

**FAA REAUTHORIZATION: NEXTGEN
AND THE BENEFITS OF MODERNIZATION**

HEARING

BEFORE THE

SUBCOMMITTEE ON AVIATION OPERATIONS,
SAFETY, AND SECURITY

OF THE

COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION

UNITED STATES SENATE

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

—————
MARCH 25, 2009
—————

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



U.S. GOVERNMENT PRINTING OFFICE

52-164 PDF

WASHINGTON : 2010

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 ELEVENTH CONGRESS

FIRST SESSION

JOHN D. ROCKEFELLER IV, West Virginia, *Chairman*

DANIEL K. INOUE, Hawaii	KAY BAILEY HUTCHISON, Texas, <i>Ranking</i>
JOHN F. KERRY, Massachusetts	OLYMPIA J. SNOWE, Maine
BYRON L. DORGAN, North Dakota	JOHN ENSIGN, Nevada
BARBARA BOXER, California	JIM DEMINT, South Carolina
BILL NELSON, Florida	JOHN THUNE, South Dakota
MARIA CANTWELL, Washington	ROGER F. WICKER, Mississippi
FRANK R. LAUTENBERG, New Jersey	JOHNNY ISAKSON, Georgia
MARK PRYOR, Arkansas	DAVID VITTER, Louisiana
CLAIRE McCASKILL, Missouri	SAM BROWNBACK, Kansas
AMY KLOBUCHAR, Minnesota	MEL MARTINEZ, Florida
TOM UDALL, New Mexico	MIKE JOHANNNS, Nebraska
MARK WARNER, Virginia	
MARK BEGICH, Alaska	

ELLEN L. DONESKI, *Chief of Staff*

JAMES REID, *Deputy Chief of Staff*

BRUCE H. ANDREWS, *General Counsel*

CHRISTINE D. KURTH, *Republican Staff Director and General Counsel*

PAUL NAGLE, *Republican Chief Counsel*

SUBCOMMITTEE ON AVIATION OPERATIONS, SAFETY, AND SECURITY

BYRON L. DORGAN, North Dakota, <i>Chairman</i>	JIM DEMINT, South Carolina, <i>Ranking</i> <i>Member</i>
DANIEL K. INOUE, Hawaii	OLYMPIA J. SNOWE, Maine
JOHN F. KERRY, Massachusetts	JOHN ENSIGN, Nevada
BARBARA BOXER, California	JOHN THUNE, South Dakota
BILL NELSON, Florida	ROGER F. WICKER, Mississippi
MARIA CANTWELL, Washington	JOHNNY ISAKSON, Georgia
FRANK R. LAUTENBERG, New Jersey	DAVID VITTER, Louisiana
MARK PRYOR, Arkansas	SAM BROWNBACK, Kansas
CLAIRE McCASKILL, Missouri	MEL MARTINEZ, Florida
AMY KLOBUCHAR, Minnesota	MIKE JOHANNNS, Nebraska
MARK WARNER, Virginia	
MARK BEGICH, Alaska	

CONTENTS

	Page
Hearing held on March 25, 2009	1
Statement of Senator Dorgan	1
Statement of Senator DeMint	2
Statement of Senator Lautenberg	3
Statement of Senator Rockefeller	5
Statement of Senator Hutchison	6
Prepared statement	6
Statement of Senator Begich	7
Statement of Senator Johanns	7
Statement of Senator Brownback	57
Prepared statement	57
Statement of Senator Nelson	63
Statement of Senator Thune	65

WITNESSES

Hank Krakowski, Chief Operating Officer, Air Traffic Organization, Federal Aviation Administration	8
Prepared statement	10
Gerald L. Dillingham, Ph.D. Director, Physical Infrastructure Issues, U.S. Government Accountability Office	15
Prepared statement	17
Joe Kolshak, Senior Vice President—Operations, United Airlines on Behalf of the Air Transport Association of America	26
Prepared statement	28
Dale Wright, Director of Safety and Technology, National Air Traffic Controllers Association	33
Prepared statement	35
T. K. Kallenbach, Vice President, Marketing and Product Management, Honeywell Aerospace	43
Prepared statement	45

APPENDIX

Letter, dated March 24, 2009, from Joseph D. Gebhardt, Gebhardt & Associates, LLP, to Hon. Byron L. Dorgan	69
Response to written questions submitted to Hank Krakowski by:	
Hon. John D. Rockefeller IV	70
Hon. Bill Nelson	72
Hon. Mark Warner	73
Hon. Mark Begich	74
Hon. John Ensign	77
Response to written questions submitted to Dr. Gerald L. Dillingham by:	
Hon. John D. Rockefeller IV	78
Hon. Mark Begich	78
Hon. John Ensign	79
Response to written questions submitted to Joe Kolshak by:	
Hon. Mark Begich	80
Hon. John Ensign	81
Response to written questions submitted by Hon. Mark Begich to Dale Wright	81
Response to written question submitted by Hon. Mark Begich to T. K. Kallenbach	82

FAA REAUTHORIZATION: NEXTGEN AND THE BENEFITS OF MODERNIZATION

WEDNESDAY, MARCH 25, 2009

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

The Subcommittee met, pursuant to notice, at 9:45 a.m. in room SR-253, Russell Senate Office Building, Hon. Byron L. Dorgan, Chairman of the Subcommittee, presiding.

OPENING STATEMENT OF HON. BYRON L. DORGAN, U.S. SENATOR FROM NORTH DAKOTA

Senator DORGAN. I'm going to call the hearing to order.

I'm Senator Dorgan, the Chairman of the Subcommittee on Aviation. I'm joined by Senator DeMint and Senator Johanns, and others will join us shortly.

This is a hearing to discuss FAA reauthorization, but especially to discuss the issue of modernization. We will have other hearings and discuss other aspects of the reauthorization bill, which we want to work on and we want to be successful in moving through the U.S. Senate and getting a bill to the President in this Congress. But for now we will be discussing modernization.

"Modernization," is kind of a big old term, but most of us understand the need to modernize our system. We understand that there are opportunities to move toward what is called NextGen. And the pace and the price are always at odds here with respect to implementing next-generation systems, but we believe very strongly—I certainly do, and I know my colleagues do, as well—that we need to make progress. Some are talking about NextGen 2020, 2025. In my judgment, that's a pace that is too slow, and we just need to make substantially more progress at a much better pace than that. And so, this will be the first hearing in which we discuss that.

Let me just make a point. We invited Dale Wright, from the National Air Traffic Controllers Association, and I know that he will want to talk about other things, because there are other issues with the air traffic controllers. But, I've asked Mr. Wright, today, to talk about modernization, and he's prepared to do that. We'll have another hearing on the subject of the air traffic controller issues.

We have Mr. Hank Krakowski, the FAA Chief Operating Officer of the Air Traffic Organization. Hank, thank you for being with us. Gerald Dillingham, who is the Director of the Physical Infrastruc-

ture Issues at the GAO. Mr. Dillingham, welcome. Dale Wright, who I have just mentioned, Director of Safety and Technology at the National Air Traffic Controllers Association. Joe Kolshak, Senior Vice President of Operations at United Airlines. Welcome. And T. K. Kallenbach, Vice President of Marketing at Honeywell Aerospace. We appreciate the five of you being willing to provide statements today about this issue of modernization and NextGen.

I was at a meeting a while ago and someone was describing that the new technology, which I'm well aware of because we have a couple of kids in college—everybody has a cell phone these days. They advertise technologies where parents can use GPS systems and, with the consent of the one telephone, that perhaps is in the possession of your child, a parent can know exactly where the child is, because you can track it with your own cell phone. You can track the location of up to 20 of your acquaintances, provided they allow you to do that.

Well, it is interesting that a teenager with a cell phone can track the exact whereabouts of 20 friends, and we can't track the exact whereabouts of an airplane, because we're using an old system. We generally know where they are—I'm not suggesting that the system doesn't understand where an airplane is flying, but it is the case that we are not using the more sophisticated capability from the GPS system. NextGen would allow us to do that. It would allow us to have a greater margin of safety, greater efficiencies with respect to the way we fly and the more direct routes that we fly, and less air pollution, certainly beneficial for the environment. All of these things are possible, and they are possible now with today's technology.

We need standards that are developed. We need a determination to move in this direction. We need training. We need equipment. But, the fact is, this is not some 20-years-from-now-sci-fi application. We have to decide that here's where we're going to move with respect to modernization of the FAA, and move there with some dispatch. 2025 or 2020 is too long a time frame, in my judgment.

So, having said all of that, this will be the first hearing on modernization. We will, as I said, write legislation in the Committee. Senator Rockefeller, the Chairman of our Committee, and the Ranking Senator, Kay Bailey Hutchison, are both very interested in this subject. I expect a lot of cooperation from members of the Committee.

