGATS.

Leveraging Resources and Expertise Poses a Challenge over Time

JPDO officials view leveraging the partner agencies' resources and expertise as one of their most significant challenges. According to JPDO officials, leveraging efforts have worked well so far, but JPDO's need for resources and expertise will increase with the development of NGATS, and for at least two reasons, JPDO may have difficulty meeting this need. First, JPDO's partner agencies have a variety of missions and priorities in addition to NGATS, and their priorities may change. Recently, for example, NASA reduced its aeronautics budget and decided to focus on fundamental[11] research, in part because the agency believes such research is more in keeping with its mission and unique capabilities. These changes occurred even though NASA's current reauthorization act requires the agency to align its aviation research projects to directly support NGATS goals. In light of the changes, it is unclear what fundamental research NASA will perform to support NGATS and who will perform the development steps for that research—that is, the validation and demonstration that must take place before a new technology can be transferred to industry and incorporated into a product. JPDO and FAA officials said that not enough is understood about NASA's plans to assess the impact of NASA's action on NGATS, but many experts told us that NASA's new focus on fundamental research creates a gap in the technology development continuum. Some believe that FAA has neither the research and development infrastructure nor the funding to do this work. As I previously mentioned, REDAC, in a draft report, estimated that FAA would need at least $100 million annually in increased funding to perform this research and development work. REDAC further estimated that establishing the necessary infrastructure within FAA could delay the implementation of NGATS by 5 years.

Second, JPDO may have difficulty leveraging its partner agencies' resources and expertise because it does not yet have formal, long-term agreements with the agen-

cies on their roles and responsibilities in creating NGATS. According to JPDO officials, they are working to establish memorandums of understanding (MOU) signed by the heads of the partner agencies that will broadly define the partner agencies' roles and responsibilities at a high level. JPDO is also developing more specific MOUs with individual partner agencies that lay out expectations for support on NGATS components, such as information sharing through network-centric operations.

Obtaining the specialized expertise of some stakeholders poses an additional challenge for JPDO. Air traffic controllers, for example, will play a key role in NGATS, but their union is not participating in JPDO. Currently, the ATC system relies primarily on air traffic controllers to direct pilots to maintain safe separation between aircraft. Under NGATS, this premise could change and, accordingly, JPDO has recognized the need for human factors research on issues such as how tasks should be allocated between humans and automated systems and how the existing allocation of responsibilities between pilots and air traffic controllers might change. The input of current air traffic controllers who have recent experience controlling aircraft is important in considering human factors and safety issues because of the controllers' familiarity with existing operating conditions.

The air traffic controllers' labor union, the National Air Traffic Controllers Association (NATCA), has not participated in NGATS since June 2005, when FAA terminated a labor liaison program that assigned air traffic controllers to major system acquisition program offices and to JPDO. FAA had determined that the benefits of the program were not great enough to justify its cost. The NGATS Institute Management Council includes a seat for the union, but a NATCA official told us that the union's head had been unable to attend the council's meetings. According to JPDO officials, the council has left a seat open in hopes that the controllers will participate in NGATS as the new labor-management agreement between NATCA and FAA is implemented.

Convincing Non-Federal Stakeholders That the Government Is Fully Committed to NGATS Presents Another Challenge

Convincing non-federal stakeholders that the government is fully committed to NGATS poses a challenge because, in the past, the government has stopped some modernization efforts, including one in which an airline had already invested in supporting technologies. Specifically, FAA developed a datalink communications system that transmitted scripted e-mail-like messages between controllers and pilots. One airline equipped some of its aircraft with this new technology, but because of funding cuts, among other things, FAA canceled the program. Moreover, as we have reported,[12] some aviation stakeholders have expressed concern that FAA may not follow through with its airspace redesign efforts and are hesitant to invest in equipment unless they are sure that FAA will remain committed to its efforts. One expert suggested that the government might mitigate this issue by making an initial investment in a specific technology before requesting that airlines or other industry stakeholders purchase equipment.

Stakeholders' belief that the government is fully committed to NGATS will be important as efforts to implement NGATS technologies move forward. Achieving many of the benefits of NGATS will require users of the system—airlines and general aviation—to purchase NGATS-compatible technologies, such as ADS–B. This new air traffic surveillance system, which JPDO has identified as one of the early core technologies for NGATS, requires aircraft to be equipped with components that will be implemented in two phases. FAA anticipates significant cost savings from the implementation of the first phase, but the airlines do not expect to benefit until the second phase is complete. The technology should then allow pilots to fly more precise routes at night and in poor visual conditions. Another early core technology for NGATS, SWIM, is also intended to produce benefits for users, but again, it is not expected to do so for many years. Non-Federal stakeholders' support for these and other NGATS technologies will be important, and their support will depend, in part, on their assurance of the government's full commitment.

FAA Faces Institutionalization, Expertise, and Resource Challenges as It Transitions to NGATS

FAA faces challenges in implementing NGATS, including institutionalizing recent improvements in its management and acquisition processes, acquiring expertise to implement highly complex systems, and achieving cost savings to help fund NGATS technologies.

Institutionalizing Recent Improvements in Management and Acquisition Processes Will Be Critical to the Successful Implementation of NGATS

With the establishment of ATO and the appointment of a Chief Operating Officer (COO) for it, FAA put a new management structure in place and established more businesslike management and acquisition processes to address the cost, schedule, and performance shortfalls that have plagued ATC modernization over the years. Under the new structure, FAA is a flatter organization, with fewer management layers, and managers are in closer contact with the services they deliver. FAA has also taken some steps to break down the vertical lines of authority, or organizational stovepipes, that we found hindered communication and coordination across FAA. For example, the COO holds daily meetings with the managers of ATO's departments and holds the managers collectively responsible for the success of ATO through the performance management system.

FAA has revised its management processes to increase accountability. For example, it has established a cost accounting system and made the units that deliver services within each department responsible for managing their own costs. Thus, each unit manager develops an operating budget and is held accountable for holding costs within specific targets. Managers track the costs of their unit's operations, facilities and equipment, and overhead and use this information to determine the costs of the services their unit provides. Managers are evaluated and rewarded according to how well they hold their costs within established targets. Our work has shown that it is important, when implementing organizational transformations, to use a performance management system to assure accountability for change.[13]

Finally, FAA is revising its acquisition processes, as we recommended,[14] and taking steps to improve oversight, operational efficiency, and cost control. To ensure executive-level oversight of all key decisions, FAA has revised its Acquisition Management System to incorporate key decision points in a knowledge-based product development process. Moreover, as we have reported, an executive council now reviews major acquisitions before they are sent to FAA's Joint Resources Council.[15] To better manage cost growth, this executive council also reviews breaches of 5 percent or more in a project's cost, schedule, or performance. FAA has issued guidance on how to develop and use pricing, including guidelines for disclosing the levels of uncertainty and imprecision that are inherent in cost estimates for major ATC systems. Additionally, FAA has begun to base funding decisions for system acquisitions on a system's expected contribution to controlling operating costs. Finally, FAA is creating a training framework for its acquisition workforce that mirrors effective human capital practices that we have identified, and the agency is taking steps to measure the effectiveness of its training.

Since 2004, FAA has met its acquisitions performance goal—to have 80 percent of its system acquisitions on schedule and within 10 percent of budget. To sustain this record, FAA will need to institutionalize its reforms—that is, provide for their duration beyond the current administration at FAA and ATO by ensuring that the reforms are fully integrated into the agency's structure and processes at all levels and have become part of its organizational culture. Our work has shown that successfully institutionalizing change in large public and private organizations can take 5 to 7 years or more.[16]

Despite Recent Process Improvements, FAA Faces Challenges in Obtaining the Expertise Needed to Implement a System as Complex as NGATS

In the past, a lack of expertise contributed to shortfalls in FAA's management of ATC modernization projects. Although the personnel flexibilities that Congress authorized in 1995 allowed FAA to establish criteria for outstanding performance and match industry pay scales for needed expertise, industry experts have questioned whether FAA will have the technical expertise needed to implement NGATS—a task of unprecedented complexity, according to JPDO, FAA, and other aviation experts. In 2004, we found that FAA could not ensure that its own best practices were consistently used in managing acquisitions and, as a result, its major acquisitions were still at risk of cost overruns, schedule slippages, or performance shortfalls.[17] These findings are consistent with concerns about the expertise of acquisition managers governmentwide. According to a 2005 study by the Merit Systems Protection Board,[18] at least 50 percent of the government personnel who currently manage technical contracts reported needing training in areas such as contract law, developing requirements, requesting bids, developing bid selection criteria and price determinations, and monitoring contractor performance.

Recognizing the complexity of the NGATS 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 NGATS 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. 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. Consequently, selecting, assigning responsibilities to, and managing an LSI could pose significant challenges for JPDO and FAA.

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.

FAA officials indicated that they are considering at least these two approaches to help address any possible gaps the agency may have in its technical expertise. Given the complexity of implementing NGATS, we believe that FAA's consideration of these approaches to filling any gaps in its technical expertise is appropriate. We believe that either of these approaches could reduce the risks associated with implementing NGATS.

FAA Will Require Resources to Implement NGATS

The cost of operating and maintaining the current ATC system while implementing NGATS will be another important challenge in transitioning to NGATS—a system that, as noted, is broader in scope than the current ATC system and will require funding for security technologies and environmental activities as well as ATC technologies. Although additional funding for the current ATC system and for NGATS may come from increased congressional appropriations, some industry analysts expect that most of the funds for implementing NGATS will have to come from savings in operating and maintaining the current ATC system.

FAA is currently seeking to reduce costs by introducing infrastructure and operational efficiencies and expects to use the savings from these efforts to help fund the implementation of NGATS. For example, FAA has begun to decommission ground-based navigational aids, such as compass locators, outer markers, and nondirectional radio beacons, as it begins to move toward a satellite-based navigation system. In Fiscal Year 2005, FAA decommissioned 177 navigational aids, claiming savings of $2.9 million. According to one expert, FAA could additionally generate revenue from these sites by leasing them for warehouses or cell phone towers. FAA also expects to reduce costs by streamlining its operations. For example, it is consolidating its administrative activities, currently decentralized across its nine regions, into three regions, and anticipates an annual savings of up to $460 million over the next 10 years. Our work analyzing international air navigation service providers has shown that additional cost savings may be possible by further consolidating ATC facilities such as terminal radar approach control (TRACON) facilities and ATC centers. According to one estimate of potential FAA savings, consolidating the existing 21 air route traffic control centers into 6 centers could save approximately $600 million per year. Finally, FAA expects to save costs through outsourcing. For example, it outsourced its automated flight service stations to a private contractor and expects to achieve savings of $1.7 billion over 10 years. In addition, it expects savings of $0.5 billion from 400 staffing reductions that occurred between the time the outsourcing began and the time the new contract was actually implemented. The agency expects to receive $66 million—the first installment of these cost savings—in Fiscal Year 2007.

Until FAA has completed its estimates of both NGATS costs and the cost savings it will be able to achieve between now and 2025, it will not be able to determine how far these cost savings will go toward financing NGATS. Nonetheless, one analyst has preliminarily estimated that FAA's expected savings through infrastructure and operational efficiencies will fall far short of the amount needed to finance NGATS.[19] While more information is needed to estimate the amount of any shortfall with greater confidence, these preliminary and incomplete estimates signal the extent of the resource challenge.

Mr. Chairman, this concludes my statement. We would be pleased to answer any questions that you and members of the Subcommittee may have.

Contact and Staff Acknowledgments

Individuals making key contributions to this statement include Kevin Egan, Elizabeth Eisenstadt, David Hooper, Heather Krause, Elizabeth Marchak, Edmond Menoche, Faye Morrison, Taylor Reeves, and Richard Scott.

ENDNOTES

[1] Although ATO is immediately responsible for modernizing the ATC system, we will refer to FAA throughout this statement because it encompasses JPDO and is ultimately responsible for the modernization effort.

[2] Pub. L. 108–176, Vision 100—Century of Aviation Reauthorization Act, December 12, 2003.

[3] ATC modernization has remained on our high-risk list since 1995. See GAO, *High Risk Series: An Update,* GAO–05–207 (Washington, D.C.: January 2005).

[4] An enterprise architecture is a tool, or blueprint, for understanding and planning complex systems. The NGATS 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. The enterprise architecture will describe the current national airspace system, NGATS, and the sequence of steps needed to implement the transformation to NGATS.

[5] GAO, *Results-Oriented Government: Practices That Can Help Enhance and Sustain Collaboration among Federal Agencies,* GAO–06–15 (Washington, D.C.: Oct. 21, 2005) and GAO, *Federal Aviation Administration: Stronger Architecture Program Needed to Guide Systems Modernization Efforts,* GAO–05–266 (Washington, D.C.: Apr. 29, 2005).

[6] Network-centric systems aim to exploit technical advances in information technology and telecommunications to improve situational awareness and the speed of decision-making.

[7] The National Center for Advanced Technologies is a nonprofit unit within the Aerospace Industries Association.

[8] ADS–B is a surveillance technology that transmits an aircraft's identity, position, velocity, and intent to other aircraft and to ATC systems on the ground, thereby enabling pilots and controllers to have a common picture of airspace and traffic. By providing pilots with a display that shows the location of nearby aircraft, the system enables pilots to collaborate in decision-making with controllers, safely allowing reduced aircraft separation and thereby increasing capacity within the national airspace system.

[9] SWIM is expected to help in the transition to network-centric operations by providing the infrastructure and associated policies and standards to enable information sharing among all authorized system users, such as the airlines, civilian government agencies, and the military.

[10] GAO, *National Airspace System: Current Efforts and Proposed Changes to Improve Performance of FAA's Air Traffic Control System;* GAO–03–542 (Washington, D.C.: May 30, 2003).

[11] NASA uses the term fundamental to refer to research that includes continued long-term, scientific study in core areas such as physics, chemistry, materials, experimental techniques, and computational techniques to enable new capabilities and technologies for individual and multiple disciplines.

[12] 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).

[13] GAO–03–542.

[14] GAO, *Air Traffic Control: FAA's Acquisition Management Has Improved, but Policies and Oversight Need Strengthening to Help Ensure Results,* GAO–05–23 (Washington, D.C.: Nov. 12, 2004).

[15] GAO–05–23.

[16] GAO, *Results-Oriented Cultures: Implementation Steps to Assist Mergers and Organizational Transformations,* GAO–03–669 (Washington, D.C.: July 2, 2003).

[17] GAO–05–23.

[18] U.S. Merit Systems Protection Board, *Contracting Officer Representatives: Managing the Government's Technical Experts to Achieve Positive Contract Outcomes* (Washington, D.C.: Dec. 2005).

[19] Aviation Management Associates, Inc., *The "No New Money" Scenario for the Next Generation Air Transportation System,* (Alexandria, VA: Oct. 1, 2005).

Senator BURNS. Thank you and we appreciate the good work that you've done and the testimony that you've offered this committee

over the years. It has been very, very good and very solid and put in a language that we can all understand.

Mr. DILLINGHAM. Thank you, Mr. Chairman.

Senator BURNS. We appreciate that very much. Now we have Mr. David Dobbs, Assistant Inspector General for Aviation, down at the Department of Aviation. Thank you for coming this morning. I look forward to your comments.

Mr. DOBBS. Mr. Chairman and members of the Subcommittee, we appreciate——

Senator BURNS. You might want to get into that microphone.

Mr. DOBBS. I'm sorry. Is this better?

Senator BURNS. And by the way, Senator Snowe has joined the Committee. Do you have a statement or?

STATEMENT OF HON. OLYMPIA J. SNOWE, U.S. SENATOR FROM MAINE

Senator SNOWE. I do. I'll just include it in the record.

Senator BURNS. Without objection, that will be done.

[The prepared statement of Senator Snowe follows:]

PREPARED STATEMENT OF OLYMPIA J. SNOWE, U.S. SENATOR FROM MAINE

Thank you, Mr.Chairman, for convening this hearing to explore the reasons behind some of the delays in modernizing our air traffic control system.

The evolution of the next generation of air traffic control systems must not only utilize the cutting edge technology that would greatly improve the safety of our crowded skies, but we must not overlook or alienate the incredibly skilled workforce that is so vital to maintaining and operating that same technology.

The creation of the Joint Planning and Development Office, in conjunction with the Air Traffic Organization, is one that reflects the vast changes that have taken place within our Air Traffic Control System, and the critical need to address those same changes. As many of our controllers age and consider retirement, and the Federal Aviation Administration fails to sufficiently reinvest in their personnel, new technology is looked to as a replacement for many of our human resources. I will not pass judgment on the validity of this thought process, but I do have serious concerns about the potential "Safety Gap" that could arise. If the technologically based "Next Generation Air Traffic System," or NGATS [*En-Gatts*] is not due to be in place until the year 2025, and a startling number of our Controllers, 25 percent according to an article in the *Philadelphia Inquirer,* are eligible to retire by the end of this year, then where does that leave us insofar as securing our skies? At the TRACON in Chicago, for example, nearly half of those controllers are eligible to retire. With O'Hare Airport as the busiest airport in the country according to the FAA's recently released statistics, if only half of those controllers in Chicago were to opt for retirement, that would result in nearly a 25 percent cut in controller personnel. Imagine a potential "perfect storm" with increased enplanements, more regional and very light jets in the air, and fewer controllers watching our skies and directing traffic. Worse than gridlock in our skies, it would be an accident waiting to happen. A potentially catastrophic accident.

Our aviation industry is vital to our Nation's economy, and the global economy. If we are ill-prepared to accommodate more operations, more passengers, and more cargo, we will be left behind by other nations better suited to do just that. That is unacceptable. But an inability to navigate our skies could have a tremendous impact on our industry; delaying the delivery of air cargo, escalating numbers of runway incursions, and raising the question of safety in the minds of our flying public. This sort of hit would be a knock-out blow to many in the aviation industry; one they could not survive a second time.

I am encouraged that the JPDO office is serving as a warehouse for all the relevant agencies that, on their own, would never be able to come together on such an ambitious project. I urge them to speed along any advancements that are ready for even partial implementation. However, we must be certain that the industry is adequately consulted as we move forward on the NGATS proposals. If JPDO's European counterpart, SESAR, is actively courting the industry as they advance their own new paradigm for air traffic management, we must realistically consider fol-

lowing suit. We cannot allow European aerospace and aviation interests to drive their modernization efforts while we here in America have a bureaucracy developing our proposal with little or no input from private industry. I believe that amounts to handing over a competitive advantage to foreign interests, which must be guarded against in this global marketplace.

America has always been at the forefront of aviation, the measuring stick by which other nations evaluate their own systems. We must do all we can to retain that position. I look forward to the testimony of our esteemed panel today. Thank you, Mr. Chairman.

Senator BURNS. Thank you, Mr. Dobbs. You may proceed.

STATEMENT OF DAVID A. DOBBS, ASSISTANT INSPECTOR GENERAL FOR AVIATION AND SPECIAL PROGRAM AUDITS, DEPARTMENT OF TRANSPORTATION

Mr. DOBBS. Mr. Chairman and members of the Subcommittee, we appreciate the opportunity to discuss the JPDO and plans for the Next Generation System. We know this is a priority for the Subcommittee. Today, I'll limit my testimony to three points. First, the important role JPDO plays in leveraging resources. A multiagency approach is critical for a number of reasons. One is that 70 percent of FAA's research budget of about $130 million goes for safety not air traffic management research. Two, FAA is requesting $2.5 billion for its capital account, which is $50 million less than last year's request and more than $500 million less than the authorized level. More importantly, FAA's capital account now focuses on keeping things running, not new initiatives and only about 55 percent of that capital account actually goes for new systems. As Administrator Blakey pointed out, despite the tight budget, two important projects in 2007 are included in FAA's FY 2007 budget request: ADS–B and SWIM. We agree that ADS–B has tremendous potential for changing the way that air traffic is managed.

I would also like to highlight ongoing multibillion-dollar projects that will be critical to NGATS. ERAM, with a price of $2.1 billion, replaces the brain or the central nervous system at facilities that manage high altitude traffic. This year is critical for ERAM as FAA plans to spend $1 million a day on the program and if not kept on track, there could be cascading impacts on FAA's ability to deliver future systems. FAA's FTI program is an effort to replace FAA's entire telecommunications systems for air traffic. We have raised concerns that FTI will not be completed on time. We have made recommendations to FAA to help FTI get back on track. Right now, the key issues focus on developing an effective transition plan and realistic master schedule, improving coordination between the contractor and FAA field offices, and updating cost and benefits. FAA is currently taking positive steps in addressing these issues.

My second point is that while the JPDO has made progress, considerable work remains to align agency budgets and plans. Central to JPDO's mission is the alignment of agency resources. This is a complex task, as each agency conducts research for their own mission.

We looked at three of the JPDO's eight integrated product teams and found a lot of coordination but so far, little alignment on budgets. The Product Team Leaders have no authority to commit agency resources and often have no products, other than plans. Right now, it is hard to assess alignment because JPDO's progress re-

ports do not provide details on ongoing research projects or budgets at other agencies.

My third point focuses on actions needed to shift from planning to implementation. Mr. Chairman, right now the key questions for the JPDO to focus on is what the new office can deliver, when, and how much it will cost. Our prepared statement outlines a number of actions that we believe will help shift JPDO initiatives from a research agenda to implementation. I'll briefly touch on a few of them. One is getting Congress reliable cost information. Last year, the Administration promised that they would provide some clarity on the cost issue; that has not been accomplished. Right now, this subcommittee and stakeholders need reliable costs for the next 5 years, which corresponds to the next FAA reauthorization. This cost data is needed on three vectors: research and development that will be needed to meet FAA's requirements, adjustments to existing FAA projects, and costs to implement NGATS initiatives. Two, is developing and implementing a mechanism for alignment. JPDO is working with OMB to develop an integrated budget document that provides a single business case for various research efforts. As part of this, JPDO has promised to provide OMB with an architecture for the Next Generation System as well as a list of programs in other agency budgets it intends to leverage. This should be done soon. We understand that the JPDO is meeting with OMB later today to start this process. Third, is risk management. Given FAA's past track record with modernization projects and the potential billion dollar investments for NGATS, the JPDO and ATO need to articulate what they intend to do differently and what skill sets are needed. While it is true that FAA's management of major acquisitions has improved, developing and implementing the next generation system is an incredibly complex undertaking.

There is a lot of discussion right now in FAA and industry about whether a lead systems integrator will be needed to help integrate new and ongoing systems and manage the transition. Experts tell us that a lead system integrator is most successful when the government has a clear understanding of what it wants to buy. And finally, conducting sufficient human research to support anticipated changes. History has shown that insufficient attention to human factors can increase the cost of acquisitions and delay much needed benefits. For example, the JPDO envisions the controller role changing from direct tactical control of aircraft to one of overall traffic management. There will also be significant human factor concerns for pilots who will rely more on systems on board aircraft. Once requirements have been established, the JPDO will have to put together a focused, human resource effort that integrates both NASA and FAA human factors work.

Mr. Chairman, that concludes my statement. I'd be happy to answer any questions you or members of the Subcommittee may have. Thank you.

[The prepared statement of Mr. Dobbs follows:]

PREPARED STATEMENT OF DAVID A. DOBBS, ASSISTANT INSPECTOR GENERAL FOR AVIATION AND SPECIAL PROGRAM AUDITS, DEPARTMENT OF TRANSPORTATION

Mr. Chairman and members of the Subcommittee:

We appreciate the opportunity to testify on the Federal Aviation Administration's (FAA) *Joint Planning and Development Office)*(JPDO) and the plans for the Next Generation Air Transportation System.

The JPDO was mandated by Congress to develop a vision for the Next Generation Air Transportation System (NGATS) in the 2025 timeframe and coordinate diverse agency research efforts. This office was established within FAA; also participating are the National Aeronautics and Space Administration (NASA), the Department of Commerce, the Department of Defense (DOD), and the Department of Homeland Security. Thus far, we have focused primarily on the JPDO's air traffic management efforts that involve NASA, DOD, and Commerce.

There are a number of compelling reasons for moving toward the Next Generation Air Transportation System. The current Air Transportation System has served the Nation well, but FAA reports that the current system (or business as usual) will not be sufficient to meet the anticipated demand for air travel. Last year, over 700 million passengers used the system, and this number is forecasted to grow to over 1 billion by 2015.

Because of the forecasted growth in air travel, the JPDO needs to continue to work on what can be done much sooner than the 2025 time frame. It will also be important for the JPDO to show tangible benefits to airspace users from its efforts. We have made this point before, and it was a key theme of the JPDO/industry workshop on costs in April.

The JPDO's mission is critical given that FAA conducts little long-term air traffic management research and the fact the most of the Agency's current $2.5 billion capital account goes for keeping things running. However, the cost of NGATS remains uncertain and much work remains to refine costs, align diverse agency budgets, and set expectations for airspace users with respect to milestones, equipage, and anticipated benefits. In addition, FAA and JPDO need to transition from planning to implementation, and we have identified a range of actions that will help them do so.

My remarks today will focus on three points:

- JPDO's critical role in leveraging resources in light of recent trends in FAA's Research, Engineering, and Development (RE&D) and Facilities and Equipment (F&E) accounts.
- JPDO progress to date in aligning agency budgets and plans, and
- Actions that will help the JPDO keep moving forward in both the short and long term and shift from planning to implementation.

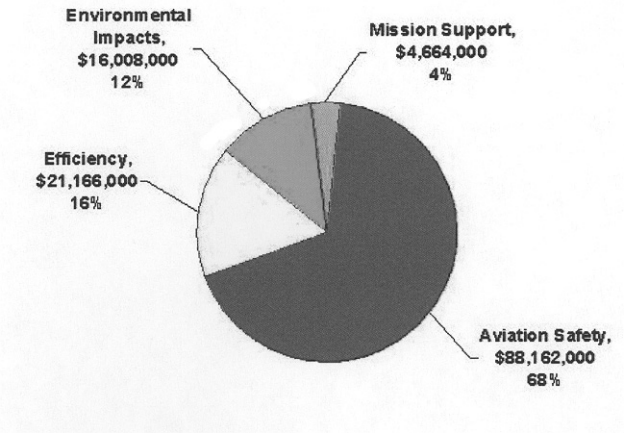
The JPDO has an Important Role in Leveraging Resources for the Next Generation Air Transportation System

The JPDO is expected to develop a vision for the next generation system and has established ambitious, much needed goals to accommodate three times more air traffic and reduce FAA operating costs. The JPDO also expects a shift from today's ground-based system to an aircraft-based system and to significantly enhance controller productivity through automation. To do so, a multi-agency approach—as outlined in Vision 100—is critical given the current deficit environment, competition for Federal funds, and FAA's tight budget. Moreover, leveraging of scarce resources is essential because FAA does not conduct much long-term air traffic management research.

FAA's Fiscal Year 2007 Budget Request for Research, Engineering, and Development

FAA is requesting $130 million for Fiscal Year (FY) 2007, a decrease of $6.6 million from last year's appropriated level of $136.6 million. This includes $18 million specifically for the JPDO. Figure 1 illustrates the makeup of the Fiscal Year 2007 RE&D request by major lines of effort.

Figure 1. FAA FY 2007 Budget Submission for R,E & D



As shown above, almost 70 percent of FAA's research budget submission, or $88 million, focuses on improving safety—not new air traffic management initiatives. This includes projects on fire safety and aging aircraft systems, which focus on preventing accidents and making them more survivable. The remaining funds are requested for efficiency, environmental research, and mission support efforts.

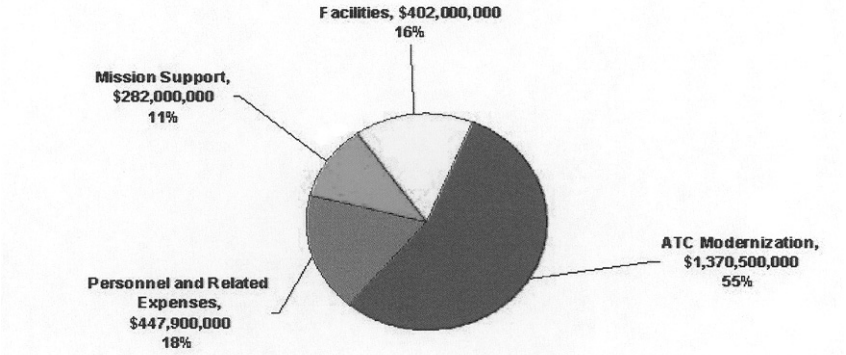
FAA is also requesting research funds from its airport account for safety and efficiency issues. FAA is requesting $17.8 million in Fiscal Year 2007 for research in areas of, among other things, airport pavement and airport markings. In addition, FAA is requesting $10 million in Fiscal Year 2007 for cooperative research projects with airports, including efforts to enhance safety and improve airport lighting.

Perspectives on FAA's Capital Account and Progress and Challenges with Key Modernization Projects

The Capital Account. FAA's capital account—or the F&E account—is the principal vehicle for modernizing the National Airspace System. It represents about 18 percent of the Agency's Fiscal Year 2007 budget request of $13.7 billion. For Fiscal Year 2007, FAA is requesting $2.5 billion for the F&E account, which is $50 million less than last year's appropriation. This is the fourth consecutive year that funding requests for the capital account are below authorized levels called for in Vision 100.

As we have noted in previous reports and testimonies, FAA's increasing operating costs have crowded out funds for modernization. Further, only about 55 percent of FAA's Fiscal Year 2007 request for F&E (or $1.4 billion) will actually go for acquiring air traffic control systems, while the remainder will be spent on personnel, mission support, and facilities. This is illustrated in Figure 2.

Figure 2. FAA's FY 2007 Facilities and Equipment Budget Request



The majority of FAA's capital account now goes for keeping things running (i.e., sustainment), not new initiatives. A review of the top 10 projects by dollar amount in the Fiscal Year 2007 request shows that while some projects will form the platforms for future initiatives, the bulk of funds are requested for projects that have been delayed for years and for efforts to improve or maintain FAA facilities or replace existing radars.

Over the last several years, FAA has deferred or canceled a number of projects as funding for the capital account has remained essentially flat. This includes efforts for a new air-to-ground communication system, controller-pilot data link communications, and a new satellite-based precision landing system. FAA has also postponed making decisions on projects like the billion-dollar Standard Terminal Automation Replacement System.

In spite of a lack of clarity about the next generation system, FAA is requesting F&E funds for two projects that are considered "building blocks" for the next generation system. These are not new programs and have been under development or been funded in previous budgets.

- *Automatic Dependent Surveillance-Broadcast (ADS–B)* is a satellite-based technology that allows aircraft to broadcast their position to others. In Fiscal Year 2007, FAA is requesting $80 million for this. In prior budgets, ADS–B was funded under the Safe Flight 21 Initiative, which demonstrated the potential of ADS–B and cockpit displays in Alaska and the Ohio River Valley. FAA expects to award a contract for the ADS–B ground infrastructure in 2007. FAA has a lot of work ahead to quantify and set expectations for the benefits it and airspace users can expect from ADS–B.[1] Airspace users will have to equip with new avionics to obtain benefits, and FAA may have to rely on a rulemaking initiative to help speed equipage. This illustrates why the JPDO must address complex policy issues as well as research.
- *System Wide Information Management (SWIM)* is a new information architecture that will allow airspace users to access securely and seamlessly 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 is requesting $24 million for this program in Fiscal Year 2007.

Progress and Challenges with Key Air Traffic Control Modernization Projects. We are not seeing the massive cost growth and schedule delays we have seen with FAA major acquisitions in the past because of this Administration's more incremental ap-

[1] The first phase of ADS–B implementation, known as *ADS–B out* is expected to replace many ground radars that currently provide surveillance with less costly ground-based transceivers. But 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 ADS–B equipped aircraft—this could allow pilots to "see" nearby traffic and, consequently, transition some responsibility for maintaining safe separation from the controllers to the cockpit.

proach to major acquisitions and decisions to defer several complex and challenging efforts.