Let me call on the Ranking Member, Senator DeMint.

Senator DeMint, thank you. And I'm pleased once again that we've joined on a subcommittee. We were the Chair and Ranking Member of a subcommittee, previously, on this Committee.

**STATEMENT OF HON. JIM DEMINT,
U.S. SENATOR FROM SOUTH CAROLINA**

Senator DEMINT. Thank you, Mr. Chairman.

And the Chairman has noted that I am sitting to his left today, so I have moderated my views.

[Laughter.]

Senator DEMINT. Thank you. Well, I came to Congress 10 years ago, and I was on the Transportation Committee in the House, and we were talking about the desperate need to modernize the FAA

at that time. And I'm afraid we haven't made near the progress that we had hoped.

Modernization is much more critical today as we see congestion, not only in the air, but on the roads, and stress in our whole transportation system across the country. So, this time I hope we can actually get something done, and do it the right way.

As the Chairman mentioned, there's a lot at stake, not just reducing delays, but also reducing fuel consumption by being more efficient in how we manage the airplanes. There's a kind of new industry developing in general aviation. We're seeing, in our areas, air taxis and other ways that people can use smaller airports to move around, which will create new challenges for the FAA and air traffic control.

As the Chairman mentioned, GPS and other new technologies offer what appear to be inexpensive and very good ways to begin to track things. My concern is that because the government moves so slowly, by the time we got something done, the equipment we decided to use would be antiquated. It's like when I buy a new BlackBerry, the one I decide to get is antiquated, and everyone else is using a newer one.

But, we need to figure out how we can be flexible enough as a country to constantly improve and upgrade technology in a way that doesn't leave us with an antiquated system 10 years from now, if we do modernize.

So, there are a lot of challenges in front of us, but I do appreciate the five witnesses who are here who will get us started with, hopefully, the right ideas on how to move ahead.

Thank you, Mr. Chairman.

Senator DORGAN. Senator DeMint, thank you very much.

We're joined by the Chairman of the full Committee, Senator Rockefeller. Senator Rockefeller, I just described, in brilliant words—

The CHAIRMAN. I heard. I listened.

Senator DORGAN.—how terrific you are—

The CHAIRMAN. Yes, I—

Senator DORGAN.—and how much you've worked on this subject already, and what we're going to do on this Committee.

The CHAIRMAN. I know. Do you want to go over it? Do you want to do it again?

[Laughter.]

Senator LAUTENBERG. If it wouldn't be too much of an imposition, I've got a meeting—another Committee starting in 5 minutes, if I—

The CHAIRMAN. Be my guest.

Senator DORGAN. I'd just call on Senator Lautenberg.

**STATEMENT OF HON. FRANK R. LAUTENBERG,
U.S. SENATOR FROM NEW JERSEY**

Senator LAUTENBERG. Thanks very much, Senator Rockefeller and our Chairman today, Senator Dorgan.

And I start off, Senator Dorgan, by offering our best wishes and thoughts about your State and the difficulty that we see you going through, and we hope that you and the citizens of your State of

North Dakota will be able to muster the energy and the resources to get things moving.

It's noted that 2007 was one of the worst years on record for flight delays. And I appreciate the fact that Senator Rockefeller, Chairman of the committee, is permitting me to jump in ahead of time, but I have another committee hearing. One in four flights was late. And I have the opportunity to test the system on a regular basis, because, though New Jersey is not too far away, we're lulled into thinking that if we go by air, it's going to be a shorter trip. I've found out it isn't. I got on a plane Thursday night to LaGuardia. I live midway between LaGuardia Airport and Newark Airport. They closed the door on the airplane, and the pilot almost instantaneously announced the fact that there was a 2-hour delay. And I could hear the people scratching at the windows, wanting to get out of there. But, we were imprisoned for the next 2 hours. But, we had little snacks, one a person.

[Laughter.]

Senator LAUTENBERG. Newark Liberty International is one of the most delayed airports in the country. These delays come with a terrible cost that translates into losses of nearly \$10 billion each year to our economy.

And there are many reasons that our air travelers are burdened with delays. The central reason is our outdated air traffic control system. When I arrived here, in 1983, I came out of the computer business, and the first thing that I noted was that the FAA had an antiquated computer system, really rudimentary. And the fact of the matter is that our company, which is a large computer user, had discarded the idea of trying to keep these things, because the maintenance was a higher cost than going out and tossing them out the window. So, it's been an old situation here, and we want to improve it.

And, as the Chairman knows, our air traffic system is basically the same system that we used in the 1960s. It's simply not equipped for the massive amounts of air traffic that we have today.

So, the need for the update is clear. The way that we modernize it requires careful spending, planning, and smart spending. And I come, as I said, from the private sector, and I know that upgrading technology requires resources, time, and constant oversight. One of the things that I've also learned in my business experience, and we've seen it here, is that if you try to take a massive problem and solve it all in one fell swoop, it's very difficult. Very often we have to turn to modular systems. And we've tried to repair the system, upgrade the system twice with some of America's best companies, spent billions of dollars, and had no results for our efforts, except less money. The FAA needs to get new technology on our towers and on our runways, and it needs a plan with clear benefits for the flying public.

Now, while we modernize, we cannot neglect air travel's immediate needs. Our air traffic controllers are retiring in droves. The FAA is not replacing them fast enough, and has always resisted getting people into the training loop. There are nearly 2,000 fewer controllers than we had in 2002. It takes several years to fully train new controllers, so the FAA needs to get moving with a plan to hire and train a new generation of controllers.

And I'm also hopeful that the Obama Administration and the FAA will reach a long overdue collective bargaining agreement with our controllers so that we can return to the era of cooperation and collaboration that will best serve the flying public.

Mr. Chairman, the FAA and our Nation's airports will also need to get moving to upgrade our runways to prevent overruns. Runway incursions are listed by the NTSB as a major safety concern, and so it should be, because the forecast for incursions is mind-boggling. This year, I'm going to continue to push for comprehensive runway safety legislation to address these and other problems.

And I close with an observation. Mr. Chairman and fellow Committee members, one way to improve air traffic flow is highspeed rail. And if we could get that going, as well, it would eliminate so much travel by air between short distances.

I look forward to hearing from our panel. I'm sorry that I have to go to another committee, and I appreciate the indulgence of my colleagues.

Senator DORGAN. Senator Lautenberg, thank you very much.
Senator Rockefeller?

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

The CHAIRMAN. Thank you, Mr. Chairman.

First of all, let me say how proud I am that you're Chairman of this Subcommittee. Any Subcommittee that you chair is bound to be effective, is destined to be effective. And you will do the same with this.

And you have a big chore, in terms of air traffic control. I don't think of NextGen, really, in terms of technology, I think about it in terms of people. Obviously it's expensive. Obviously we need cooperation between the different elements that are in the air. It's obviously slowing down and costing Americans hundreds of millions of dollars because it's so ancient. We—if we're going to have a national aviation system, we might as well be able to route the aviation system intelligently, efficiently, and quickly. And, as I like to say, I'd very much like to catch up with Mongolia on our air traffic control system, but we haven't been able to do that yet.

The challenge I want to pose to the witnesses today, and to the aviation industry, is to find a way to work together to make this happen. It's no secret that the aviation industry is in two categories, and there has got to be a way for them to work together so that we can afford to pay the cost of both keeping an analog system in place while we build a GPS ground-based system.

So, simply put, we cannot afford to fail.

Thank you, Mr. Chairman.

Senator DORGAN. Senator Rockefeller, thank you very much.

Are there others who wish to make an opening statement?

Senator Lautenberg had asked for special consideration; he had to leave. But, I'd be happy to—

Senator HUTCHISON. Yes.

Senator DORGAN. If we could limit them to 2 minutes, I'd appreciate that.

Senator Hutchison?

**STATEMENT OF HON. KAY BAILEY HUTCHISON,
U.S. SENATOR FROM TEXAS**

Senator HUTCHISON. Senator Rockefeller and I worked so hard last year to get an FAA reauthorization bill through, I am very hopeful that you all will be more successful than we were. NextGen is, of course, the key component for us to go forward with an FAA reauthorization bill.

Senator Rockefeller and I had an amendment ready for the stimulus that would have accelerated the use of the precision approaches across the country and given us a real head-start. Unfortunately, we weren't able to get that in the final package, but it is something that would be a legitimate use of our stimulus money, because, of course, it will create jobs and it will begin the process.

But, I will just say that, as we move forward, we are going to need the buy-in of all of the components of the air traffic control system in order to find the right solutions for the funding and the implementation of NextGen. So, I certainly look forward to working with everyone in this room and on our Committee to get a good bill put forward. The one that we had last year was bipartisan and agreed to by all concerned, and I hope that will be the basis for the bill that we would use, going forward, for FAA reauthorization.