Last year, we reported that 11 of 16 major acquisitions accounted for cost growth of $5.6 billion.[2] Most of this cost growth occurred before the establishment of the Air Traffic Organization. The cost growth was also a reflection of efforts to re-baseline programs, which identified costs that had been pent up for years and were not reflected in prior cost estimates. We are updating our work on the 16 major acquisitions and the challenges they face.

Many efforts are maturing, and completing them within existing cost and schedule parameters is critical to allow room for future initiatives. Only one ongoing modernization project, *FAA Telecommunications Infrastructure,* has the potential to reduce FAA's operating costs, which is a top priority within the Agency. We would like to highlight two multi-billion-dollar programs that require attention.

- *En Route Automation Modernization (ERAM)* is intended to replace the Host computer network—the central nervous system for facilities that manage high-altitude traffic. FAA is requesting $375.7 million for ERAM, which is this program's peak single-year funding level according to FAA's Capital Investment Plan. With an acquisition cost of $2.1 billion, this program continues to be one of the most expensive and complex acquisitions in FAA's modernization portfolio. The monthly burn rate for ERAM will increase from $28 million a month in Fiscal Year 2006 to $31 million per month in Fiscal Year 2007. This year is critical for ERAM because the system is scheduled to begin real-world testing. Should ERAM experience cost increases or schedule slips, the problems would have a cascading impact on other capital programs and directly affect the pace of efforts to transition to the next generation system.
- *FAA Telecommunications Infrastructure (FTI).* FAA is requesting $28 million in Fiscal Year 2007 toward its effort to replace its entire telecommunications system for air traffic control, including radar and controller voice circuits. Between Fiscal Year 2003 and Fiscal Year 2006, the Congress appropriated $556 million for FTI (from the capital and operating accounts).

  In our recent report to FAA, we concluded that FTI is a high-risk program—with a FAA reported lifecycle cost estimate of $2.4 billion ($310 million estimated acquisition costs and $2.1 billion estimated operations costs) through 2017.[3] Only months after being re-baselined in December 2004, the program fell behind its revised schedule and has not recovered.

  The primary purpose of the FTI program is to lower operating costs. It also forms the basic infrastructure for NGATS initiatives, like SWIM, and is important for FAA's ongoing work with Lockheed-Martin on flight service stations. However, expected benefits from reducing operating costs are eroding because of schedule problems. For example, FAA did not realize $32.6 million in expected savings in Fiscal Year 2005 (due to the limited progress made in disconnecting legacy circuits). In addition, the estimated cost savings of $102 million for Fiscal Year 2006 is at risk.

  In our April report, we found that FTI was not likely to meet its planned completion date, December 2007, because FAA had not developed a detailed, realistic master schedule for all critical steps, including identifying when each service will be accepted, when services will be cut over to FTI, and when existing (legacy) services will be disconnected. Without a realistic master schedule, it will be difficult to obtain a binding commitment from the FTI contractor, Harris Corporation, to complete the transition by any specific point in time.

  We recommended, among other things, that FAA develop both a master schedule and an effective FTI transition plan and validate FTI cost, schedule, and benefits. FAA agreed with our recommendations and commissioned the MITRE Corporation[4] to conduct an independent assessment of FTI's schedule and transition performance to date.

  MITRE completed a limited assessment of FTI schedule risk and concluded FTI will not be completed as planned in December 2007, but is more likely to be

---

[2] OIG Report Number AV–2005–061, "Report on the Status of FAA's Major Acquisitions: Cost Growth and Schedule Delays Continue To Stall Air Traffic Modernization," May 26, 2005. OIG reports and testimonies can be found on our website: *www.oig.dot.gov.*

[3] 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.

[4] The MITRE Corporation functions as FAA's federally funded research and development center.

completed later in 2008. Also, MITRE underscores the need to focus Harris' resources and FAA's field resources on achieving timely cutovers and increased disconnects of legacy services, both of which are important for realizing cost-savings. However, we have observed that a significant number of FTI services that have been accepted by FAA could not be cutover, thus requiring considerable re-work and causing an increased backlog.

We are currently reviewing FAA's effort to develop an effective transition plan and a realistic master schedule. We note that FAA's Joint Resources Council—FAA's decision-making body for major acquisitions—is planning to meet in August 2006 to review revised FTI cost estimates against a newly validated schedule. We see several key issues that FAA needs to address. They include determining the number of existing legacy circuits and the funding requirements needed to maintain those circuits until FTI is complete, improving coordination between Harris and FAA field offices, and updating cost and benefits based on actual and projected legacy and FTI network costs.

It is important to recognize that FAA's existing investments will heavily influence NGATS requirements and schedules. In fact, ongoing projects, like ERAM and FTI, will form important platforms for JPDO initiatives. Enclosure A provides details on selected modernization projects that will likely play a key role in moving toward the next generation system. FAA will have to assess how JPDO plans affect ongoing projects and determine which ones need to be accelerated or re-scoped.

Progress Is Being Made in Coordinating Diverse Agency Efforts but Considerable Work Remains To Align Agency Budgets and Plans

The law requires the JPDO to coordinate and oversee research that could play a role in NGATS. Central to the JPDO's mission—and making it an effective multi-agency vehicle—is alignment of agency resources. This is a complex task, and the law provides no authority for the JPDO to redirect agency resources. Enclosure B provides information on potential agency contributions to the JPDO and each agency's area of expertise.

The Department has played an important role in coordinating various efforts by chairing the Senior Policy Committee. This committee was established by Vision 100 and includes deputy secretary level representatives from the Departments of Commerce and Homeland Security, and the Secretary of the Air Force. It also includes the FAA and NASA Administrators. This committee provides high-level guidance, resolves policy issues, and identifies resource needs. Each participating agency conducts research tailored for its specific mission.

The JPDO's March 2006 progress report to Congress outlined various accomplishments to date, including the establishment of multi-agency teams and the NGATS institute (a mechanism for interfacing with the private sector) as well as a demonstration of network-enabled operations for security purposes. However, the report did not provide details on specific ongoing research projects at FAA or funding that the JPDO expects to leverage at other agencies. Without this information, it is difficult to assess progress with alignment of budgets.

The majority of JPDO's work is done through eight Integrated Product Teams (IPTs) that focus on eight strategies, such as how to use weather information to improve the performance of the National Airspace System. The teams are composed of members from FAA, other Federal agencies, and the private sector. Enclosure C provides information on the JPDO's IPTs.

The National Research Council recently examined JPDO plans and was critical of the IPT structure.[5] The Council's report found that even though the teams have multi-agency participation, they are functioning primarily as experts in specific disciplines rather than as cross-functional, integrated, multidisciplinary teams organized to deliver specific products. One of the report's recommendations was that the IPTs be reduced in number and made more "product driven." Although we have not reached any conclusions on how to best structure the IPTs, we do agree that a more product-driven focus would be an important step forward.

Our audit work on three IPTs shows that there is considerable coordination but little alignment of agency budgets to date. Moreover, the IPT leaders have no authority to commit agency resources to JPDO efforts and often have no products other than plans. The following illustrates progress and challenges to date with the three IPTs we examined in detail.

- *The Weather IPT* is led by the National Oceanic Atmospheric Administration (NOAA), an agency of the Department of Commerce. FAA, NASA, DOD, and

[5] National Research Council, "Technology Pathways Accessing the Integrated Plan for a Next Generation Air Transportation System," 2005.

NOAA are all conducting weather research tailored for their specific missions. Thus far, this team's efforts have focused on contributions to FAA's *Traffic Flow Management Program* (which assists traffic managers to optimize air traffic by working with airlines). NOAA is also helping the JPDO refine its concept of a fully automated system. Integrating new, up-to-date weather forecast systems into planned automation efforts will be challenging.

We note that JPDO has not yet determined if a considerable amount of applied research and development conducted by NOAA at the Office of Atmospheric Research and the National Environmental Satellite Data and Information Service could be leveraged for next generation initiatives. We have shared our concerns about taking full advantage of weather research conducted by others with the JPDO, which recognizes it can do a better job.

- *The Shared Situational Awareness IPT* is led by DOD. All participating agencies are adopting network-centric systems.[6] As noted earlier, FAA is developing its own network system called SWIM. While there are considerable opportunities for leveraging net-centric efforts, there is also potential for duplication of effort. Challenges here focus on taking an approach pioneered by DOD and applying it specifically to air traffic control to get benefits in terms of enhanced capacity and delay reduction.

  An active role by DOD is vital because it is both a provider and a consumer of air traffic services. Thus far, work with this IPT has focused almost exclusively on maximizing agency network capabilities in DOD, such as the Global Information Grid, which is a net-centric communication system DOD is developing for global use. Moreover, DOD's real-world experiences and the lessons it has learned in sharing data (from air and ground systems) in actual operations and in real-time have not been fully tapped and will prove invaluable in reducing cost and technical risks in developing the next generation system.

  Another area where DOD could provide expertise is with *sensor fusion*[7] which is the integration of information on an aircraft's position from radar and non-radar sources, such as satellite-based systems. While fusion could help reduce separation between aircraft, it will be technically challenging to integrate radar and satellite-based systems (which have different update rates and levels of accuracy) to manage traffic in high volume airspace, particularly in the vicinity of airports. DOD expertise with target acquisition and sensor fusion for weapons targeting could prove helpful for the JPDO.
- *The Air Traffic Management IPT* is led by NASA. It is expected to play a key role by helping develop the automated systems to boost controller productivity. The bulk of this work will be funded by NASA, which has conducted the majority of long-term air traffic management research over the last few years.[8] FAA has neither planned nor budgeted for this type of research. Major challenges focus on establishing requirements and gaining a full understanding of the risks associated with developing and acquiring these new software-intensive systems before making financial commitments. This is important because future automation efforts will be a major cost driver for the Next Generation System.

  Even though NASA is restructuring its aeronautical research program and spending less than in the past, the JPDO and NASA are working on several complex concepts for new automation systems (for monitoring multiple aircraft trajectories, tracking separation minima, and responding to weather events) and the timing of research efforts. This work will be funded through NASA efforts on airspace systems (with a Fiscal Year 2007 requested funding level of $120 million). However, experience shows that NASA will need a much clearer picture of FAA's requirements (i.e., performance parameters for new automated systems) to better support the next generation system.

Several Actions Are Critical for the JPDO To Make Progress in Both the Short and Long Term and Make the Transition From Planning to Implementation

Key questions for FAA and the JPDO to focus on include what the new office can deliver, when, and how much this transition will cost. They are central questions

[6] A net-centric system uses internet protocols to transfer data.

[7] For additional views on sensor fusion or fusion tracking see our audit report "Terminal Modernization: FAA Needs To Address Its Small, Medium, and Large Sites Based Upon Cost, Time, and Capability" (AV–2005–016, November 23, 2004).

[8] For additional details on the FAA/NASA relationship and funding profiles, see our testimony entitled "Observations on the Progress and Actions Needed To Address the Next Generation Air Transportation System," (CC–2006–032, March 29, 2006).

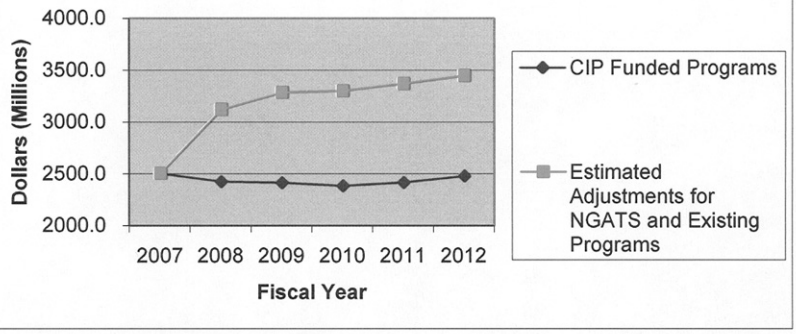
in the discussion about how to best finance FAA and will shape the size, requirements, and direction of the capital program for the next decade.

Moving to the next generation system is important to meet the demand for air travel, change the way FAA provides services, and help control operating costs. However, it is also a high-risk effort. To make progress and successfully shift from planning to actual implementation, several steps are needed.

- *Leadership*. The position of the JPDO Director is currently vacant—FAA needs to find the right person to lead this effort. Leadership will be important to align diverse agency efforts and bridge the gap between the Air Traffic Organization's (ATO) near-term planning horizon and the JPDO's longer-term mission to transform the National Airspace System. We understand that FAA is interviewing candidates and will be making a selection very soon.
- *Finalizing Cost Estimates, Quantifying Expected Benefits, and Developing a Roadmap for Industry.* The JPDO's progress report to Congress did not address funding requirements and complex transition issues. Moving to the next generation system will require significant investments from FAA (new ground systems) and airspace users (new avionics). FAA is conducting workshops with industry to develop program costs.

  We have seen some preliminary estimates developed by the ATO and a working group of FAA's Research, Engineering, and Development Advisory Committee (REDAC), but they have not been finalized or approved by senior FAA management. There are considerable unknowns, and costs depend on, among other things, performance requirements for new automation and weather initiatives and to what extent FAA intends to consolidate facilities. The following Figure illustrates a very preliminary estimate of the implications for FAA's capital account from Fiscal Year 2007 through Fiscal Year 2012—the focus of the FAA reauthorization—from the April JPDO/Industry workshop.

Figure 3. Preliminary Cost Estimates for NGATS Impact on Current FAA F&E Account FY 2007- 2012



Source: FAA Cost Projection Briefing, presented by Air Traffic Organization—Planning at the April 28, 2006 JPDO/Industry Cost Workshop

These ATO estimates presented that moving forward with NGATS would cost $4.4 billion between Fiscal Year 2007 and Fiscal Year 2012 over and above the current CIP plan. These preliminary numbers do not distinguish between development efforts, adjustments to existing programs, or implementation of new initiatives.

A key short-term cost factor for NGATS is the level of development funding that will be required to take efforts from other agencies (like NASA) and successfully transition them into the National Airspace System and meet FAA's safety and certification requirements. The REDAC working group is raising concerns about this in light of NASA's restructuring of its aeronautics research portfolio and plans to focus on more basic research. To accommodate changes in NASA investments, the REDAC working group estimated in its draft report that the JPDO will need approximately $100 million annually for development.

FAA will have to analyze information from the JPDO/industry workshops and the REDAC working group and provide Congress with expected funding requirements and when the funding will be needed. When transmitting this information to Congress, FAA should provide cost data on three vectors—research and development needed (including demonstration projects), adjustments to existing projects and estimates for implementing NGATS initiatives. This will give decision-makers a clear understanding of NGATS costs.

An important theme from the recent JPDO workshop was the need for FAA to clearly define the expected benefits from NGATS initiatives, particularly for projects that require airspace users to install and equip with new avionics, such as ADS–B. Airspace users have a much shorter horizon for the return on investment from new systems than FAA, and incentives (*i.e.,* tax incentives, financing options, or targeted deployments for users that equip early) will likely be needed to spur equipage.

At the April workshop, industry participants asked FAA for a "service roadmap" that: (1) specifies required 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 links with aircraft maintenance schedules. It will be important for FAA to provide industry with this information.

- *Establishing Connectivity Between JPDO Plans and ATO Efforts.* This is important because the JPDO, as currently structured, is a planning and coordinating organization, not an implementation or program-execution office. At the April JPDO/industry workshop, industry asked for a much stronger link between ATO and JPDO plans.

  Although the JPDO's progress report discusses new capabilities such as ADS–B and SWIM, the ATO is responsible for managing those efforts and establishing funding levels, schedule, and performance parameters. The ADS–B and SWIM projects are not yet integrated into ongoing communications and automation efforts but need to be. If the JPDO and ATO are not sufficiently linked and clear lines of accountability are not established, cost and schedules for NGATS will not be reliable and expected benefits will be diminished or postponed.

  Linking JPDO and ATO efforts is challenging because NGATS projects cut across the ATO's different lines of business (i.e., terminal and en route) and will require adjustments to ongoing projects managed by different ATO vice presidents.

  For example, SWIM is envisioned as an Agency-wide effort, and planning documents show that SWIM will interface with at least 12 ongoing projects, including FTI which is managed by the Vice President for Technical Operations. Also, SWIM will need to be integrated with ongoing projects to revamp systems for controlling high-altitude traffic managed by the Vice President for En Route and Oceanic Services. Projects managed by the Vice President for Terminal Services (to modernize both controller displays used in the vicinity of airports and weather systems) will also be affected. It will be important to establish clear lines of accountability for linking JPDO efforts to ATO programs and resolving differences between the two organizations.

  We shared our concerns about effectively linking the JPDO and ATO and establishing clear lines of accountability with the Chief Operating Officer and the Acting Director for ATO Planning earlier this year. They recognize the need for close coordination and are examining ways to better link the two organizations. One step that is underway is to adjust the *Operational Evolution Plan* (the Agency's capacity blueprint) to reflect JPDO efforts. This is an important matter that will require sustained management attention.

- *Developing and Implementing Mechanisms for Alignment.* As noted earlier, there is considerable coordination among JPDO participating agencies but little alignment of budgets and plans. There is a need for mechanisms to help the JPDO align different agency efforts over the long haul. This will help identify the full range of research that can be leveraged by the JPDO—not how much NGATS will cost to implement.

  The JPDO recognizes that more needs to be done and is working with the Office of Management and Budget (OMB) to develop an integrated budget document that provides a single business case (a document similar to the "OMB Exhibit

300") to make sure efforts are indeed aligned.[9] As part of this, the JPDO has promised to provide OMB this summer with an architecture for the Next Generation System, as well as a specific list of programs in other agency budgets it intends to leverage.

The JPDO's ongoing efforts to develop an enterprise architecture,[10] or overall blueprint for the next generation system, will help in setting goals, supporting decisions, adjusting plans, and tracking agency commitments. The architecture will also show requirements from FAA and the Departments of Defense and Homeland Security and where various agency efforts fit in the next generation system. It will prove helpful in the future in resolving difficult policy decisions, including who pays for what elements of the system.

The JPDO is taking an incremental approach to architecture development and plans to have an initial version this summer. However, considerable work remains to link current systems with future capabilities and develop technical requirements, particularly for new concepts for automation.

Until these actions are taken, it will be difficult for the Congress and aviation stakeholders to determine if the JPDO is leveraging the right research, if funding is adequate for specific efforts, or how projects will improve the U.S. air transportation system and at what cost. Therefore, we think the JPDO should include in its periodic reports to Congress a table of specific research projects with budget data for FAA developmental efforts, as well as budget data of other agencies it is leveraging and how that ongoing research is supporting the JPDO.

- *Developing Approaches for Risk Management and Systems Integration.* Given that the transition to NGATS is a high-risk effort potentially involving billions of dollars, the JPDO and FAA need to articulate how problems that affected past modernization efforts will be mitigated and what specific skill sets will be required. The JPDO's recent progress report did not address this issue.

  The central issue focuses on what will be done differently from past modernization efforts with NGATS initiatives to ensure success and deliver much needed benefits to FAA and airspace users. FAA faces a wide range of risks, such as complex software development and complex systems integration and engineering challenges with NGATS initiatives and existing FAA projects.
  To help manage the transition to the next generation system, FAA is considering whether or not a lead systems integrator—a private contractor who would help link new and existing systems and help manage other contractors—will be required. DOD has relied on this approach to guide its development of complex weapon systems. Models for using a lead system integrator throughout the government differ with respect to roles and responsibilities. We note that FAA has relied on systems engineering and integration contractors in the past to help integrate modernization projects, but questions about the roles, responsibilities, and expected costs will need to be examined before a decision is made.
- *Clarifying and Updating Approaches for Industry Participation as the JPDO Evolves.* The JPDO established the NGATS institute specifically to allow for industry participation in shaping the Next Generation Air Traffic Management System. Currently, industry representatives are participating in JPDO IPTs. For example, the JPDO's progress report noted that over 140 industry and private sector participants (from 66 organizations) are involved in IPT planning efforts.

  Industry has expressed concern that participation in JPDO activities might preclude them from bidding on future FAA acquisitions related to NGATS because it may create an organizational conflict of interest. Generally speaking, FAA's Acquisition Management System precludes contractors from competing on production contracts if the contractor either participated in or materially influenced the drafting of specifications to be used in future acquisitions for production contracts or had advanced knowledge of the requirements.

  FAA is aware of industry's concern and is working to ensure that industry participation does not result in organizational conflicts of interest. Recently, the JPDO revised the contracting mechanism with the institute to address this issue. Specifically, the JPDO and the institute have committed to develop proce-

[9] OMB Exhibit 300 was established by OMB as a source of information on which budgetary decisions could be based so that they are consistent with Administration and OMB policy and guidance.

[10] Enterprise architecture links an organizations strategic plan to the programs and supporting systems in terms of interrelated business processes, rules, and information needs. This includes the transition from the "as-is" to the "to-be" environment.

dures related to organizational conflict of interest concerns, and methods to avoid them. Putting these procedures in place will help get and sustain the desired expertise from industry and help prevent problems in the future.

We think the JPDO needs to continue to foster awareness of potential conflicts of interest among IPTs and its contractors to identify information that might later lead to conflicts of interest. It will be particularly important for FAA and the JPDO to monitor these matters as the role of the JPDO evolves and various efforts shift from planning to implementation.

- *Examining and Overcoming Barriers to Transforming the National Airspace System That Have Affected Past FAA Programs.* Our work on many major acquisitions shows the importance of clearly defined transition paths, having expected costs (for both FAA and airspace users), and determining benefits in terms of reduced delays. This is particularly the case for initiatives that require airspace users to equip with new avionics.

  For example, FAA canceled the controller-pilot data link communications program specifically because of uncertain benefits, concerns about user equipage, cost growth, and the impact on the Agency's operations account. The inability to synchronize data link with other modernization efforts, such as the multi-billion-dollar ERAM program, was also a factor.

  Other important barriers to be overcome include how to ensure new systems are certified as safe for pilots to use and getting the critical expertise in place at the right time. Problems with FAA's multi-billion dollar *Wide Area Augmentation System* were directly traceable to problems in certifying the new satellite-based navigation system.

  FAA's certification workforce has participated in IPT meetings, but considerable work remains to determine how air and ground components will be certified and the corresponding impact on requirements. This is a complex task. *We agree with industry that FAA's certification workforce needs to be actively engaged with JPDO initiatives*.

- *Developing 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 envisions new capabilities developed by other Federal agencies (or the private sector) being transitioned into the National Airspace System. The JPDO will have to pay greater attention to this matter as it moves forward to reduce development times with NGATS initiatives.

  Our past work shows that FAA has experienced mixed results in transitioning systems developed by others into the National Airspace System. For example, FAA ultimately abandoned work on a 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 and cost issues.

  As we noted in our review of FAA's Free Flight Phase 1 Program, the use of "technology readiness levels" could be useful to help assess maturity of systems and ease issues associated with the transfer of technology.[11] Both NASA and DOD have experience with categorizing technical maturity. This could help reduce cost, schedule, and technical risk with implementing JPDO initiatives.

- *Conducting Sufficient Human Factors Research To Support Anticipated Changes.* The JPDO is planning to make fundamental changes in how the system operates and how controllers manage traffic to accommodate three times more aircraft in the system. Currently, the union that represents controllers is not yet participating in JPDO efforts for a variety of reasons but needs to be.

  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, who will be expected to rely more on data link communications. It will be important to have sufficient human factors analysis and studies to ensure that the changes envisioned by the JPDO can be safely accommodated.

---

[11] OIG Report Number AV–2002–067, "Free Flight Phase 1 Technologies: Progress to Date and Future Challenges," December 14, 2001.

Mr. Chairman, that concludes my statement. I would be happy to answer any questions you or other members of this Subcommittee might have.

ENCLOSURE A

Key Platforms

System	Status and Key Issues
Terminal Modernization: Standard Terminal Automation Replacement System (STARS), Common Automated Radar Terminal System (Common ARTS): Controller work-stations that process surveillance data and display it on the screen to manage air traffic in the terminal environment.	FAA has struggled with how to complete terminal modernization. STARS, which so far has cost $1.3 billion for only 47 sites, was envisioned as the centerpiece of terminal modernization. Because of technical problems and schedule delays with STARS, FAA decided to deploy another system, Common ARTS, as an interim solution at over 140 facilities in several configurations. FAA is rethinking its approach to terminal modernization and recently decided to field STARS to only five additional sites. A decision affecting the remaining 100-plus sites has been postponed for over a year. FAA needs to address problems with aging displays at four large sites, including Chicago and Denver, and resolve how it will complete terminal modernization and what additional capabilities will be needed as it works with the JPDO.
En Route Automation Modernization (ERAM): Replaces the Host computer hardware and software (including the Host backup system) and associated support infrastructure at 20 En Route Centers.	With an estimated cost of $2.1 billion, ERAM is one of the largest and most complex acquisitions in FAA's modernization portfolio. Progress is being made with the first ERAM deliverable—a backup system for the Host computer. However, the bulk of the work focuses on development of the first major ERAM software release, which involves developing over 1 million lines of code. A number of new capabilities (e.g., dynamic airspace management and data link) depend on future enhancements to ERAM that have yet to be defined or priced.
FAA Telecommunications Infrastructure (FTI): Replaces existing telecommunications networks with one new network.	FTI is FAA's effort to transition from multiple telecommunication networks to a single new network for the purpose of reducing operating costs at more than 4,400 facilities. As of May 31, 2006, FAA reported 5,925 FTI services completed with 14,555 remaining. According to a recent MITRE study, FTI is not likely to be completed by December 2007. Moreover, FAA is still in the process of determining the number of existing service requirements that will need to be maintained until FTI is complete. As a result, expected FTI benefits with respect to savings are eroding. Key issues for FAA include developing an effective transition plan and realistic master schedule, negotiating a contract extension for the existing legacy system with Verizon, and revising and validating FTI cost and benefit estimates.
Traffic Flow Management (TFM) modernizes the hardware and software used to manage the flow of air traffic.	Traffic Flow Management Infrastructure products and services are designed to support the Traffic Management Specialists and Traffic Management Coordinators to optimize air traffic flow across the National Air Space System. The specialists and coordinators analyze, plan, and coordinate air traffic flow through continuous coordination with the airlines and the use of surveillance sources, weather information, automation, and display subsystems.

ENCLOSURE B

Potential Agency Contributions

The following table provides perspectives on the wide range of research being conducted at agencies that participate in the JDPO for their specific missions. We note that only some of the ongoing research will be applicable to the JPDO's efforts.

Agency	Key Area of Leverage
DOD	DOD has an extensive and diverse Research and Development (R&D) base, including research in new aircraft, composites, imaging systems, and data exchange systems for all services. DOD has requested $73 billion overall for R&D in Fiscal Year 2007. The JPDO is particularly interested in DOD's broadband communication networks, such as the *Global Information Grid.* DOD planned upgrades to the Global Positioning System Constellation will be critical to civil aviation.
Commerce/NOAA	Commerce is requesting $1.1 billion for research in Fiscal Year 2007. NOAA is a part of Commerce and is responsible for the National Weather Service; the National Environmental Satellite, Data and Information Service; and Oceanic and Atmospheric Research. NOAA requested $533 million in Fiscal Year 2007 for R&D. The JPDO is seeking from NOAA probability weighted forecast capabilities, a national uniform weather database of forecasts and observations, and transparent automatic adjusted traffic management for weather.
NASA	For years, NASA has conducted the majority of long-term Air Traffic Management research, including automated controller tools and human factors work. NASA has requested $724 million for aeronautical R&D in Fiscal Year 2007. The JPDO is looking to NASA to develop automated aircraft metering and sequencing and dynamic airspace reconfiguration.
Department of Homeland Security (DHS)	DHS contributes expertise in the areas of security and netcentric initiatives. The Agency has requested $1 billion in Fiscal Year 2007 for Science and Technology R&D. FAA is looking to DHS to develop automated passenger and cargo screening, hardened aircraft security, and flight control overrides.

ENCLOSURE C

Integrated Product Teams

IPTs are multi-agency teams that are defining the specific concepts and capabilities and are coordinating the actions necessary to make possible the transformation in each of the eight strategies articulated in the NGATS Integrated Plan. The following provides a listing of the JPDO's IPTs and the agency responsible for leading each team.

1. Develop Airport Infrastructure To Meet the Future Demand—led by FAA.
2. Establish an Effective Security System Without Limiting Mobility or Civil Liberties—led by DHS.
3. Establish an Agile Air Traffic System—led by NASA.
4. Establish User-Specific Situational Awareness—led by DOD.
5. Establish a Comprehensive Proactive Safety Management Approach—led by FAA.
6. Develop Environmental Protection That Allows Sustained Aviation Growth—led by FAA.
7. Develop a System-Wide Capability To Reduce Weather Impacts—led by Commerce/NOAA.
8. Harmonize Equipage and Operations Globally—led by FAA.

Senator BURNS. Thank you and I appreciate your report. We will be looking at that. Like I mentioned before, we have many, many

committee meetings on the Hill this morning and Members have to attend all of them, it seems. I'm going to lead off with the Chairman of the Full Committee, Senator Stevens, and he has a few questions and then I will move to Senator Rockefeller and as they have other meetings to go to also and then to Senator Lott. Then I will kind of bat clean up.

The CHAIRMAN. Thank you very much, Mr. Chairman. Let me start with you first, Mr. Dobbs. I think you are pressing the agencies too hard and I certainly hope that the OMB and—you don't push this agency to make decisions before we know where the money is coming from. If we make decisions now, based upon what the budget looks like it could afford, we're not going to have a modernization program at all. We've got to find some way to define how to raise this money and meet with the industry and get the participants to understand how much is going to be available from the private sector as opposed to how much is going to be Federal before we decide what limitations we're going to put on these agencies from a budget process. So I hope you'll warm them. You are going too fast, to demand what you've just demanded over that period of time.

Mr. DOBBS. No, that wasn't my intent, I think the first thing the FAA needs to do is to, as the Administrator said, is get the architecture—or blueprint—completed, which will set out a list of requirements that FAA will be able to work with to determine funding requirements. FAA should have a final cut at that very soon, within weeks. This is a very important point and I apologize if you misinterpreted my statement.

The CHAIRMAN. Well frankly, I disagree with you because what we need to do first is find out if there is a funding mechanism that can produce what we need and if so, then get the architecture to fit the funding concepts. I don't think you can go into this with the point of view of having OMB saying, this is the amount of money we've got for the next 10 years. We've got to have a funding mechanism in this or the system modernization is going to not go forward. So I hope you won't really—the way I understand what you've said, was, it is their duty to come up with some budgets right now and make the architecture fit into the budget.

Mr. DOBBS. No, I didn't mean to imply that. My comments focus on getting a handle on ongoing research.

The CHAIRMAN. I'm glad, if that was not your impression. I apologize if that is not your meaning, not what you meant to convey.

Mr. DOBBS. I just want to clarify my remarks. We understand that financing is important and that additional resources will be needed. With respect to alignment OMB will put together a single business case so we can all identify what other agencies can contribute in terms of research. This will help FAA leverage much needed resources as envisioned by the law. It won't set limits with respect to funding for implementation in any way. It will just identify in a clearer picture, how NASA and DOD research will help the FAA. Hopefully, it will also help this committee identify where other resources can be leveraged.

The CHAIRMAN. Yes, well we're going to try to do that. Dr. Porter, I appreciate your statement. This enterprise architecture—am

I to understand now that they worked out with FAA and other agencies, that NASA is going to be a part of, really the center of, developing that architecture?

Dr. PORTER. The architecture is actually developed through the JPDO's EAD—EAD stands for——

The CHAIRMAN. Could you close those doors, please? And can you pull that mike back a little toward the doctor? I'm not hearing you.