Thank you, Mr. Chairman.

[The prepared statement of Senator Hutchison follows:]

PREPARED STATEMENT OF HON. KAY BAILEY HUTCHISON, U.S. SENATOR FROM TEXAS

Thank you Senator Dorgan, I would like to welcome both you and Senator DeMint to your new positions as Chairman and Ranking Member of the Aviation Subcommittee. I look forward to working with both of you as we move forward with the FAA Reauthorization process. I am especially hopeful we can continue to move forward in a bipartisan manner and develop a consensus bill we can all strongly support.

I am also pleased we are starting out the FAA Reauthorization process and discussing the importance and benefits of the Next Generation Air Transportation System or NextGen. I believe that NextGen should be the centerpiece of our FAA proposal. We need to give the agency the tools and resources it needs to make NextGen a reality.

I am very concerned that when the economy rebounds, the air traffic control system will not be able to handle the accompanying rebound in air travel.

The investments needed for NextGen are exactly the type of infrastructure projects our country needs to create jobs and opportunities that will last not just for a few years, but for a few decades.

We have a very complex aviation system that calls for a sophisticated and well organized solution. The benefits of increased efficiency and expanded capacity, along with critical safety enhancements and a reduction of the overall industry environmental footprint should be enough of a "carrot" to entice interest and support for the effort.

The FAA is moving away from planning phases and toward implementation of NextGen technologies. We know what we can, and need to do, in the short-term; so let's put the infrastructure in place.

The industry can then follow suit and complete the transition. Chairman Rockefeller and I had an amendment to the stimulus bill that accelerated the deployment of ADS-B ground stations by 2 years and accelerated the use of precision approaches across the country.

That amendment ultimately was not accepted into the final package, but it was a move in the right direction and a signal that we are serious about improving this system. This hearing is also important because the FAA is starting a new era of modernization with NextGen.

The FAA, unfortunately, has a long history of mishandling long-term capital projects, but as we move into the implementation phase of NextGen, the FAA has a tremendous opportunity to change that reputation.

The FAA will need help though. If industry is serious about NextGen then they need to coalesce behind the idea and they need to help find solutions.

I look forward to starting that process today. I welcome our panel and look forward to the testimony.

Thank you.

Senator DORGAN. Senator Hutchison, thank you very much. I did describe, at the start of this, the work you have done with Senator Rockefeller, and I think that accomplished a great deal in setting the foundation for all of this, and we appreciate that.

Senator Begich?

**STATEMENT OF HON. MARK BEGICH,
U.S. SENATOR FROM ALASKA**

Senator BEGICH. Mr. Chairman, thank you very much, and thank you for the opportunity to be part of this Subcommittee. I'll be very brief, because I'm looking forward to the testimony of the folks that are here today.

There's no place like Alaska when it comes to aviation, to say the least. With the recent volcanic eruptions of Mt. Redoubt, our cities and communities have experienced exactly what happens when aviation is interrupted.

Some interesting aviation statistics I always like to throw out there: in Alaska, we have 6 times more pilots and 16 times more planes per capita than any other place in the country.

The NextGen technology that we'll be talking about today is of strong interest to my constituents. To help combat a high aviation accident rate, in 2001, the Capstone Program made Alaska one of the first states to deploy and implement some of the advanced navigation technology used in NextGen at a trial level. The Capstone Program demonstrated a 47 percent reduction in the aviation accident rate of Capstone-avionics equipped aircraft compared to non-equipped aircraft in southwest Alaska. The NextGen technology that we are discussing this morning will not only increase efficiency, but it will save lives. It is important to upgrade our air traffic systems, because as we know firsthand in Alaska how valuable it is.

I'm looking forward to the testimony, I'm looking forward to doing whatever I can on this Subcommittee, as well as the full Committee, in helping to make sure the NextGen system gets into place as soon as possible. As we know from the Capstone Program in Alaska, we have seen the impacts in a very positive way.

So, thank you, Mr. Chairman, and I look forward to this Subcommittee.

Senator DORGAN. Thank you.

Senator Johanns?

**STATEMENT OF HON. MIKE JOHANNS,
U.S. SENATOR FROM NEBRASKA**

Senator JOHANNS. Just very briefly. Mr. Chairman, thanks for putting this together. I look forward to the testimony. And, gentlemen, thank you for being here.

Just to kind of cue you up, if I could, in terms of what I'm interested in, as a new member, is of course cost—it has already been mentioned. What is this going to cost? Second, timing. And that's

been mentioned also, but I'll just underscore it. What do you think the realistic timeline is? And then, the third thing is a very realistic assessment of what the system will do. I don't want to over-promise this. I don't want to tell people that all of a sudden the world is going to be dramatically better and different, if it's not. So, I would like to hear, once it's up and running, once this investment has been made, once we have worked our way through the timing issues, how will we know that this system is up and running? How will it improve the lives of the people that are in the system, the passengers, the pilots, the air traffic controllers? So, that's what I want to hear about, I hope, in your testimonies, is some testimony on those three items—cost, timing, and capability of the system.

Thank you, Mr. Chairman.

Senator DORGAN. Senator Johanns, thank you very much.

This morning we will hear from the first witness, Hank Krakowski, who is the FAA Chief Operating Officer.

And, Hank, you and I have had some experience working together, and I appreciate your work very much. Why don't you proceed.

We will ask that the entire statements of all of the witnesses be made a part of the permanent record, and we would ask all of the witnesses to summarize.

Mr. Krakowski?

STATEMENT OF HANK KRAKOWSKI, CHIEF OPERATING OFFICER, AIR TRAFFIC ORGANIZATION, FEDERAL AVIATION ADMINISTRATION

Mr. KRAKOWSKI. Thank you, Mr. Chairman.

To your first statement, I just spent 2 days in Colorado Springs talking with DOD and the other Federal agencies on unmanned aircraft, and I think the work that we did over the past 2 days assures our ability to deliver on the promise up in North Dakota on time next year.

Senator DORGAN. If we might—just so the audience understands what you're talking about—we're talking about commercial aviation, general aviation, and then, particularly with respect to the military and homeland security, there are Unmanned Aerial Vehicles, UAV. In order to integrate them into our airspace and provide margins of safety for everyone else that's flying, there needs to be new rules, new regulations, and that's where NextGen will play a significant role. So, thank you for that.

Mr. KRAKOWSKI. It's true that NextGen and the Custom and Border Protection are flying a Predator today over the territory in preparation for possible recovery operations later, if needed.

Chairman Dorgan, Senator DeMint, and members of the Subcommittee, thank you very much for asking the FAA to update you on the current state of our modernization efforts.

We have solid progress to report, as is reflected in the GAO's removal of our air traffic control modernization efforts from the high-risk list. As positive as this news is, we strive for continuous improvement. The cornerstone of the modernization effort is NextGen, and it is designed to increase safety, reduce delays, and expand capacity while reducing the environmental impact of aviation.

Making improvements to our current hardwired system will not achieve these aspirations. NextGen will provide flexibility, scalability, and, more importantly, predictability, to better serve the changing needs of the aviation community who uses our system.

Since 2000, the peak year of air traffic, operations today are down about 17 percent, yet in places like New York, New Jersey, and Philadelphia, congestion and delays continue in our busiest airspace and airports. These landlocked, closely spaced airports are limited in their physical ability to expand.

In contrast, last year we initiated three new runways, in Seattle, Chicago, and Washington Dulles. We are already experiencing significant delay reduction and capacity relief at O'Hare. More runways are planned, with a new one in Charlotte next year and at O'Hare a few years later.

Where new runways are not viable, NextGen fundamentals, using existing technology, do offer some immediate relief. As a result of NextGen research, last year we published a national order that allows us to safely reduce separation between aircraft on parallel runways that are spaced closely to each other: Boston, Cleveland, Philadelphia, St. Louis, and Seattle, notably. In Seattle, we're watching low-visibility operations increase by more than 70 percent, in terms of delay reduction and capacity.

Another building block for NextGen are procedures we can use today, such as RNAV, Area Navigation, and RNP, Required Navigation Performance, providing increased throughput and delay reduction. Properly equipped aircraft can use these procedures now, with more procedures and techniques being developed. This issue of proper equipage is critical; and, specifically, we're talking about GPS.

A faster realization of NextGen benefits is directly linked to how quickly the operators can equip their aircraft, and we can do this in a targeted way. As such, the FAA has asked the RTCA Committee to establish a Next-Generation Implementation Task Force. They are working to provide recommendations by August of this year, on what areas of technology and procedures to concentrate on and where to deploy them in the next 5 to 8 years. Nearly every manufacturer, airline, airplane operator, and labor organization are working members of this rapid-fire task force.