Dr. PORTER. Sure. The Engineering and Architecture division of the JPDO is actually what is designing the architecture, so it is not just NASA but there are members of NASA that are part of that JPDO effort. So NASA and FAA personnel, as well as members from other agencies, are participating to put that architecture together.

The CHAIRMAN. Ms. Blakey, when we look at this from the point of view of planning for the future, is this right? JPDO is going to be the centerpiece of planning for the whole expansion into the modern phase, the re-making of the airway system?

Ms. BLAKEY. Essentially, yes. It is the planning and coordinating office that will bring together the relevant agencies. We've talked a lot about, this morning, about the airspace and certainly air traffic control and that aspect of this is absolutely front and center. It is critical. But as we all recognize, security has got to be embedded in this new system and therefore, we are coordinating with Homeland Security. The needs of the military, are also front and center when you would go through this. So it is a very important that we work, not just the planning function and coordinating function, but that we are also reaching out through the Institute and bringing to the fore, the work of the private sector. So that is the Institute's agenda and that's the functionality it has. It will be doing a great deal of the work in terms of systems integration and in terms of the work of monitoring and evaluating and eventually quality control.

The CHAIRMAN. I hope you send that chart on the right to OMB today with somebody. If they don't understand what's coming, we're in real trouble. I do believe, Mr. Chairman, what we've got to do is find some way as this goes forward, to have more of a meeting of the minds, some roundtable discussions. Get away from the hearings and let's try to keep our pace and learn what is being developed. I am really concerned about the funding. I think the funding is going to be overwhelming and it cannot be driven by budget considerations, it has to be driven by need and we have to develop a funding mechanism to meet the needs of this modernization that is not constrained by the budget process. It will, over a period of years, meet the budget process but it cannot be constrained in initial years or it won't get off the ground. Mr. Dillingham, by the way, we've got a town in my state named after you or you carry it's name. I'm glad to see a Dillingham here.

Mr. DILLINGHAM. I was hoping I was a relative but it didn't turn out that way.

[Laughter.]

The CHAIRMAN. It could well be. It could well be. I'm a little worried about your comment about BRAC, because BRAC thrown into this process now, before we really understand the architecture and the funding capabilities, would be a mistake. I hope that we get

some timing on this, that makes sense in terms of really realizing we may have to put some additional money into this existing system to let it expand a little and pick up some of the strain and move from that level rather than to try and build on what we've got now. There is an adjustment phase in this modernization program, which I think relates to what Ms. Blakey is talking about, about the high-tech concepts of bringing it in. Our experience in Alaska was that a lot of pilots didn't want to experiment with Capstone. Today, they are falling all over themselves to get it and I think we have to find ways, to find places to test some of these new systems before we put all of our money into them. There is no question that ADS–B has worked in our state and I hope it works nationally the way it has worked in our state. But without that experimental phase, I don't think the South 48, as we call it, would ever have gone into ADS–B. We've proven that it works in Alaska. There are other components to this new architecture that have to be proven, too. That is why I think we really have to pace this and pace funding toward the full realization of the modernization and set some realistic goals of when this must be turned on. I don't think you have one yet, do you, Ms. Blakey? Is there a date certain that this system has to be operable?

Ms. BLAKEY. No, I think we really see it phasing in and some of the sort of, if you will, the backbone technologies, like ADS–B, coming on earlier. As you know, we are deploying ADS–B in places around the country where we really can both use the technology to the greatest effect. We're going in now to the Gulf of Mexico, where there is no radar coverage and that is going to be a very exciting development. So we will see these systems prove themselves, develop and then we will be able to attach functionality and add on additional technologies as we go. We are looking at the year 2025 as being a, if you will, a goal, but there is really no end state in this as we all know. It evolves over time and certainly the next 10 years are going to be very critical.

The CHAIRMAN. By that time, I'll be older than Strom Thurman, OK?

Ms. BLAKEY. And you'll still be flying in the system, Mr. Chairman, I'm confident of that.

The CHAIRMAN. What I want to do is get some timeframe built into this so we know where the gates are in terms of the stress that cannot be carried by the existing system. Once we know where that gate is, then we've got our first target we have to meet. I do believe we can meet it if we get rational about financing. Financing ought to be up front and should not be the constraint on the system, as I see it outlined here this morning. Maybe you didn't intend to leave me that impression but I have the impression that financing is going to drive modernization rather than modernization driving the need for finance. I hope that's the way it comes out. Thank you, Mr. Chairman.

Senator BURNS. Thank you. Senator Rockefeller?

Senator ROCKEFELLER. Thank you, Mr. Chairman. I think that is the point, Administrator Blakey. I would just ask you three questions. I agree, I took from the IG's statement that a certain hostility toward—on the other hand, if you one look around government, it is replete with systems that are designed, budgeted, fail-

ures emerge, more money is added and that is the subject of a hearing that nobody ever wants to have. But from your point of view, you've got a lot of new things you want to do, satellites, all kinds of things. You want to get a lot of them done in the next 3–5 years. So my question, to give you a chance to answer this, is how do you plan to go about that? It would seem to me that money is always a problem. You never have enough money. You are always having to cut and that's our fault and the White House's fault and not your fault because you're the one who suffers from it. How do you—it would seem to me that you need to decide what you want the most, what you have to have. Then you figure out how much it is going to cost, to the best of your ability and then, you have to proceed to try and get it with the stakeholders, so to speak, onboard with that. The control is that the airlines, general aviation, etcetera and then you also have to make that they are going to use this stuff, respond to this stuff and you know, they are not always willing participations. The trip out to Herndon and your place out there as opposed to most other places, is very interesting because what you have there, other places might not be able to put to use, simply because of the lack of training and skills. So in 3–5 years, you want to get certain new technologies in. In generic terms, how do you plan to do that, with the caveats I've just added? People on board, people to use it and do you agree with the idea that you have to figure out what you want first and then how much it is going to cost, second? And then if we don't give you the money, then it is our fault and the White House's fault?

Ms. BLAKEY. Well, we're not looking immediately to establish fault here, I'll go to what we——

Senator ROCKEFELLER. I'm not looking for that. I'm just trying to be helpful to you.

Ms. BLAKEY. I understand. I think that probably the best things I can point to in terms of how we intend to do this go the following. I absolutely agree 200 percent with your sense that you have to accept some things are going to take priority and other things you have to set aside. I was delighted when Dr. Dillingham pointed out that we have been able to maintain, for the last several years, all of our capital investment accounts, our major acquisition programs, on budget and on schedule. That, given the FAA's previous track record, is no mean feat and it was done, in part, by focusing like a laser on those programs that are important and not trying to fund every single thing that, at one point, was in the portfolio. I think that has proven to be extremely successful and our major components that are going toward the Next Generation system, such as ERAM that Dr. Porter mentioned. The system, if you will, the backbone for the En Route system, is on track and on budget. So from a very practical standpoint, we are working very hard as a business to do this. We also have a great deal of confidence in the way that the JPDO is processing with the concept of operations—what exactly do you expect the system to be able to do? And then having the enterprise architecture, which really spells out what the technologies are and how they will work together. The final thing I would point to is that we have had great success with the highly specific roadmaps. As you know, we are running the FAA with a very businesslike approach, driven by metrics. Every-

thing from our flight plan, which spells out exactly what we've got to accomplish in the next year and we report on it quarterly and our bonuses are tied to it—right through to the operational evolution plan, which is a 10-year plan. For every year, we know what the benchmarks are. We either hit them or we don't and we're working very hard to again, deliver on those specifics. So we're going to use that approach. The operational evolution, now partnership, which will continue to be linked right into the concept of operations and the enterprise architecture and we will be able to see what the benchmarks are. I have no doubt about the fact that this is going to be something that we have to consult our stakeholders on very closely, because you can move faster or more slowly. Some of it is a question of their own business case for equipage, for example. Does it make sense to put on the aircraft the necessary technologies to take full advantage of the kind of satellite-based system we are talking about? There are tremendous cost benefits in this but businesses are going to have to be a part of that decision.

Senator ROCKEFELLER. I'm running out of time. Let's suppose that it begins to work. You've got to decommission a lot of technology.

Ms. BLAKEY. Yes.

Senator ROCKEFELLER. And that's not an easy thing to do, legacy technology. People have been living with it forever. Do you see that as a problem?

Ms. BLAKEY. I'm sure it will be a problem, I think, for two reasons. One, people are very wedded to what is and what has worked for so long and that is essentially ground-based radar. We have a tremendous amount of ground based radar that could be decommissioned and it is part of making the business case for this system. You do have to substantially move to a satellite-based system with a good backup. The second thing about it is, and it has certainly proven to be an issue in recent appropriations discussions in just in the last few weeks, that it is extremely difficult to get political backing as we move to consolidate and co-locate so that we can pull our costs down and allow more room for these new systems. It is a question of political will. I think you—as a concept, people tend to favor it until it affects their district and their state and that has proven challenging.

Senator ROCKEFELLER. Final—I'll change my final one to go back to the first one. I indicated that throughout Federal Government—and it really is a grisly story that somebody should win a Pulitzer Prize on, of what the Federal Government wants, whether it is in the intelligence field or anything and then what they end up paying for it, DOD, etcetera. I mean, it's just—we've gotten mad about so many things for so long that we no longer get mad enough to do anything about it. But it occurs to me, when I ask the question, I'm not sure how much you have run into that kind of problem, either because you haven't made steps this big or because you think that you can, in fact, anticipate once you've decided what you want, how much something might cost. Just because DOD—something, you know, Lockheed Martin runs something up three times the cost because they have delays and they didn't do the work in the beginning or because there was false bidding or whatever, etcetera. It

doesn't mean that you have that problem or that you have had that problem or that you would have that problem with this. Is this more discrete, more definable, that you can avoid those—this is what it is going to cost, and oh by the way, 3 years later, it's going to cost twice as much or whatever.

Ms. BLAKEY. Honestly, I think it is always a challenge. I am very, very happy with our acquisition track record and the fact that we have not allowed requirements creep and other kinds of things to begin to inflate costs of current programs. That has required a lot of discipline. But honestly, Senator, much of this is to come and it would probably be overreaching on my part to say that we know we can avoid those kinds of problems, particularly when, in some cases here, you are going where no one has gone before. Therefore, some of the technologies, as you begin to do the demonstrations and deploy them, may turn out to not be as promising as we'd hoped and those will be sunk dollars. But on the major implementation, I do believe that if you are able to apply a highly disciplined process to it, that we can learn how to proceed. We've got some people who have worked on big programs coming in from Defense and from other parts of industry, to help us on this. I think we've got a pretty good team from that standpoint.

Senator ROCKEFELLER. You expect to save money if you get this all in place. One thing I start worrying about right away is that that saved money go back into investment opportunities for the FAA, as opposed to going back into the General Treasury. I mean, you may not be here by that time. I just want you to tell me that you would never allow such a thing, from any town or city in Alabama or anywhere else in the world.

Ms. BLAKEY. I'm flexing my muscles. I'll do my best. We all are very concerned about the fact that we need to be able to invest in the system and I think we all agree that changing our system of financing is critical for this. We are right at that point. We're going to have a very challenging year in front of us because all the taxes and fees that support the aviation trust fund are up in a year from this September. So we have got literally a matter of months to figure out how we can best set up financing so it does allow for the kind of investment that is clearly needed. And there are mechanisms that could do that.

Senator ROCKEFELLER. I thank you and I thank the Chairman.

Senator BURNS. Thank you. Senator Lott?

STATEMENT OF HON. TRENT LOTT,
U.S. SENATOR FROM MISSISSIPPI

Senator LOTT. Thank you, Mr. Chairman. Thank you for having this hearing and thank all of the witnesses for being here. Madame Administrator, it is good to see you again. I appreciate your leadership at FAA and I want to commend you for what you are doing in a variety of areas and encourage you to continue. I have been interested in this hearing because I do know that effort is being put into the future but I am concerned about making sure that this is just not a bunch of acronyms and meetings that don't really produce anything. We have a problem here and it is going to grow with every passing year. So we do need to come to some conclusions and get some actions and some results. I know that you are

being squeezed with budget and I know you're trying to implement cost savings, which is never easy and actively opposed by some of your own people. But at some point, we've got to quit trying—I mean, trying to find savings is all very well and good but when you are trying to implement a whole new program, the Next Generation, you're going to have to figure out how we're going to pay for this. One of my big disappointments in this Administration, frankly, has been the lack of proper attention to transportation, which I think is one of the critical areas for the Federal Government. I mean the whole package: highways, bridges, airports, air traffic control modernization system, railroads, passenger trains, ports and harbors, navigable streams—the whole package. I really think it is one of the few things the Federal Government has a prime role in and I hope that you will push, within the Administration, within the Department of Transportation, and on OMB to face up to this task. In December 2000, I met with the incoming President and his to-be Chief of Staff. It was the former Secretary of Transportation. One of the subjects we talked about and I thought we were going to focus on, was a modern air traffic control system because I was concerned about where we were headed and what needed to be done.

Well, this is turning into a speech or lecture, but I just, I think we are going to have to face up to this. I think that on the money, we're just going to have to find a way not just to look for savings, which we always should. If you've got a legacy infrastructure that really is a throwback to another era, you need to begin to phase that out. You've done some things in control towers and so forth—that has led to some savings, which we haven't always liked in Congress, including me. But I think we're going to have to decide we're going to put money into this and I'm not talking about necessarily new taxes and fees. I'm talking about General Budget. This is of interest to the general public and you're not just going to increase fees any further. You're all going to try it and we're going to reject it and you're going to talk about more ticket taxes and stuff like that. We aren't going to do that. This is about modernization of a critical system that is important for the future, the economic development and growth of America and we're just going to have to toss a Rubicon and decide in the big picture? Look, I'm a cheap hulk and all of that, but $18 billion over a period of years, to do what we need to do is not a big amount of money. We're arguing right now on a bill that will, over the next 10 years, cost $268 billion and we've sloughed it off like it was chicken feed. So I think we need to come to terms, in Congress, in the Administration, FAA, Department of Transportation, OMB and the White House, we're going to have to put money into this and we're not going to charge a bunch of new fees to make it happen. It's going to come out of the General Treasury. That's my opinion. But let me just—I do want to say to you again, you need to think about the funding problem, how we're going to do it and you need to make some recommendations. The OMB is going to shoot you down. We're going to shoot you down so maybe you ought to have a multiple choice list and maybe you'll find one or a combination of all the above that we can achieve. I agree with Senator Stevens that we have to figure out how to pay for this. We're going to have to do this. Let's

do it right and let's figure out how we're going to pay for. So let me just ask a couple of questions. How are you doing with the implementation of new ATC technologies, for instance?

Ms. BLAKEY. For the current situation we are in, I think we're going very well, as a matter of fact. One of the things that we have concentrated on is looking at procedures and looking at ways we can set up operationally to take full advantage of what we have out there. That means that we have begun putting in place what is called RNAV and RNP procedures at a number of our critical airports and they have really delivered a tremendous amount of efficiencies. It is just much more precise, using satellite-based technologies and capabilities that are already built into the aircraft right now, today, to get a lot more capability into places like Atlanta, for example. Delta has been saving tremendous amounts of money using these new routes into Atlanta, just as one example. The same thing is going on in Dallas-Fort Worth and I could start naming airports around the country where we have genuinely increased capacity. When we talk about technologies, the ERAM system is hitting its milestones precisely on target. Now this is the brain, if you will. It is changing out the host for the upper route airspace. But we've had other successes that I am very pleased about. The new technology that governs aircraft across the oceans—it is now in place both in the Atlantic and in the Pacific and it is coming on board in Alaska. This is allowing us to know much more precisely where aircraft are, way out there when before we really were relying on radio technology and very mechanical, procedural things. At this point, we have software that is allowing us to space aircraft much more precisely coming in to our coasts and it is making a big difference. I could mention a few other technologies that we are using—URET, which allows controllers to probe where an aircraft will be 20 minutes further into the system and determine whether or not a much more desirable route is available. A year ago, we dropped the vertical separation in the airspace. A huge step—the compression of upper airspace from 2,000 to 1,000 feet allowed again, a great deal more in terms of efficient use of the airspace. The final thing I would say, going to these newer technologies, which are reality today—I do want to say ADS–B is in place in a number of places—UPS is using it in Louisville. In that one airport alone, because the aircraft are able to have a very smooth, continuous descent approach, which uses a glide as much as anything—they are getting a 30 percent reduction in terms of noise below 6,000 feet, which is huge for a community and a 34 percent reduction in emissions and literally, a million fewer gallons of jet fuel in a year. Now, these are benefits that are very real and tangible and we are delivering them in the system today. I point to those statistics because I think they are very concrete examples of things that we are putting out, that are working and as I say, a delivery of what we had promised at the outset.

May I make one comment, Senator Lott, on your thought about financing because I do believe you are quite right. This is going to be a big challenge for this coming year and it is not necessarily about raising taxes—more money, although to invest in this system at some point, there is going to have to be additional investment, no question. But it is also about the ability to have predictability,

have a revenue stream that ties the costs and the revenue together and makes it a business-like operation that means you do have a sensible investment flow. I think, one of the problems we have had over the years in terms of making these capital investment programs work, is the fluctuations in funding so that you are revved up and then you have to step down. Contractors are laid off, things don't happen and then you try to jump back up. You have warehoused equipment that is not deployed and on it goes. So anything we can do as we are thinking about financing reform, to make it predictable and tie those costs to the revenue and tie it to the investments that we are committed to, I think, will be a tremendous improvement regardless of the level of funding.

Senator LOTT. Thank you for your leadership and I know what you said made a lot of sense. We look forward to working with you on this.

Ms. BLAKEY. Thank you.

Senator LOTT. Thank you, Mr. Chairman.

Senator BURNS. Thank you, Senator Lott. I want to follow up here with Mr. Dillingham. In your testimony, you review not only the management structure but also the interagency involvement to this point. What do you believe are the three top issues that JPDO must overcome in the short term, to fulfill its mission, so to speak?

Mr. DILLINGHAM. Mr. Chairman, I think the first thing is the progress that JPDO has made to date, the progress that FAA has made to date, needs to be institutionalized and by that, I mean systems and agreements need to be put in place so that when you have a change of Administrator at FAA or if you have a change of Secretary of Transportation or you have a change of leadership in any part of the JPDO organization, that there is some continuity there and we don't have to start from scratch. We need that commitment. We need it formalized in some way.

I think the second thing is what everyone has been talking about, that is to complete this planning process in an innovative way, so that there is a basis for stakeholder involvement. There is a basis for estimating the cost of this and arranging or putting in place the financing for it. As we mentioned, without the financing and some commitment on the part of the government, this could go south in a hurry. I think another element is something that the Administrator mentioned in her testimony—that is the importance of international harmonization. It is important for our aviation industry and it is important for worldwide transportation that there be a harmonized and seamless air transportation system. So those are the three top things that I think are important at this point.

Senator BURNS. Right now, is it structured—do they have enough autonomy? Do we have an estimated cost of this JPDO in order to be effective?

Mr. DILLINGHAM. Well, the structure that has been put in place so far——

Senator BURNS. I think they've got to be autonomous in some way or other to survive the change of leadership in the Department of Transportation or FAA or any other part, OMB or anywhere else.

Mr. DILLINGHAM. What we understand is happening, Mr. Chairman, is that there is in process a Memorandum of Understanding

between the constituent agencies that will, in some way, institutionalize, formalize the relationships as they continue to participate. You also heard them mention that they are working with OMB, which is very important, in that they are trying to have a situation where all of the constituent agencies would identify those projects that are NGATS-related or Next Generation related and OMB could consider them as a package, rather than individual projects. The Administrator also mentioned an MOU between the EC and the United States. So in fact, these things are beginning to be institutionalized and we think that is really critical because of changing administrations—you don't want to start from zero again.

Senator BURNS. I agree with that. Dr. Porter, getting research to a mature point where the private sector can take over is very important. I guess my question would be, does your agency plan on assisting the JPDO with development or developmental validation like prototyping and demonstration of new technologies and this type of thing, on how these new technologies will work? What is NASA's plan? How do they fit into this JPDO?

Dr. PORTER. That was a very broad question. I think you're actually—you're really trying to focus, however, on the development of the technologies.

Senator BURNS. That's right, the technologies because I know it is—today, technologies are developed in a shorter time period, before we even get them in place, why, they are out-of-date, so to speak. How do we remain agile and versatile so that we can take advantage of some of those situations?

Dr. PORTER. What NASA tends to do is invest very heavily in the fundamental research that is going to be required to enable this NGATS that we are talking about today. There are a lot of things that, while we've talked about the technologies that do exist today, such as ADS–B that can be taken into the near term and put forward, there is a lot that we have to do and NASA is uniquely qualified to do it, to answer fundamental questions we don't have answers for today. For example, human automation and the roles that humans in automation will play as we go to this more and more complex system. There are fundamental research questions that have to be answered in that regard. That is just an example. There are a whole host of them. So this vision that has been articulated by the NGATS—I don't want to give the impression that we can just turn the switch on and everything is already solved and it is just an integration challenge. There is a lot that has to be done at the fundamental level in research, in order to answer key questions, to enable those concepts and technologies that are going to take us there. The technologies that exist today that are based on the knowledge we have today are not sufficient. There is a lot that still has to be done and that is our role and we intend to do that. So if we abdicate that responsibility, we would argue that the NGATS cannot be achieved because what it is trying to do is truly revolutionary. It is not an incremental step forward; it is a revolutionary step forward. So our commitment from the air traffic management to the safety, to the air vehicle research itself that I talked to you about, is very broad and it is very committed and it is very committed toward the cutting edge, to address the chal-

lenges that we face for the vehicles in terms of their safety as well as their noise and their emissions and their performance that we talked about earlier as well as the air traffic management challenges. It is a very, very challenging fundamental research issue that we have to address.

Senator BURNS. It seems to me that the private sector will have a role to play in this.

Dr. PORTER. Absolutely, absolutely and I believe that the Administrator made that clear when she was explaining about the NGATS Institute and she referenced the CON OPS, which was heavily—the institute was heavily involved in terms of getting the feedback back into that as well as the enterprise architecture. The reason why that is such a complex challenge is that it is not just the government that's devising, that it is also with input from the Institute and their members, which of course, are some of the world's experts, our industry partners.

Senator BURNS. Tell me, Administrator Blakey, where are we on the structure of the—and getting people in place, the right people in place, as far as the JPDO is concerned?

Ms. BLAKEY. I think things are going very well. We've certainly got a talented team of people from all the agencies that are involved and we've been very pleased about the level of commitment that we have seen. I think all the agencies really understand that it is in their self-interest as well as a critical thing for the Nation, to transform this system. We are on the cusp of selecting a new director. I am pleased to say that we took this very seriously because we realized the challenging aspects of this position and we went out with a search firm and looked very thoroughly and we are at the final stages of making that selection. I think we will be able to announce a new director within days. That is my expectation. There obviously are clearances and all those sorts of things that we don't entirely control. The other thing I would point to is the Institute. The Institute is, I think, becoming a very robust organization of our private sector stakeholders who are not only collaborating with the JPDO, they have a formal structure where they have a governing board, they have a director and they also have very significant organizations participating in it. In this case, the Association of Airline Pilots, ALPA and the ATA, the Air Transport Association, also working with the AIA. So you have a very strong institutional commitment from industry as well as a lot of individuals. They are at the point now where they are going to begin to draw down funds from the JPDO for demonstration projects. They will be accepting contracts to undertake the projects as well spend the contributions they made.

Senator BURNS. Do you think that we have enough dollars in there to complete the mission?

Ms. BLAKEY. We don't have enough dollars right now to complete the mission.

Senator BURNS. Do we have an estimate of what it is going to cost or what is going to be our yearly commitment?

Ms. BLAKEY. We are working toward that with these workshops that we are conducting. We have another one coming up with the general aviation community and another coming up with the airport community in the next several months. The cost analysis that

we have already done with the corporate sector, the airline community, as well as these other two still to come, I think will give us a much more granular sense of cost. It is not just the question of Federal dollars invested. It is also the question of how quickly the private sector wants to step up into this new system with all of the costs and the benefits that are going to go to them. There is an estimate that Dr. Dillingham mentioned before, that one of the committees that has been working closely with us has estimated it will require approximately a billion dollars additional investment a year. But obviously that can be front loaded, back loaded and some of this again, goes to where are the benefits and when do we get them?

Senator BURNS. Well, that figure sure caught my attention, a billion dollars a year, plus I don't know where we're going to find it right now but I believe that we'll have to rely on some estimates coming out of the JPDO once it is finally—it is finalized and the structure has been set. I think Congress should know about that right away. Mr. Dobbs, the Next Generation vision includes some migration from ground systems to airplanes and right now if I hear anything at all, as I travel, and I do a lot of it between here and Montana, mostly. We hear that with our airplanes in the air have a lot more sophisticated technology than our ground operations. Now to implement these ground systems, investments will be required by both the FAA and industry stockholders and will require a joint public private ownership plan. Do you believe there is sufficient industry participation to develop the necessary joint ownership of the plan and if not, what steps should be taken to strengthen that involvement of private industry? In other words, the investment coming in from private sources.

Mr. DOBBS. Without question, industry participation is critical. I think the FAA is definitely on the right track and the NGATS institute was set up to get industry participation. I think the Administrator mentioned prototype efforts in the Gulf of Mexico. The airline industry, for example, has mentioned that they would like some clarity about when they need to equip. They would like that linked to their maintenance schedule and they would like a little bit more information on the benefits that they would get from moving forward with ADS–B. Clearly, ADS–B could be revolutionary with the things that it could do in terms of safety and capacity. It is really a matter of having the air carriers be able to afford it. So, they just need sort of a plan, a roadmap. That is what they told us.

Senator BURNS. I don't think you're just going to have the air carriers participate. I think there is going to have to be other participants, too. Dr. Porter, I forgot to ask you a while ago, you know, we were talking about the R&D that goes on in NASA. I know that your budget has been drastically cut over there and that would tell me that funds for the efforts to go to mars have been sort of scaled back. With these scale backs, how has that budget, these cuts, how has that affected the work that you do in research and development?

Dr. PORTER. You're correct that the budget, of course, has been cut, the aeronautics budget, in particular. The overall NASA budget has gone up. The importance of what we're doing now is ensur-

ing that what we do is of high quality. So regardless of budget, we have to ensure that we have principles in place that are sound and logical and drive the decisions that we make and then we apply our budget accordingly. Some of those issues have been brought up earlier today. Those core principles have been established. We have put together our program according to those principles and now we're confident that given that, we can apply a budget in an efficient and logical and cogent manner. So it is important, I think, not just to look at budget but also to ask, how is that money being spent? And of course, both of those elements are important and I think we have a smart and efficient way of going forward that allows us to address these challenges we talked about, the research challenges for NGATS and do that in a manner that uses the money well.

Senator BURNS. I was going to say, on NGATS, that won't—these cutbacks wouldn't affect the work that you are doing in that area?

Dr. PORTER. We have firmly—one of our core principles, we have three core principles and one of our core principles is to focus and make sure we are firmly aligned in the fundamental research needs of NGATS. So regardless of budget, that will be one of our principles.

Senator BURNS. Mr. Dillingham, I know that GAO has held forums and meetings regarding the JPDO for the NextGen System. You are also having meetings, I guess, with the Europeans. What are the Europeans currently planning and how is their plan different from ours?

Mr. DILLINGHAM. Yes, Mr. Chairman. We have looked at the European counterpart known as SESAR. They are in the very early planning stage. I think they began their planning stage in March of 2006 and we've been planning now, going on 2 years. I think that the recent MOU that was signed is sort of a landmark kind of occurrence in that it means that the European community and the U.S. will be working together more so than they have in the past, with a formal understanding of trying to make sure that we have international harmonization and standards development. So the Europeans are using a different process but they are aiming for the same thing and our position has always been that it is not the process that's important, it is the outcome and right now, the outcomes are aimed at the same place.

Senator BURNS. Are they very serious about systems that are inter—that will talk to each other?

Mr. DILLINGHAM. Yes, sir. Interoperability is a main——

Senator BURNS. That's the word I was looking for and it didn't come.

Mr. DILLINGHAM. Right. I practiced it before I came.

Senator BURNS. Maybe I should!

Mr. DILLINGHAM. It is one of the main elements, both for the U.S. and for EC because again, the transportation system, the worldwide transportation system, is an economic driver on both sides of the ocean. So although there is competition, there is cooperation as well.

Senator BURNS. When you're looking for words, you know, the human brain is a wonderful thing. It starts working the very in-

stant you are born and it does not stop until that red light comes on, right here.

[Laughter.]

Senator BURNS. I just, drawing down to some conclusion here, to end this hearing, I'd just like, in your opinion and I'd like for all three of you to respond to this. As of right now, if you had three things that you wanted addressed today to take care of, what would they be? Three things with regard to JPDO. What would they be right now, what would be your concerns and I'd just start with you, Mr. Dobbs.

Mr. DOBBS. I think obviously, would be to figure out how to finance it. I think, too, it is important to finish the enterprise architecture and third, would be to maintain stakeholder involvement because you need both the government and industry right now. Many participants are volunteers right now, from different agencies and industry. We need to maintain that involvement over the long haul.

Senator BURNS. Mr. Dillingham?

Mr. DILLINGHAM. I thought you were going to skip me, Mr. Chairman, since I answered one like that.

Senator BURNS. You didn't practice this one, is that it?

Mr. DILLINGHAM. No, no. I agree with the IG that we need to first of all, complete the plan and that plan is the baseline for all things that we need to do after that, including cost estimation. I think it is also important that we maintain the progress that we've made, with regard to keeping acquisitions on time and on budget and institutionalize that progress. Also, institutionalize the relationship between the constituents of the JPDO. I think those things are first and foremost to keep us on schedule.

Senator BURNS. Dr. Porter?

Dr. PORTER. OK, they stole all my answers. I think the most important thing is the enterprise architecture, which I highlighted in my testimony. That is critical and it has to be done right. I would say as a sub-bullet to that, we don't want to rush that for the sake of meeting a timeline. I think the JPDO has done the right thing by saying, let's get it right first. If we don't get that right, we're going to spend a lot of time on the back end, fixing what we didn't think about up front. So I think they are doing a great job and the NGATS Institute's involvement is critical, as you mentioned. The industry involvement in that endeavor, leveraging the expertise that industry has in that is critical. I think the need to have the leadership sustained and Administrator Blakey had mentioned that we are hopefully going to be hearing about a new director soon. That is good because you've got to get that stabilized and also sustaining the partnerships. We really do have a great partnership among the agencies. That has been working very well, but I think Mr. Dillingham's point is a very good, that you want to have a mechanism of institutionalizing that. I don't really like that word but I think ensuring that is a solid commitment that stays forward, regardless of who is there. Personalities come and go and you want to have that passion and commitment. I've been very impressed by the passion and commitment of the current members and we want to sustain that. This is going to take a 20-year committed and focused effort. I think we all are very cognizant of that and that is

why there are a lot of people working long hours to ensure this sustains. But it does have to be formalized or I guess, institutionalized as Gerald had mentioned. So I think I hit three points and if not, I'm sure I talked long enough.

Senator BURNS. Well, I would tell you. This is just a personal opinion and observation here. I agree with you that we've got some awfully good people. The stars are lined up right because we've got some awfully good people in the right places now. As this becomes one of my top priorities in the Congress and as we get this kicked off for the next generation, we've been the beneficiaries of strong leadership, especially in the Administrator and I'm going to ask her about her three things. I just think we've just got some awfully good people in the right places right now to get some really powerful things done. That's why I—I'm worried more about the process, get it in place, don't experience paralysis by analysis and to move forward and to be flexible and agile as we do. I just believe that we've got those kinds of people here in place now. Administrator Blakey?

Ms. BLAKEY. Well, thank you and I think——

Senator BURNS. You're the one that has to do all this, you know. You're the do part. You're at the jump. You've got the do part.