While we transition to NextGen, it is imperative that we ensure safety in the system, so we have other interim issues to do, such as runway status lights, which alert pilots or vehicles if the runway is occupied before they actually occupy the runway. We have 22 airports slated for runway status lights by 2011.

Last, the FAA needs the entire community of aviation to make NextGen a reality, sooner rather than later. This includes airports, airlines, pilots, manufacturers, academia, and, of course, the air traffic control work force, especially the controllers.

Secretary LaHood made it very clear that resolving the labor disputes so we can have a better operating environment with our controllers as we build NextGen is important, and I look very much forward to working with the new Administrator on clearing that path forward.

Thank you.

[The prepared statement of Mr. Krakowski follows:]

PREPARED STATEMENT OF HANK KRAKOWSKI, CHIEF OPERATING OFFICER,
AIR TRAFFIC ORGANIZATION, FEDERAL AVIATION ADMINISTRATION

Chairman Dorgan, Senator DeMint, Members of the Subcommittee:

Thank you for inviting me here today to discuss the current state of the Federal Aviation Administration's (FAA) efforts on air traffic control modernization. We have recently made some great strides in this area, and I am happy to report that in recognition of that, the Government Accountability Office (GAO) recently removed the FAA's air traffic control modernization program from its High Risk List, its biennial update of Federal programs, policies, and operations that are at "high risk" for waste, fraud, abuse, and mismanagement or in need of broad-based transformation.

The GAO added FAA air traffic control modernization to the High Risk List in 1995 due to cost overruns, schedule delays, and performance shortfalls in the FAA attempts to modernize its air traffic control system. However, the GAO has found that the FAA is making progress in "addressing most of the root cause of its past problems." The GAO concluded that the FAA's efforts "have yielded results, including deploying new systems across the country and incurring fewer cost overruns."

As positive as this news is, we are not resting on our laurels. As you know, at the heart of the FAA's modernization is the Next Generation Air Transportation System (NextGen). NextGen is a wide-ranging transformation of the entire national air transportation system to meet future demand and support the economic viability of the system while reducing delays, improving safety, and protecting the environment. NextGen will change the way the system operates—reducing congestion, noise, and emissions, expanding capacity and improving the passenger experience. NextGen is a complex, multilayered, evolutionary process of developing and implementing new technologies and procedures. NextGen is *not* a single piece of equipment or a program or a system that will instantaneously transform the air transportation system. NextGen is an evolutionary process, and existing systems must be sustained as we transition. NextGen builds on legacy systems to increase capability in today's National Airspace System (NAS), adds new performance-based procedures and routes, and ultimately delivers programs that transform the NAS. NextGen takes advantage of new technology that is similarly being used to transform our personal lives and the way we do business, such as GPS, analog-to-digital, and network to network data sharing.

NextGen goals will be realized through the development of aviation-specific applications for existing, widely-used technologies. They will also be realized through the fostering of technological innovation in areas such as weather forecasting, data networking, and digital communications. Hand in hand with state-of-the-art technology will be new airport infrastructure and new procedures, including the shift of certain decision-making tools and accompanying responsibility from the ground to the cockpit.

As it is implemented, NextGen will gradually allow aircraft to safely fly more closely together on more direct routes, reducing delays, and providing benefits for the environment and the economy through reductions in carbon emissions, fuel consumption, and noise.

Defining NextGen: The Need

Although it is extremely safe, and staffed by a capable, dedicated work force, our current air traffic control system is not scalable or flexible enough to keep up with future demand. Our future preeminence as a nation in air transportation is not assured. In addition to improving efficiency and creating additional capacity, NextGen is needed to provide corresponding enhancements to safety and environmental performance. It will bring to air transportation the same twenty-first century processes that give operations in other industries greater reliability, flexibility, and predictability.

Even in the face of falling demand and reduced capacity, we've seen congestion continue in our busiest airspace and airports. In February 2008, there were 1,171,721 operations, while in February 2009, there were 1,040,150 operations. That's a reduction of over 11 percent. Still, while traffic is down overall, our congested airspace in New York/New Jersey/Philadelphia has seen only about a 5.5 percent reduction in traffic from last year to this year.

We know that we must be poised to handle future demand that will surely return as the Nation's economy improves. In fact, the aviation sector will be an important factor in the Nation's economic recovery. The FAA estimates that in 2006, civil aviation accounted for 11 million jobs and represented 5.6 percent of the Gross Domestic

Product; and, according to the FAA's calculations using U.S. International Trade Commission's reported trade data statistics, at \$61 billion, aerospace products and parts contributed more to the positive balance of trade than any other sector—\$32 billion more than the next highest contributor.

NextGen must also help manage the constraints on the air transportation system from the environmental impacts of aircraft noise and emissions and concerns about energy usage. Increased efficiency with NextGen operations will lead to reduced fuel consumption resulting in lower carbon emissions. NextGen investments in engine and airframe design and alternative fuels will produce the changes needed to reduce the environmental impact of aviation.

NextGen will also increase the safety of an already exceedingly safe system. NextGen further enables FAA's transition from traditional forensic investigations of accidents and incidents to a prognostic approach to improving safety. NextGen promotes the open exchange of pertinent safety information to continuously improve aviation safety.

Benefits of NextGen

NextGen is reaping the benefits originated under the Operational Evolution Plan (OEP). Communities, airports, and the FAA continue to work together to build new runways, which provide significant capacity and operational improvements. In Fiscal Year 2009, four runway projects have been commissioned. On November 20, three major new runways opened: at Seattle-Tacoma, Washington Dulles, and Chicago O'Hare International Airports. The Seattle runway is expected to cut local delays in half by increasing capacity in bad weather by 60 percent, while the new runway at Dulles will provide capacity for an additional 100,000 annual operations. The new Chicago runway, which added capacity for an additional 52,300 annual operations, is a part of the greater O'Hare Modernization Program (OMP) that will reconfigure the airport's intersecting runways into a more modern, parallel layout. The OMP will substantially reduce delays in all weather conditions and increase capacity at the airfield, allowing O'Hare to meet the region's aviation needs well into the future. On February 12, a runway extension at Philadelphia was completed, helping reduce delays at the airport. Looking forward for the next 3 years, new runways will open at Charlotte and Chicago O'Hare. Eleven other runway projects are in the planning or environmental stage at OEP airports through 2018.

While airfield improvements offer significant capacity increases, they alone are not enough to address current problems at certain airports, or the growth in demand we expect in the future. New technology and procedures can help us gain extra use from existing runways.

Today, capacity for closely spaced parallel runway operations (CSPO) is dramatically reduced in poor visibility conditions. We are working on capabilities that allow for continued use of those runways in low visibility conditions by providing precise path assignments that provide safe separation between aircraft assigned on parallel paths, restoring capacity and reducing delays throughout the system. In November 2008, we published a national order that allows us to safely reduce separation between aircraft approaching parallel runways at Boston, Cleveland, Philadelphia, St. Louis and Seattle. In good visibility Seattle's pair of parallel runways, together, could handle roughly 60 operations per hour; poor visibility conditions cut that rate in half. Even in poor visibility, the new order now safely allows a rate of about 52 operations per hour, a significant improvement for the airport and its users. We are beginning to see similar benefits in Boston.

This order is a first step in a phased approach for safely increasing the use of CSPOs through a combination of procedural changes and new ground and aircraft equipment. Down the road, new rules for CSPOs could give airports more design flexibility so that they can safely build runways more closely together, increasing their capacity within their existing boundaries, providing better service to their communities without requiring additional land.

Performance-based navigation is another building block for NextGen which we are accelerating with cooperation from industry. Performance-based routes and procedures result in shorter distances flown, which add up to both fuel and time savings. Fuel savings equate to reduced emissions, enhancing environmental performance. Safety is increased as air traffic operations become more predictable. Performance-based navigation includes Area Navigation (RNAV) and Required Navigation Procedures (RNP), which allow equipped aircraft to fly more direct and precise paths, reducing flight time and fuel use, as well as localizer performance with vertical guidance (LPV) procedures, which can increase access to airports, especially in low visibility conditions.

Advances in performance-based procedures and routes allow for optimal use of airspace. The FAA maximizes the use of airspace, especially in congested areas,

through targeted airspace and procedures enhancements. Continuing work in the New York area includes integration of RNAV procedures, relocation and expansion of airways, airspace reconfiguration, and creation of optimal descent procedures. In the Chicago area, the FAA is adding departure routes and changing procedures to allow for triple arrivals. In southern Nevada, the FAA is optimizing existing airports and airspace. Houston will also see additional departure routes and arrival procedures, along with improved procedures to avoid severe weather.

Operators like Southwest Airlines recognize the value of performance-based navigation. The airline made the business decision early last year to equip its entire fleet for RNAV and RNP procedures. The company envisions building a network of RNP routes for their system. Southwest believes its \$175 million investment can be recouped within the next three to 5 years because of the operational efficiencies RNP offers. We are currently working with Southwest on a pilot project to build RNAV/RNP routes between Texas' Dallas Love Field and Houston Hobby airports.

Today, more than three-quarters of commercial aircraft are equipped for RNAV, and almost half of these are equipped for RNP precision procedures. Likewise, more than 20,000 aircraft are equipped for LPVs. This level of equipage provides an excellent opportunity for the aviation community to use what it already has to produce ever-greater benefits. FAA has responded: last year the agency published more than 600 performance-based navigation procedures and routes, versus our goal of almost 400. The FAA plans to keep up this pace each year for the next 4 years.

Because the realization of NextGen benefits is integrally linked to how quickly the operators equip their aircraft, it is imperative that the FAA work closely with industry on NextGen deployment. As such, the FAA has established a NextGen Implementation Task Force with RTCA, an industry association that serves as a Federal advisory committee. The task force will provide recommendations on how to move forward together on implementation. FAA's governing principles for accelerating equipage, published in the January 2009 FAA's NextGen Implementation Plan, provide a starting point for this work. These principles focus on mitigating the risk for early adopters of NextGen avionics, while providing the maximum operational benefits in the airspace where they're most needed. They also focus on international interoperability, and incentivizing the equipage of aircraft that meet evolving environmental standards. The Task Force will deliver recommendations to the FAA in August 2009.

Our current national airspace system is safer than it has ever been. However, new means are required to ensure this remains the case as we transform the NAS. NextGen will continue that trend in the face of increasing traffic and the introduction of very light jets, unmanned aerial vehicles, and commercial space flights. To continue to minimize risk as we introduce a wave of new systems and procedures over the next decade, the aviation community will continue its move to safety management systems and other aspects of proactive management, where trends are analyzed to uncover problems early on. This allows preventive measures to be put in place before any accidents can occur.

An important part of NAS modernization, the FAA's Aviation Safety and Information Analysis and Sharing program (ASIAS), provides a suite of tools that extract relevant knowledge from large amounts of disparate safety information. The FAA is partnering with NASA and major airlines for ASIAS, which helps FAA and our industry partners to monitor the effectiveness of safety enhancements. In use today, ASIAS will ensure that the operational capabilities that produce capacity, efficiency and environmental benefits are first and foremost inherently safe. ASIAS has already demonstrated the ability to measure the performance of safety solutions to known problems, such as Loss of Control, Controlled Flight Into Terrain, Runway Incursion, Approach, and Landing Accident Reduction. Additionally, ASIAS has demonstrated the ability to detect new safety issues, such as terrain avoidance warning system alerts (TAWS) at mountainous terrain airports, and to identify solutions that have the potential to virtually eliminate these threats. Between now and Fiscal Year 2013, the FAA intends to increase the number of data bases ASIAS can access; expand ASIAS to include maintenance/air traffic information; increase membership by adding regional air carriers; increase community stakeholders to include general aviation, helicopter and military; and increase the automated search capabilities.

The primary environmental and energy issues that will significantly influence the future capacity and flexibility of the NAS are aircraft noise, air quality, global climate effects, energy availability, and water quality. Aviation accounts for approximately 3 percent of direct greenhouse gas emissions, and national and international concerns about climate impacts could constrain the industry in the future, if not properly addressed. An environmental management system approach will be used

to integrate all environmental and energy considerations into core NextGen business and operational strategies.

In 2009, we are moving forward on a research consortium called Continuous Low Emissions, Energy and Noise (CLEEN), which will allow us to work with industry to accelerate the maturation of technology that will lower energy, emissions and noise. CLEEN also seeks to advance renewable alternative fuels for aviation. These fuels not only improve air quality and reduce life cycle greenhouse emissions, but also enhance energy security and supplies. FAA helped form—and is an active participant in—the Commercial Aviation Alternative Fuels Initiative, or CAAFI. Alternative fuels will be the “game changer” technology that gets us closer to carbon neutrality. Significant deliverables in the FY09–13 period include demonstrations of clean and quiet aircraft technologies that can be transitioned into new products and used to retrofit existing products, approval of generic renewable fuels for aviation, and models and guidance to improve our ability to quantify environmental costs and benefits and to optimize solutions, including those to address CO₂ and non-CO₂ aviation climate impacts.

Current Status

FAA is working closely with all aspects of the aviation community to make NextGen a reality sooner rather than later. We are also leveraging the capabilities of our legacy systems to improve operations. We’re partnering with several of the Nation’s air carriers for trials and demonstrations; we’re engaging with universities like Embry Riddle. We’re working with pilots, dispatchers, and controllers on NextGen integration and development to achieve balance in the safety and efficiency design of NextGen. The FAA has established an integrated demonstration capability in Florida where, working with a wide range of government, university and industry partners, we are evaluating NextGen technologies. We’re working with airport authorities, manufacturers and with government bodies and industry from around the world. We are collaborating with Joint Planning and Development Office (JPDO) Working Groups, RTCA, and other industry groups to integrate stakeholder requirements into government commitments.

Moreover, this past year, through the efforts of the JPDO, we have seen the contributions to NextGen resulting from cross-department and cross-agency cooperation increase significantly. Through the cross-agency support provided by the JPDO and its Senior Policy Committee, we are collaborating with the Department of Transportation (DOT), the Department of Defense (DOD), the Department of Commerce (Commerce), the Department of Homeland Security (DHS), and the National Aeronautics and Space Administration (NASA). Some of our collaborations have resulted in:

- DOD established a division at JPDO to work on efficient and secure information sharing;
- The Departments of Commerce, Defense and the FAA have collaborated to deliver the first NextGen weather capability in 2013; and
- JPDO conceived and facilitated the formation of Research Transition Teams to further the effective transition of research from NASA to implementation in the FAA.

The FAA officially began its development of NextGen in Fiscal Year 2007 by identifying and funding two transformational programs—Automatic Dependent Surveillance—Broadcast (ADS-B) and System Wide Information Management (SWIM). ADS-B is a key component of NextGen that will move air traffic control from a system based on radar to one that uses satellite-derived aircraft location data. In addition to improved safety with traffic, weather, and flight information, the system also promises greater efficiency and flexibility for the national airspace system. Aircraft transponders receive GPS signals and use them to determine the aircraft’s precise position in the sky, which is combined with other data and broadcast out to other aircraft and air traffic controllers.

ADS-B is surveillance, like radar, but offers more precision and additional services, such as weather and traffic information. ADS-B provides air traffic controllers and pilots with much more accurate information to help keep aircraft safely separated in the sky and on runways. When properly equipped with ADS-B, both pilots and controllers will, for the very first time, see the same real-time displays of air traffic, thereby substantially improving safety.

NextGen transformational programs made significant advances over the past year. ADS-B essential services have been deployed in southern Florida and are being deployed in the Gulf of Mexico, where we have never had radar coverage. In December, FAA achieved its In-Service Decision for ADS-B essential services in southern Florida. Achievement of this major milestone clears the way for national

deployment of broadcast services. The National Aeronautics Association recognized ADS-B last year by presenting the ADS-B team with its Collier Trophy. This award is given yearly for “the greatest achievement in aeronautics or astronautics in America with respect to improving the performance, efficiency and safety of air or space vehicles.” The Collier award is generally recognized as the epitome of aviation innovation and excellence.

The SWIM program, Data Communications, and NAS Voice Switch achieved major acquisition milestones, and NextGen Network Enabled Weather (NNEW) conducted demonstrations of the integration of weather data into automated decision support tools. This is a necessary step in the realization of improved management of weather in the NAS.

An updated FAA NextGen Implementation Plan was published in January 2009. This edition of the plan focuses on answering five fundamental questions: What does NextGen look like in 2018; what aircraft avionics are needed to support operations in 2018; what benefits will be delivered by 2018; what is the FAA specifically committed to deploy in the near-term that makes the most of existing resources; and what activities are underway to support future capabilities?

While the focus of the FAA’s NextGen Implementation Plan is on the mid-term (through 2018), the plan, coupled with the NAS Enterprise Architecture, provides a picture of near-term (2009–2013) deliverables. FAA’s near-term NextGen implementation efforts are targeted across three broad areas: airfield development, air traffic operations, and aircraft capabilities. Together, these efforts will increase capacity and operational efficiency, enhance safety, and improve our environmental performance. We are moving forward with a dual-pronged approach: maximizing the use of untapped capabilities in today’s aircraft and ground infrastructure, while working aggressively to develop and deploy new systems and procedures that will form a foundation for more transformative capabilities that will be delivered in the mid-term. We believe this approach allows both government and industry to extract the greatest value from existing investments, while positioning the industry to gain exponential benefits in the mid-term and beyond.