Ms. BLAKEY.—the jump do. I figured I'd be the rear end on that. Well, I'll tell you. We're certainly all working together on this and believe me, the do part has got a lot of partners. So I'm grateful for that. I guess what I would say, in addition to echoing everything that was said at the table here, is it all does come down to leadership on three fronts. I think we do need, of course, to have a strong and committed organization and the directors. I want to, by the way, thank our Acting Director, Bob Pearce, who has stood in and done a yeoman's duty. Bob is right here behind us and he has really done a wonderful job over the last 6 months. So we have benefited from him and I think we will continue to benefit from the strong work of the Institute and the JPDO staff. I think it is also critical that we have leadership on all of our parts, from the Administration and from the Congress, as we address this financing issue. It will not be easy. It never is when we're talking about trying to change the way we pay for things. I mean, it is as straightforward as that. It is all about the pocketbook and that is going to make this a tough year where leadership is concerned. Folks stepping up, is going to be huge. And then the final thing; it is a 20-year vision and goal we're pursuing and I have to say that the leadership of this committee—I remember where the JPDO came from—remember this was in Vision 100? And I must also mention the leadership of this President. I wish Senator Lott were here. I would have to say that this President has certainly backed the JPDO and has backed all of our efforts. The Administration's support has got five agencies of government pulling at the same rope and that is no small thing. So I hope on all fronts, we'll continue that kind of leadership. Thank you.

Senator BURNS. Let me assure our witnesses today that I'm going to do everything that I can do to make sure that you get great support from the Congress. The more that we communicate with colleagues, especially here on the Senate side, on the challenge ahead and the more clear they are about this issue will en-

able us, I think, to secure the funds that we will need to make—not only develop the new technologies but make the transition. As Mr. Dillingham has recounted, it is going to cost more money and especially in the transition. So let me pledge to you that you'll have as much cooperation and support from Congress as I can possibly muster as we move forward and I thank you for your testimony. You'll be called upon again. There will be other hearings. We'll have other hearings, with stakeholders, with the private sector, with other folks that will be involved in this here in this hearing room. Then the job of putting the organization into a mode of success—let's don't structure something that is structured to fail. That's what we have to be very, very careful of. So I appreciate the testimony of everybody today. I would imagine there will be other people on the Commerce Committee that will have questions. I would, if you have questions from individual members of this committee, if you would respond to the Committee and to the individual Senator, I would appreciate that. We'll leave the record open for a couple of days right now. If you have other statements that you would like to make part of the record, why we'll do that also. And again, thank you for coming this morning and this hearing is closed.

[Whereupon, at 11:40 a.m., the hearing was adjourned.]

A P P E N D I X

PREPARED STATEMENT OF HON. DANIEL K. INOUYE, U.S. SENATOR FROM HAWAII

As the Aviation Subcommittee has begun to focus on the reauthorization of the Federal Aviation Administration (FAA), I believe we will find few issues as critical for the future of our National Airspace System (NAS) as the need to modernize our air traffic control system. In 2003, I was an original cosponsor of the legislation that created the Joint Planning and Development Office (JPDO) to spearhead this effort, and I have watched with interest as they have been established and began their mission.

While most reports of the progress of the JPDO to date have been positive, this is a critical period for the modernization effort and I am hopeful that the involved agencies will respond positively to any criticism they receive to make this effort a success. We must ensure that the industry stakeholders are properly included to help bolster this effort and that the JPDO continues to have broad multi-agency participation to move forward with the Next Generation Air Transportation System (NGATS).

We also must be certain that this process is as safe as possible while providing the promised benefits for our citizens and industry. I look forward to working with the witnesses to make certain that the JPDO receives the necessary support from Congress to effectively modernize our air traffic control system and position the Nation to have the world's leading air transportation system in the 21st Century.

PREPARED STATEMENT OF THE AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA

A safe, secure and efficient air transportation system is essential to the United States' prosperity, competitiveness, and national security. Approximately 10 percent of the U.S. economy is directly tied to aviation. The industry is a strong driver in our Nation's economic growth, and it will take on increased importance as air traffic triples over the next 20 years. But for that to occur, fundamental, transformational improvements to our Nation's air transportation infrastructure are essential to address the known capacity constraints in our current system. Since our current system is operating close to the point of gridlock, it is critical that our country develop and implement the Next Generation Air Transportation System (NGATS) in a timely manner.

Members of the Aerospace Industries Association are strong proponents of the Joint Planning and Development Office (JPDO) and are constructively engaged to help make the transformational NGATS a reality. The AIA represents more than 100 large companies and 170 smaller business suppliers, and we operate as the largest trade association in the United States across three sectors: civil aviation, space systems, and national defense. The export of aerospace products provides our Nation's largest trade surplus ($40 billion in 2005), and U.S. companies continue to invest heavily in R&D, spending more than $50 billion over the last 15 years. Maintaining U.S. aviation leadership is critical to our national economic health and national security.

Since the JPDO was created, they have built a consensus around its vision for the next generation air transportation system. But now that the vision creation stage is nearing completion, JPDO and the respective agencies must expeditiously embark on the task of turning that vision into an executable implementation plan and ensuring that plan is implemented on schedule.

AIA commends the JPDO leadership and participants for their accomplishments in establishing this remarkable enterprise and creating a vision for the future. Bringing these organizations together to collaborate and leverage individual agency expertise and resources gives the United States a powerful opportunity to achieve the goal of transformation of the air transportation system. The inclusion of non-Federal government stakeholders, bringing added viewpoints, knowledge and exper-

tise to the JPDO through the NGATS Institute, is also a significant accomplishment for both the government and private sectors.

It is imperative that the JPDO effort succeed. But this enterprise is unprecedented and achievement of its goal involves management of a process that is highly complex with challenging inter-agency and stakeholder integration. Understandably, we are learning as we go and, in addition to the successes, we are learning what changes are required to achieve the desired result: implementation of NGATS.

The AIA, like all JPDO participants and stakeholders, is committed to the JPDO and its mission. JPDO must succeed. From our evaluation of JPDO's process, products, and progress to date, continued attention must be focused in the following areas for JPDO to achieve its challenging goal.

Authority: Creating and implementing a national plan that crosses over the jurisdictions of numerous agencies and departments is a monumentally challenging task. The JPDO's and our country's success in this endeavor depends upon the Administration and Congress ensuring that the appropriate level of responsibility, authority and imperative exist to properly manage and conduct the integrated activities at the JPDO and the agencies. Now that a consensus vision has been established, the need for adequate JPDO authority is even more crucial as it addresses the "development" of NGATS: defining and implementing the policies, requirements, and system designs for the supporting agencies to advance the NGATS construct. JPDO-participating agencies' commitment to, and programmatic alignment with, JPDO and NGATS requires explicit alignment to the JPDO and NGATS goals, and a demonstrated commitment to the associated research and capital needs. To ensure success, the JPDO and participating agencies need to be accountable for NGATS progress through appropriate Administration and Congressional oversight to ensure adherence to programmatic commitments and interagency coordination.

Funding: JPDO and the associated NGATS research, development and implementation must be fully funded, as needed and when needed. It is critical that Congress and the Administration properly address infrastructure commitments. Creative means may be necessary to finance and incentivize infrastructure improvements in both government and the private sector. R&D for NGATS is heavily frontloaded and the timetable is, by necessity, ambitious, both to initiate deployment in the near term and for completion by 2025. It is estimated that an additional $200–300 million of transitional research is needed each year in vital areas such as air traffic modernization, environment and safety in order to implement NGATS. Most of NGATS research will be through NASA but other agencies will also play a role. Not only must this vitally important NASA R&D be appropriately funded, NASA must evidence its fiscal and programmatic commitment to this rigorous endeavor. A failure to adequately fund and conduct this important research in a timely way could result in significant delays or problems developing and implementing the NGATS.

JPDO Leadership: The JPDO has acted without a full time Director since early 2006. The interim management team has performed well under very difficult circumstances. However, in order to ensure that the JPDO moves forward, it is imperative that an effective long-term leader be appointed as soon as possible to guide the NGATS effort forward through this demanding phase. NGATS Institute has brought over 200 private sector participants into the JPDO to execute studies, demonstrations and other activities in support of JPDO. JPDO has embraced this partnership and should work with the private sector to enhance this unique enterprise.

Program Alignment/Integration/Management: Achievement of NGATS is an intricate process, involving several Federal agencies' programmatic integration. One of the greatest potential risk areas is the lack of sufficient program integration across the various agencies. Agencies' relevant programmatic sectors should have strong links to the JPDO to ensure continuity and consistency in development between the planning at JPDO and the planning and execution performed at the respective agencies. The schedules and resource requirements must be realistic, accounting for both input and capabilities of both government and industry stakeholders. Robust systems integration tools should be consistently used. Additionally, clearly visible and traceable alignment of Federal funding should be established for this multiagency effort. NGATS-related funding must be identified and unimpeachable for the mission effort to be undeterred and on schedule. Both JPDO and other appropriate personnel should be rewarded for achieving NGATS goals.

In summary, the JPDO effort is an unprecedented government-industry partnership. Its uniqueness requires government and industry stakeholders to break the bounds of precedent and truly achieve a new level of cooperation and partnership. One thing is certain: our entire Nation will reap the positive benefits of JPDO/NGATS success. Just as certainly, our entire Nation will suffer the negative impacts if the JPDO/NGATS effort is allowed to fail.

PREPARED STATEMENT OF THE AIR LINE PILOTS ASSOCIATION, INTERNATIONAL

I am Captain Duane E. Woerth, President of the Air Line Pilots Association, International (ALPA). ALPA represents the professional safety and security interests of 61,000 pilots who fly for 40 airlines in the United States and Canada. I appreciate the opportunity to submit a statement for the record to discuss issues of great importance to the FAA, as the Air Traffic Service provider, and the pilots and operators that use the system, as we work to collaboratively modernize the National Airspace System (NAS) into the Next Generation Air Transportation System (NGATS).

Jim May, President and CEO of the Air Transport Association, and I co-chair the NGATS Institute Management Council (IMC). We are charged with leading industry involvement and support for NGATS. To that end, we provide insight, experience and input to the JPDO with our 16 member NGATS IMC and the NGATS Institute Executive Director. The IMC provides a broad and impressive set of industry perspectives, expertise, and experience—ranging from airlines and airports to the academic community.

I am proud to serve as the IMC Co-Chair with Jim May. Working together, this IMC has formed a collective personality and really stepped forward to engage the issues and support JPDO. The IMC and their member organizations have worked hard to provide the JPDO Integrated Product Teams (IPT's) with the industry expertise, experience and input they need.

There are over 200 industry participants working as unpaid volunteers on the 8 IPT's. This is a testimony to our commitment to the JPDO and this critically important mission to build the NGATS and make it a success. Our pilots and our airlines are engaged intensely at all levels. We are in it for the long haul to do whatever it takes to get it done and get it done right. Success of NGATS is both critical and crucial to all of us. We are determined to succeed.

Over the past 75 years, the NAS has changed greatly. Following the collision of two airliners over the Grand Canyon in 1956. the air traffic control system transformed from separating flights using radio position reports to a system of positive control based on radar. The introduction of jet powered airliners made air travel affordable and available to the world. With the introduction of the Global Positioning System (GPS), navigation is moving from ground-based navigation aids to a satellite-based navigation system.

All of these changes have two things in common. They have made air travel safer, and they were successfully accomplished when there was a collaborative relationship between the government and the private sector. ALPA and the NGATS Institute are actively working with the FAA and the JPDO to ensure that NGATS is yet another example of a successful collaboration leading to fundamental change in the NAS.

However, the continued road toward the implementation of NGATS will require an additional element—a national resolve. Just like the development of the interstate highway system during the 1950s and 1960s, NGATS is a major technological and transformational step forward. National resolve is required to continue the operation of the current system while we research, develop, and implement NGATS.

A sustained funding stream demonstrates national resolve. In 1997, recently retired Secretary of Transportation Mineta chaired the National Civil Aviation Review Committee (NCARC). NCARC recommended the FAA's funding and financing system receive a Federal budget treatment that ensured revenues from aviation users and spending on aviation services were directly linked and shielded from discretionary budget caps. This would ensure that FAA expenditures would be driven by aviation demand. While some movement has been made on this issue, this recommendation has not been fully implemented. With the Aviation Trust Fund expiring in 2007, the issue of a sustained funding stream is even more urgent. Without a national resolve, the funding of NGATS is uncertain, and will most certainly cost more and take longer to implement. Implementing NGATS is in the vital national interest of the United States.

NGATS has the potential to revolutionize the NAS and our air transportation system, but only if private industry and government work together. Through collaboration, we have made major strides in the almost 102 years since the Wright Brothers first flew. However, the next 20 years could see major changes in aviation. Forecasted increases in air traffic of two to three times today's traffic cannot be met in today's NAS. The changes will be not be easy and will require much work and effort.

Through the NGATS IMC, we are supporting the JPDO in developing a plan for 2025. Your funding commitment is crucial to the NAS of the future. But in the nearer-term, we believe the FAA is under funded and needs the resources to deploy foundational technologies such as Automatic Dependent Surveillance-Broadcast

(ADS–B), Performance Based Navigation, more commonly know as RNAV/RNP, and additional airport infrastructure including airport surface management.

ADS–B is a key enabler for the move to space-based navigation and surveillance. ADS–B uses the highly accurate GPS position and broadcasts it to controllers and other aircraft. As the replacement for the traditional surveillance radar, ADS–B reduces the FAA's dependence on an expensive radar system that is nearing its service life. Now is the time to invest in ADS–B rather than spending money in the future to extend the life of an aging technology.

As the NAS traffic continues to expand, the increased use of space-based RNAV and RNP procedures will enhance the capacity and efficiency of the NAS while maintaining the high level of safety that currently exists in our system. RNAV and RNP procedures in the en route environment will allow multiple lanes of aircraft to flow throughout the system while the development of new RNAV and RNP departure and arrival routes will decrease delays in the terminal area. These new procedures will provide greater accuracy, result in decreased spacing between aircraft, and reduce the impacts of noise and other environmental concerns.

These technologies will not meet our capacity expectations if airport infrastructure is not improved. The nations biggest airports will need a surface management system to meet the capacity needs. ADS–B technology, combined with cockpit moving map displays of the airport and enhanced surface displays in the tower, will allow pilots and controllers to work together to more efficiently manage traffic in the terminal area.

However, the U.S. cannot develop NGATS in isolation. Aviation is a major driver in the world economy. Transportation of passengers and air cargo in the global environment must be seamless. Therefore, ALPA is working with industry partners and regulatory agencies in North America, Europe, and the Far East to ensure airspace operations, technologies, and procedures are globally harmonized. With a globally harmonized airspace system, America's transportation system and our economy will truly benefit in terms of capacity, efficiency, and safety.

In 1931, ALPA's founders chose the motto "Schedule with Safety." On July 27, as ALPA celebrates our 75th birthday, the safety of the NAS—past, present and future, remains the Line Pilot's number one focus.

I appreciate this opportunity to place this statement into the record on this crucial issue to the economic vitality and well being of the United States and Canada. The Air Line Pilots Association, International is proud to help lead the Aviation Industry in this collaborative effort in building the Next Generation Air Transportation System. It is imperative that Congress supports the JPDO initiatives while continuing to fund the FAA's nearer-term critical infrastructure requirements. Your support will enable the collaboration of industry and government partners to deliver the next generation air transportation system that is vital to our national interests.

PREPARED STATEMENT OF PETER J. BUNCE, PRESIDENT/CEO, GENERAL AVIATION MANUFACTURERS ASSOCIATION (GAMA)

Chairman Burns and Ranking Member Rockefeller, on behalf of the over fifty-five members of the General Aviation Manufacturers Association (GAMA), I would like to thank the Subcommittee for the opportunity to share our views on the critically important issue of modernization of our Nation's air traffic management system.