From that first investment of \$109 million in 2007, and supported by sound evaluation and planning, FAA funding for NextGen grew to \$202 million in Fiscal Year 2008 and \$688 million is anticipated this Fiscal Year. The Administration’s Fiscal Year 2010 budget includes approximately \$800 million for NextGen. The January 2009 NAS Enterprise Architecture and NextGen Implementation Plan support these funding numbers.

Along those lines, I would like to thank this Committee and the Congress for the additional \$200 million in economic recovery funding that will be used for repairing and upgrading our air traffic facilities and equipment. This will go a long way to improving our buildings and providing our workforce with the tools they need to do their jobs well.

We do have other interim efforts to enhance safety and operations, such as Runway Status Lights (RWSL). The RWSL system integrates airport lighting equipment with approach and surface surveillance systems to provide a visual signal to pilots and vehicle operators indicating that it is unsafe to enter/cross or begin takeoff on a runway. The system is fully automated based on inputs from surface and terminal surveillance systems. Airport surveillance sensor inputs are processed through safety logic that commands in-pavement lights to illuminate red when there is traffic on or approaching the runway.

The RWSLs will activate either when it is unsafe to enter a runway from a taxiway (referred to as runway entrance lighting or RELs) or when it is unsafe to take off from a runway (called takeoff hold lighting or THLs). For example, if an aircraft is landing or departing, the RELs will illuminate indicating it is unsafe for an aircraft or vehicle to go onto that runway from a taxiway. Another example is if an aircraft starts to cross a runway when there is an aircraft ready for departure on that runway, the THLs will illuminate indicating to the pilot that it is unsafe to continue the departure. Both RELs and THLs will automatically turn off when the system determines it to be safe. RWSLs are red lights only; there are no green lights in RWSLs.

We currently have RWSL systems installed, one at San Diego International Airport, and the other at Dallas/Ft. Worth International Airport. Installation of RWSL systems is underway at Los Angeles International Airport and at Boston Logan International Airport. The FAA is scheduled to install RWSL systems at 18 other airports by 2011. In addition, we are continuing to test additional runway lights: in Boston we are testing Runway Intersection Lighting (RIL) to guard runway intersections; and at Dallas/Ft. Worth, we are testing the enhanced Final Approach Runway Occupancy Signal (eFAROS) to alert landing traffic that a runway is occupied.

Labor Issues

I know that this Committee has always been interested in how FAA has interacted with our labor unions, and I would like to address that briefly. In his confirmation hearing before this Committee, Secretary LaHood made it very clear that resolving labor disputes was one of his top priorities for the FAA, and that he was seeking to fill the FAA Administrator position with someone who had the people skills to resolve our outstanding issues with the National Air Traffic Controllers Association (NATCA). As someone who has sat on both sides of the labor debate, I fully support the Secretary's priority on this.

Our controllers, indeed, our entire work force, are our most valuable assets in ensuring the safety of the traveling public. As such, we have included controllers in all phases of NextGen so far. Controller input has come from individual controllers who have been invited to participate in NextGen development, though they were not participating as official NATCA representatives. NATCA does have a seat on the NextGen Management Board, the governance structure that we originally put in place as our framework for achieving NextGen. I look forward to moving ahead toward a resolution of our differences. These have been challenging times for us, and I want to commend all the hard work that has occurred on both sides.

Chairman Dorgan, Senator DeMint, Members of the Subcommittee, this concludes my prepared remarks. Thank you again for inviting me here today to discuss FAA's air traffic modernization program. I would be happy to answer any questions that you might have.

Senator DORGAN. Mr. Krakowski, thank you very much.

Next, we'll hear from Dr. Gerald Dillingham, who's the Director of Physical Infrastructure Issues at the GAO.

Dr. Dillingham?

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

Dr. DILLINGHAM. Thank you, Mr. Chairman, Ranking Member DeMint, Chairman Rockefeller, members of the Subcommittee.

Since the FAA first announced the air traffic control modernization program in 1981, the Nation has spent over \$50 billion on ATC improvements. However, today's ATC system cannot meet tomorrow's forecasted demands, and is straining to meet today's demands.

Seven years ago, the Commission on the Future of the U.S. Aerospace Industry recommended the establishment of a joint program office to plan for meeting the Nation's air transportation needs in the 21st century. The FAA has developed a vision for NextGen, which it plans to fully implement by 2025, and has completed much of the planning for it.

Support for this vision is widespread, but some of the aviation community maintains that the plans are not sufficiently detailed, especially for airlines, manufacturers, and other system users. Stakeholders have also expressed concerns about the governance and management plan for implementing NextGen. Some major stakeholders are still saying they are not sure what is and what is not included in NextGen.

During the last 2 years, we identified a shift in stakeholder emphasis. Instead of focusing on 2025 and a full and complete system transformation, stakeholders are asking for specifics about what can be done immediately to address current system delays and congestion.

In 2008, almost one in four flights arrived late or was canceled, and the average flight delay increased, despite a 6 percent decline

in the total number of operations. We have previously reported to this committee on the stakeholders' interest in what some refer to as NowGen. NowGen focuses on obtaining the maximum benefits available from existing and proven capabilities and existing NAS infrastructure as a bridge to NextGen.

The FAA is to be commended for its recent actions to address today's problems, including its issuance, in January 2009, of a NextGen implementation plan that focuses on improving the efficiency and capacity of the NAS between now and 2018.

Another recent action is the FAA's establishment of the RTCA Task Force, which is charged with identifying capabilities that can be implemented in the next few years, and prioritizing them according to their relative merits and net benefits. To obtain the full benefits of the new capabilities, the private sector will have to invest in them as well as the government, but before the private sector stakeholders, especially airlines, will invest, they will need to be convinced that their investments will produce a relatively quick return in the form of enhanced operational capabilities, fuel savings, or environmental benefits.

Given the financial health of the industry and of the economy, the FAA may have to create some incentives for airlines to make early investments in new technologies and capabilities.

The FAA also faces key challenges in the mid-term and longer term. These challenges include, first, developing standards and procedures and regulations that will further enable the use of existing capabilities; second, maintaining and repairing existing facilities so that they can continue to be used safely and reliably as part of the current system and, in some cases, integrated into NextGen; third, addressing the FAA's human resource needs so that adequate numbers of staff with the right skill mix are available to implement the transition; and finally, supporting research and development, especially with regard to weather, human factors, and environmental issues.

Work on longer-term challenges, such as infrastructure development, will also need to begin as soon as possible to ensure that solutions are available when needed. For example, the FAA has already identified 14 major airports that will need additional runways by 2025 to meet the forecasted demands.

According to a JPDO analysis, when the proposed NextGen technology solutions are added to the planned increase in runways, the best-case scenario shows an average increased system capacity of only about 60 percent.

Mr. Chairman, without the necessary follow-through on transforming the national airspace system and meeting the near- and longer-term challenges, the predictions of system gridlock could come true, resulting in severe effects for the traveling public, the national economy, and the U.S.'s global competitiveness.

Mr. Chairman, that concludes my oral statement.

[The prepared statement of Dr. 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:

I appreciate the opportunity to testify before you this morning on efforts to transform the Nation's current air traffic control (ATC) system to the Next Generation Air Transportation System (NextGen). Currently, the U.S. air transportation system handles about 50,000 flights over a 24-hour period. By 2025, air traffic is projected to increase to about 80,000 flights every 24 hours. Today's U.S. air transportation system will not be able to meet these air traffic demands. In fact, as we all know, today's system is straining to meet current demands. For example, in 2008, almost one in four flights either arrived late or was canceled, and the average flight delay increased despite a 6 percent decline in the total number of operations. The transformation to NextGen, together with other ongoing ATC modernization efforts, promises to enhance the capacity and efficiency of our air transportation system while maintaining safety and minimizing the environmental impact of air transportation.

In Vision 100,¹ enacted in 2003, Congress directed the Secretary of Transportation to establish the Joint Planning and Development Office (JPDO) to plan and coordinate the transition to NextGen in collaboration with other Federal agencies² and the aviation industry. NextGen will transform the current radar-based ATC system into a more automated, aircraft-centered, satellite-based system, and will shift the operating paradigm from air traffic control to air traffic management. NextGen encompasses five major transformational programs—Automatic Dependent Surveillance Broadcast (ADS-B), System-Wide Information Management (SWIM), NextGen Data Communications (DataComm), NextGen Network Enabled Weather (NNEW), and National Airspace Voice Switch (NVS).³ JPDO—located organizationally within the Federal Aviation Administration (FAA)—is responsible for NextGen planning and coordination. FAA's Air Traffic Organization (ATO), headed by its Chief Operating Officer (COO), is responsible for implementing the transition to NextGen. At the same time, FAA is planning and implementing other capabilities that have not been designated specifically as NextGen efforts but are also expected to enhance the capacity and efficiency of the air transportation system. FAA plans to implement these capabilities in the midterm, defined as 2012 through 2018, and eventually to integrate them with NextGen transformational programs.

My testimony this morning addresses: (1) JPDO's and ATO's progress in planning NextGen and changes in the NextGen management structure; (2) ongoing efforts to implement midterm capabilities to address capacity constraints and delays, and issues related to these efforts; and (3) key human capital issues, research and development needs, and facilities maintenance and reconfiguration challenges going forward. My statement is based on recent related GAO reports and testimonies, updated with more recent FAA data, and our discussions with selected senior FAA officials; officials of the National Air Traffic Controller Association (NATCA) and the Professional Aviation Safety Specialists (PASS) unions; and aviation industry stakeholders, including the Air Transport Association, which represents U.S. airlines, and aircraft and avionics industry representatives. This work was conducted in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the work to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit

¹Vision 100—Century of Aviation Reauthorization Act, Pub. L. No. 108–176, 117 Stat. 2490 (2003).

²NextGen was designed as an interagency effort in order to leverage various agencies' expertise and funding to advance NextGen while avoiding duplication. The Federal partner agencies are the Departments of Commerce (particularly its National Oceanic and Atmospheric Administration), Defense, Homeland Security, and Transportation; the Federal Aviation Administration; the National Aeronautics and Space Administration; and the White House Office of Science and Technology Policy.

³ADS-B is a satellite navigation system that is designed, along with other navigation technologies, to enable more precise control of aircraft during en route flight, approach, and descent. SWIM is an information management architecture for the national airspace system, acting as its "World Wide Web." SWIM will manage surveillance, weather, and flight data, as well as aeronautical and system status information, and will provide the information securely to users. DataComm provides a digital communications link for two-way exchanges between controllers and flight crews for ATC clearances, instructions, advisories, flight crew requests, and reports. NNEW will serve as the core of the NextGen weather support services and provide a common weather picture across the national airspace system. NVS will replace existing switches and provide the foundation for all air/ground and ground/ground voice communications in the future ATC environment.

objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

JPDO and ATO Have Issued Key NextGen Plans, but ATO Restructuring and Recent Executive Order Have Not Fully Resolved NextGen Management Issues

JPDO and ATO have issued key NextGen plans and have reorganized the management structure for NextGen. We have previously reported on stakeholders' concerns about the fragmented management structure for NextGen and resulting lack of clear accountability for NextGen's implementation. While recent FAA efforts have made progress on this front, they have yet to fully resolve stakeholders' concerns. Resolving this issue will be critical to advancing both the implementation of capabilities in the midterm and the full transformation to NextGen in the long term.

Planning Effort Has Shifted to Focus on Implementation, but Continues to Lack Specific Timelines and Commitments

Since 2003, JPDO and ATO have made progress in planning for and implementing NextGen. In accordance with Vision 100, JPDO created a multi-agency research and development plan for the transition to NextGen. This plan consists of three basic documents—a Concept of Operations, an Enterprise Architecture, and an Integrated Work Plan.⁴ Collectively, these three documents form a basis for inter-agency and industry planning and coordination. JPDO views these plans as iterative and intends to issue further versions as NextGen technologies are developed and implemented. As NextGen progressed from the planning to the implementation phase, ATO produced its NextGen Implementation Plan, which addresses the more detailed level of planning and activities necessary to achieve NextGen capabilities. According to ATO, it and JPDO have worked to align and ensure linkages between these planning documents. The current version of the NextGen Implementation Plan, released in January 2009, focuses on the midterm (2012 though 2018) implementation of NextGen capabilities.

In a previous testimony,⁵ we raised some concerns about the usefulness of the NextGen planning documents, and we still have some concerns. For example, we reported that the planning documents lacked the type of specific information that industry stakeholders need for their own planning purposes, such as a catalog of critical needs, clearly defined and prioritized intermediate objectives, and a structured plan for achieving tangible results. Recent versions of NextGen planning documents have partially addressed some of these concerns, but industry stakeholders continue to express frustration that the planning documents lack any specific timelines or commitments. A senior FAA official has acknowledged that FAA will face ongoing challenges in attempting to communicate effectively with industry and other stakeholders to ensure that they fully understand the content and objectives of the initiative and remain engaged and committed to its planning and implementation.

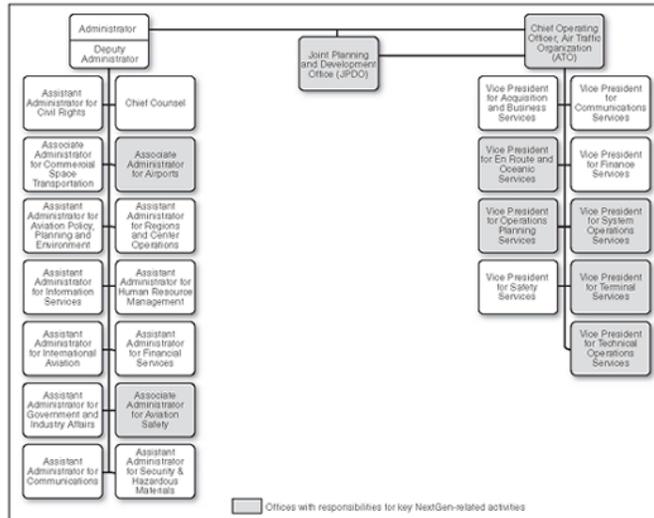
NextGen Organizational Structure Has Undergone Changes, but Roles and Responsibilities Continue to Be Unclear

Initially, JPDO was established as a separate and independent office within FAA reporting directly to both the COO of ATO and the FAA Administrator (see fig. 1).

⁴The Concept of Operations describes how the NextGen system is envisioned to operate in 2025 and beyond and identifies key research and policy issues. The Enterprise Architecture is a technical description of the NextGen system, akin to blueprints for a building; it is meant to provide a common tool for planning and understanding the complex, interrelated systems that will make up NextGen. JPDO's Integrated Work Plan is akin to a project plan and is meant to describe the capabilities needed to transition to NextGen from the current system and provide the research, policy, regulation, and acquisition timelines necessary to achieve NextGen by 2025.

⁵GAO, *Next Generation Air Transportation System: Status of Key Issues Associated with the Transition to NextGen*, GAO-08-1154T (Washington, D.C. Sept. 11, 2008).

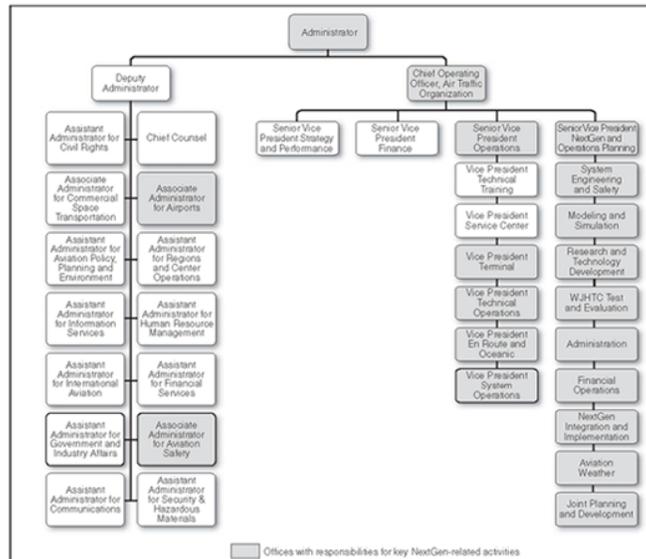
Figure 1: FAA Organization, November 2007



Source: FAA.

In May 2008, FAA announced a reorganization of its NextGen management structure and named a Senior Vice President for NextGen and Operations Planning who reports to ATO's COO (see fig. 2.). The reorganization eliminated JPDO's dual reporting status, and the JPDO Director now reports directly to the newly created Senior Vice President for NextGen and Operations Planning. The reorganization also led to JPDO's placement lower in FAA's organizational structure—it is now a fourth-level organization.

Figure 2: Current FAA and ATO Organization



Source: FAA.