Over the past several months the conflicting positions among different sectors of the aviation industry have made it clear that much work is needed to find common ground as to the future funding of the FAA and the Airport and Airway Trust Fund (AATF). It should be noted however, that even in this time of great debate, there is one issue on which all sides agree—the critical need to transform and increase capacity in our Nation's air traffic management system by taking advantage of the tremendous technological advances in digital information transfer pioneered by the United States military.

Our most advanced aircraft no longer fly via cables and pulleys. Rather, today's high performance general aviation and commercial aircraft use fly-by-wire technology and a multitude of other computer assisted mechanisms. Why then, do we still rely on ground-based radar, a technology created in the World War II era to maintain order in our Nation's skies? The United States can and must modernize. If we do not, we will be faced with increasing air traffic control delays in the congested airspace surrounding our Nation's major airports.

The United States, however, is not the only government attempting to modernize air traffic control services. The European Union is moving aggressively to modernize its own infrastructure and set the world standard for air traffic management through the SESAR (Single European Sky ATM Research) project, which would

streamline technological, economic and regulatory processes in order to create a single European sky from the current patchwork of systems.

Under SESAR, the EU is applying significant resources to Air Traffic Management (ATM) research and implementation. While this is a welcome development for global aviation safety, we must recognize that this effort challenges U.S. leadership in ATM research and development.

Mr. Chairman, the modernization of our Nation's air traffic control system is critical to the future of the U.S. aviation industry and to the well-being of our dynamic economy. Although the flight path to modernization has and will continue to face many challenges, we must address those challenges head on and persevere in the creation of a new state-of-the-art ATM system. As such, my testimony will focus on two main areas; the ongoing concern that the Joint Planning and Development Office (JPDO) does not have the necessary influence, via budget or oversight, to compel its member organizations to complete necessary research and development; and the JPDO's progress, plans and budgetary needs for the future.

Authority of the Joint Planning and Development Office

Based on the recommendation of the Commission on the Future of the United States Aerospace Industry, the Joint Planning and Development Office was created in 2003 as part of the Vision 100—The Century of Aviation Reauthorization Act and was tasked with "improving the level of safety, security, efficiency, quality and affordability of the National Airspace System and aviation services." These goals were to be overseen by the multi-agency Senior Policy Committee made up of the FAA Administrator, the NASA Administrator, the Secretary of Defense, the Secretary of Homeland Security, the Secretary of Commerce, the Director of the Office of Science and Technology Policy and other designees.

Unfortunately, the language included in Vision 100 does not go far enough to ensure the success of the JPDO and our Nation's Next Generation Air Transportation System (NGATS). For example, nowhere in the bill does the language provide the necessary authority to any single person or body to complete this critical undertaking. Instead, the JPDO and its parent FAA are left to "pass the hat" amongst the relevant Federal agencies in order to provide the necessary funding for critical research and development activities. Perhaps in the nascent stages of the development of a modernized system this architecture will be sufficient, but as we attempt to move forward with implementation there must be a clear authority figure in the administrative branch capable of directing other government entities to conduct the necessary research, regardless of the designated agencies willingness to do so. There is no more telling example of this than NASA's projected support for the JPDO and NGATS.

With the confirmation of Dr. Michael Griffin as NASA Administrator in April of 2005, NASA made dramatic changes to its structure, by transferring millions of dollars from science and aeronautics programs in order to beef up the space exploration budget. The consequence of this act, especially for NASA aeronautics research, was a reordering of priorities. Specifically, NASA has moved away from its traditional aeronautics research and has decided to focus more on fundamental disciplines. This change in NASA's focus will affect the JPDO by limiting the degree to which NASA research will be carried out and thus negatively impacting the ability to timely field the technology called for in emerging JPDO planning.

NASA is the most logical research organization to conduct much of the needed tasks for JPDO, yet with the combination of the change in NASA research philosophy and the current structure of the JPDO, there is no mechanism the JPDO can use to ensure NASA completes the required research.

We encourage this Committee to examine the interagency structure of the JPDO and make adjustments that would allow for more authority to be held by the Secretary of Transportation in order to ensure that other government agencies conduct needed research. Without such a change, the American people will be forced to wait longer than necessary to reap the benefits of a safer, and more efficient air traffic system.

Progress in the Modernization of the National Airspace System

Mr. Chairman, the debate we must have is not whether we should modernize, but rather how, when and at what cost we will be able to do so.

To this point, the JPDO has received funding of nearly $40 million, to process the mountain of information necessary to design the Next Generation Air Transportation System. Unfortunately, only now is a basic concept of operations being publicized for comment.

In order for the JPDO to continue to garner support from Congress and industry, it is time for the planning of the future system to become an issue of fact rather than one of speculation.

For the next 5 to 7 years, the JPDO will require a reasonably modest amount of funding to conduct its basic research and development work. It is only beyond that window of 5 to 7 years (once equipage is possible) that large amounts of funding are likely to be needed. As such, any debate regarding the manner of funding for the JPDO and NGATS improvements as part of the 2007 FAA reauthorization would be premature. Rather, these discussions should take place when the funding needs for the next generation system can be more clearly defined.

In the next 5 to 7 years, the JPDO must develop a clear architecture for the new system. Specifically, it must identify the improvements the new system will provide. How can we safely increase capacity and efficiency of the National Airspace System to keep pace with growing travel by air? Will air traffic control and separation be facilitated through the use of satellite navigation coupled with data-link technology or traditional ground based radar? Will critical weather data be available on a real-time basis to all in need, including pilots in the cockpit?

Once the JPDO has established the specific goals for the new system a discussion of how we will achieve those goals should take place. What equipment will be necessary? How much will it cost both the government and the aviation industry to equip? How much will the use of new technologies save the FAA in the next 20 years? Should equipment be leased rather than purchased to provide a better mechanism for periodic upgrade?

Only when we have these areas addressed should we move on to the final, and in some ways, most difficult question of how the new system should be financed. Many in Congress and industry have begun to discuss the means by which to finance the new system, without a clear indication of how much the system will cost and what the system will look like. Just as no sensible person would hand a builder a stack of money before seeing the plans and price for a new home, the aviation industry should be told of a modernization plan and its time phased cost before financing can be discussed.

Conclusions

Modernization of the Nation's air traffic control system is an issue of critical importance to all those involved in aviation. The current air traffic management system is simply not equipped to handle the amount of traffic forecast in the years to come. In order to maintain the health of our just-in-time economy and our Nation's desire to move freely and without delay, we must ensure that a new air traffic control system builds capacity rather than constrains use.

The JPDO is at a crossroads in its existence. Faced with uncertain budgets and a lack of budgetary control over its member agencies it will be unable to meet the demands of creating the next generation system within its current architecture. Congress must address the current structure of the JPDO and strengthen its abilities to ensure compliance with its basic needs for research and development. Providing this increased control over the research budgets of the JPDO member agencies will allow for a more efficient and streamlined R&D and implementation processes.

The JPDO continues to assemble the pieces of what will become the Next Generation Air Transportation System, but has yet to clearly define what the system will be, how it will operate or be equipped and how much it will cost. Before we reach conclusions as to how the next generation system will be funded (changes to the AATF, bonding, leasing) these questions must be answered. Consequently, discussions relating to changes in the funding mechanism to support the NGATS and the FAA should be postponed until a point when the critical data needed to make an informed decision on the future system is available.

PREPARED STATEMENT OF DAVE COTE, CHIEF EXECUTIVE OFFICER, HONEYWELL

While the United States continues to operate the safest and most efficient air transportation system in the world, anticipated continued growth in demand for both passenger and cargo services is driving the need to modernize the system. Requirements to double or triple capacity over the next 15–20 years dictate a major transformation in both operational procedures and the supporting technologies. In recognition of this need, Congress established the Joint Planning and Development Office (JPDO) in 2003 as part of "Vision 100" to bring together key government and industry stakeholders to lay out a plan for the Next Generation Air Transportation System (NGATS).

Over the past 2 and a half years, the JPDO has been effective in developing the necessary levels of interagency collaboration and in engaging industry in the process through the NGATS Institute. The development of the "vision" for NGATS, establishing principles and key capabilities, leading to the current effort to define the NGATS Concept of Operations is indicative of the success of the JPDO's effort to date. Honeywell firmly believes in the importance of modernizing the air transportation system and congratulates the JPDO on its accomplishments to date.

Now—as the NGATS project shifts to a more detailed definition phase, it is appropriate to consider ways to adjust the process to ensure continued success. As we look to the future, Honeywell believes the focus should be in two key areas: providing the necessary authority for JPDO to execute its mission and strengthening the role of the private sector in developing the NGATS.

The JPDO Needs Appropriate Authority to Fully Execute Its Mission

In Vision 100, Congress tasked the JPDO with creating and carrying out a national plan for the development of NGATS. There is clear agreement on JPDO's responsibility for laying out the vision for NGATS and the supporting agencies responsibility for its implementation. The responsibility for the work that bridges the JPDO's vision to the agencies implementation is less clear. To be successful, the JPDO must be given the appropriate level of responsibility and authority for the planning, and research and development of NGATS. This authority must extend past the establishment of the vision to include the definition of the policies, requirements and system designs needed by the supporting agencies to carry out the NGATS implementation.

The NGATS will be a complex system depending on the integration of numerous subsystems for successful and efficient deployment and operation. The JPDO needs to have clear responsibility for the system-level requirements definition and their integration but this can only be accomplished with support from the agencies to ensure the alignment of NGATS roadmaps and enterprise architectures.

In addition, clear JPDO responsibility for and oversight of the associated research would increase the impact of the limited research dollars available for this application. The development process led by the JPDO should identify the research required to support the mid-to-long-term NGATS critical design decisions. Due to the broad scope of NGATS and the distributed nature of R&D expertise, this research will need to be performed across a number of organizations. Coordinating this research through the JPDO will ensure the necessary topics are being addressed without duplication of effort and resources.

Strong Industry Engagement is Critical to NGATS Success

Recognizing the public-private nature of the air transportation system, it is essential to have a strong public-private partnership in place for the definition of the next generation system. NGATS will be comprised of both governmental and private sector systems and operations and its successful implementation will require firm commitments from a range of industry stakeholders, including users, labor, and manufacturers. A key characteristic of the future system will be the migration of functionality, and ultimately cost, from the ground to the aircraft. Manufacturers of aircraft and aircraft systems will need to be involved in the design process to ensure the resulting system architecture decisions are both practical and affordable.

The NGATS Institute was established as a mechanism to facilitate industry involvement in the NGATS effort. To date, the Institute has been successful in recruiting hundreds of industry volunteers representing a broad cross-section of air transportation stakeholders to support the JPDO's efforts. These volunteers are primarily assigned to one or more of the JPDO's Integrated Product Teams (IPTs) where they provide minimal input (normally less than 10 percent) reviewing and commenting on JPDO work products. During the early phases of the project, in the definition of the vision and high-level concepts, this level of participation was both appropriate and effective. As the project shifts to more detailed design work, the industry contribution must be strengthened.

Many stakeholders have asked about the benefits of engaging a Lead Systems Integrator (LSI) in the NGATS effort. While this remains a possibility for the future deployment phase of NGATS, it is not the correct model for involving industry in the JPDO's current NGATS system definition. The near-term work of the JPDO is to establish the system-level requirements, functional allocation between subsystems, and the supporting architecture. The involvement of the industry with JPDO in the NGATS system design is that of a strong supporting partner to ensure all the necessary experience and ideas are included in the design decisions. This effort should be non-competitive in nature with publicly-vetted results.

While our focus is on the development of the U.S. NGATS, we can't lose sight of the international nature of the air transportation system. Europe is aggressively moving forward with their Single European Sky in a strong public-private partnership, both to create a world-class air transportation system and to increase the global competitiveness of the European aerospace industry. They are currently working to define the Joint Undertaking that will be used for the development phase of the Single European Sky and are actively recruiting non-EU countries as investing partners in this endeavor. Other regions with rapid aviation growth, notably China and India, are interested in international collaboration on future operational concepts and technology solutions. Strengthening the public-private partnership in the U.S. will both accelerate the implementation of NGATS in the U.S. and increase its visibility with international partners, ultimately supporting continued U.S. competitiveness in the global market.

Summary

The modernization of our Nation's air transportation system is critical for continued economic growth and enhanced quality of life. Honeywell is committed to the successful implementation of NGATS and stands ready to support the JPDO and its member agencies as they move forward with the development of this important system.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. DANIEL K. INOUYE TO HON. MARION C. BLAKEY

Question 1. Currently, pilots can fly Visual Flight Rules (VFR) and they do not talk to air traffic controllers or file flight plans, etc. As you work to develop the next generation ATC system, is there any plan to operationally change VFR as we know it today? If so, what does the general aviation community think about this?

Answer. One of the principal challenges in the development of NGATS is to insure the seamless integration of VFR traffic into the airspace operations of the future. This will include commercial and business aviation traffic at much higher levels with additional entrants such as Very Light Jets and Unmanned Aerial Systems. VFR traffic will be accommodated in the NAS operations of the future. For example, if VFR traffic needs to fly in the area of heavy IFR traffic, such as the Class B airspace around some of the Nation's larger airports, they will be afforded specific areas and corridors which will facilitate their efficient movement while not limiting the capacity of IFR traffic.

Question 2. If you plan to operationally change VFR—will there be mandates/necessary equipage changes for the existing (and newly introduced) general aviation aircraft fleet? What stage are you in the planning and when will it be developed?

Answer. There may be some additional requirements for equipage for both safety and security reasons. For example, ADS–B, when fully implemented, will rely primarily on an aircraft's participation in the system to insure aircraft and those providing air traffic management can see and provide separation between aircraft. For national security reasons, there will be a need to positively identify aircraft that are not providing position updates. With that in mind, we are looking at mechanisms to facilitate cost effective equipage of general aviation aircraft.

Question 3. Given the fact that the JPDO is tasked with developing plans that ultimately result in a National Airspace System capacity increase of three times (3x), what is the JPDO doing to ensure that VFR operations, and the freedoms described above, exist in the future airspace system? Will the JPDO develop plans and strategies that ensure VFR operations are not required to file flight plans, remain in constant ATC communications, or obtain ATC clearance at more airports?

Answer. Requirements for VFR traffic in the NextGen system will be driven by the type of airspace that aircraft will be operating in. We are confident we can accommodate VFR traffic in lower density, lower altitude environments much like we do today. Similarly, to operate in Class B airspace, which involves higher density traffic, there will be additional requirements for that airspace.

Question 4. We know you have taken a number of steps, as required by law, to include industry in the airspace modernization effort including the creation of IPTs and the NGATS Institute. However, the mere creation of these entities does not ensure the proper utilization of private industry. Do you believe the FAA is working effectively with the aviation community in identifying appropriate costs, initiatives and time frames in the FAA modernization plan? How do you believe this effort could be improved?

Answer. We believe that inputs from a variety of industry stakeholders are crucial in NGATS plan development. General aviation has been involved in our Integrated

Product Teams at the grassroots level and is serving on our 16 member Institute Management Council (IMC). The IMC includes representatives from the major stakeholders in the aviation industry. All have a direct voice into the NGATS planning process. This includes not only the participation in our IPTs and the recent GA cost workshop, but also in being asked to provide comments and input on the Concept of Operations and the Enterprise Architecture documents.

Question 5. What is the FAA's current timeline for short-term and long-term modernization efforts? What specific modernization initiatives could be undertaken immediately? What types of initiatives would require a longer time frame and why?

Answer. Some of the key enabling technologies have already been identified. For example, ADS–B is a foundation upon which we intend to build space-based navigation, via RNAV and RNP procedures. This shift will allow us to save significantly on ground-based infrastructure costs. An example of several important enabling key initiatives that will require longer period for full implementation are En Route Automation Modernization (ERAM) and System Wide Information Management (SWIM). ERAM is an open architecture information system that will enable future capabilities to more efficiently handle traffic growth. SWIM when it matures will insure everyone is provided a mutual situation awareness of traffic in the NAS. Together they will give us the capability for 4 dimensional traffic flow management and will enable us to increase the capacity of the NAS multifold.