According to ATO's COO, a purpose of the reorganization was to respond to industry stakeholders' concerns about the fragmentation of authority and lack of account-

ability for NextGen, which might delay its implementation. In particular, stakeholders have expressed frustration that a program as large and important as NextGen does not follow the industry practice of having one person with the authority to make key decisions. In the COO's view, the reorganization creates one "team" with one person in charge to plan, implement, and oversee NextGen. According to FAA, the Senior Vice President for NextGen and Operations Planning is responsible for integrating and implementing all elements of NextGen. However, this individual does not have budget authority over several key NextGen projects, according to a recent testimony from the Department of Transportation's (DOT) Inspector General.⁶

In November 2008, the President issued Executive Order 13479,⁷ which took the positive step of treating NextGen as an important national initiative, but potentially added another level of complexity and uncertainty to the management structure for NextGen. The order directed the Secretary to create a staff to support the Senior Policy Committee, an advisory body chaired by the Secretary of Transportation whose members are the heads of the Federal partner agencies and whose purpose is to provide policy guidance for NextGen planning. Previously, JPDO coordinated the agenda of the Senior Policy Committee, but now, according to FAA, the new support staff will coordinate the committee's agenda, although JPDO will continue to be involved in the development of issues and topics for the committee. Furthermore, notwithstanding JPDO's statutory responsibility for coordinating with the Federal partner agencies, the director of the support staff will serve as the senior DOT liaison between the Secretary and the Federal partner agencies. It remains unclear how these changes will affect JPDO's role relative to the Senior Policy Committee or to other Federal partner agencies. The executive order also directed the Secretary to establish a committee to advise the Secretary on the implementation of NextGen. According to FAA's interpretation of the executive order, the new advisory committee will be an external (nongovernmental) committee whose role will be to provide an external stakeholder perspective. The role of this committee could potentially duplicate the roles of other advisory bodies associated with the NextGen initiative. FAA has said that it and JPDO are working with DOT to clarify roles and responsibilities in executing the executive order.

It is difficult to tell how well the reorganization and the implementation of the executive order will address stakeholders' concerns about the fragmentation of authority for NextGen. For example, although the reorganization places JPDO and the office responsible for NextGen integration and implementation under the leadership of the same Senior Vice President, other activities critical to NextGen's implementation lie outside this official's jurisdiction. Several types of aviation operations are under the leadership of the Senior Vice President for Operations, and responsibilities for airport and aviation safety activities fall outside ATO altogether and are headed by FAA Associate Administrators. According to FAA, the NextGen Management Board, which is composed of Associate Administrators, the COO, Senior Vice Presidents, and the Director of the JPDO, ensures agency-wide support for NextGen. However with no direct line of authority between the Senior Vice President for NextGen and Operations Planning and these other operations and activities, accountability for NextGen outcomes is unclear, creating the potential for delays in implementation. It is also unclear how the reorganization and the implementation of the executive order will affect the overall role created for JPDO by Vision 100. For example, according to one industry stakeholder, their ability to understand and be involved in the NextGen-related efforts of Federal partner agencies has been hampered by JPDO's placement under ATO's management.

Several stakeholders have suggested that an office above the Senior Vice President for NextGen and Operations Planning and these other units—an office that would report directly to the FAA Administrator or the Secretary of Transportation—is needed to ensure accountability for NextGen results. In contrast, another stakeholder suggested that further reorganization may not be needed, but FAA's existing leadership could play a greater role in clarifying the responsibilities of the various offices involved in planning and implementing NextGen and in clearly assigning accountability for NextGen outcomes.

⁶*Federal Aviation Administration: Actions Needed to Achieve Mid-Term NextGen Goals.* Statement by Calvin L. Scovel III, Inspector General, U.S. Department of Transportation before the Subcommittee on Aviation, Committee on Transportation and Infrastructure, U.S. House of Representatives, U.S. Congress (Washington D.C., March 18, 2009).

⁷Transformation of the National Air Transportation System, Exec. Order No. 13479 (2008).

Industry Stakeholders Seek More Rapid Midterm Implementation of Existing Capabilities, but Progress Depends Both on Airlines' Investments and on FAA's Validation, Certification, and Rulemaking

To help address current congestion and delays, many stakeholders have suggested that FAA focus on maximizing what can be done with existing, proven capabilities and existing infrastructure. We have previously characterized this approach as "NowGen." For example, industry stakeholders highlighted "off-the-shelf" technologies, including Traffic Management Advisor (TMA), Traffic Flow Management (TFM), and User Request Evaluation Tool (URET), as well as performance-based navigation⁸ and tailored arrival procedures. Such technologies and procedures are being implemented in airports now and, according to these stakeholders, could be implemented more widely and used more effectively to address capacity constraints. For example, TMA—a decision-support tool that helps controllers manage air traffic flows more efficiently—has been used at some airports to increase capacity. However, according to one stakeholder, some airports equipped with TMA are not using it to its fullest extent to increase capacity. Industry stakeholders also maintain that using existing performance-based navigation procedures during low-visibility conditions—when the required distances separating aircraft are normally increased for safety reasons—would enable greater use of closely spaced parallel runways, thereby increasing capacity.

In part to help accelerate the implementation of existing capabilities in the midterm—including technologies that are part of NextGen's five transformational programs, such as ADS-B—FAA has created a NextGen Midterm Implementation Task Force through RTCA.⁹ According to the NextGen Implementation Plan, the task force will focus on maximizing the benefits of midterm NextGen operational capabilities and addressing business and investment-related issues associated with implementing these capabilities. A member of the task force indicated that it will be identifying a handful of capabilities that can be implemented in the midterm and prioritizing them according to their relative net benefits. Furthermore, the task force will be examining the potential for deploying capabilities regionally to address key bottlenecks in the national air transportation system before deploying them nationally. Current plans call for the task force to provide final conclusions and recommendations to FAA in August 2009.

Midterm Implementation Depends on Airlines' Acquisition of Required Avionics

Implementing these capabilities in the midterm, as well as over the long term, depends not only on FAA, but also on aircraft operators, who must acquire the necessary equipment. For example, aircraft must be equipped with appropriate technology to use ADS-B. Some airlines have purchased some of the necessary technology, but over all, airlines are waiting for FAA to specify requirements and address funding concerns. In addition, industry stakeholders have expressed concerns about the progress made by FAA in adequately explaining and demonstrating the benefits of equipping aircraft with advanced avionics equipment, which comes at a significant cost to the aviation industry. For example, one industry stakeholder told us that, without an explicit FAA commitment to reduce separation standards—a key benefit of deploying aircraft with ADS-B equipment—the industry has little incentive to voluntarily purchase the equipment. One objective of the new NextGen Midterm Implementation Task Force is to help operators identify the benefits of acquiring NextGen-compatible equipment sooner rather than later.

A range of potential requirements and incentives could encourage aircraft operators to purchase equipment. These could include mandated deadlines or operational preferences—such as preferred airspace, routings, or runway access. Industry stakeholders have expressed concerns that the array of operational benefits available to early equipers has yet to be identified and defined, and have also questioned the extent to which such preferences would result in tangible benefits. Another proposed option would combine mandated deadlines and operational preferences with equipment investment tax credits that would financially support equipment implementation for a limited initial set of aircraft operators. The credits would provide a competitive advantage for early equipers. Airlines that continue to delay equipage will

⁸Performance-based navigation, which includes Area Navigation (RNAV) and Required Navigation Performance (RNP), is a framework for defining navigation performance requirements ("navigation specifications") that can be applied to an air traffic route, an instrument procedure, or a defined airspace. Performance-based navigation provides a basis for the design and implementation of automated flight paths.

⁹RTCA, Inc. is a private, not-for-profit corporation that develops consensus-based recommendations on communications, navigation, surveillance, and air traffic management (CNS/ATM) system issues. RTCA functions as a Federal Advisory Committee. FAA uses its recommendations as a basis for policy, program, and regulatory decisions.

become more and more disadvantaged, thus providing an incentive for these airlines to equip.

Midterm Implementation Also Depends on FAA's Validation, Certification, and Rulemaking Efforts

Before midterm NextGen implementation can occur, FAA must validate and certify¹⁰ technologies and issue rules for the use of procedures. FAA has made some progress in this area, including developing specifications for performance-based navigation procedures at selected airports, but much remains to be done. We and others have previously expressed concerns about the time and human resources required for these efforts and have identified them as a significant risk to the timely and cost effective implementation of NextGen.¹¹ In recent interviews, stakeholders have expressed similar concerns about the midterm implementation of existing or off-the-shelf technologies and capabilities. For example, an avionics manufacturer, an aircraft manufacturer, and an airline association we interviewed all cited the time it takes to develop rules for new procedures and the problems that result from deploying equipment before rules are finalized. Any activities needed to implement new policies and procedures, such as the expanded use of performance-based navigation procedures; to demonstrate new capabilities, such as the use of closely spaced parallel runways; to set parameters for the certification of new systems, such as ADS-B; and to develop new technologies will take time and be a priority in the mid- and long-term planning for NextGen. Just as important, the time required to complete such activities will have to be balanced against the need to ensure the reliability and safety of procedures and systems before they are used in the national airspace system.

Addressing Ongoing Human Capital, Research and Development, and Facility and Capacity Challenges Will Be Critical for NextGen's Implementation Going Forward

A number of other challenges affect FAA's ability to move forward with NextGen's implementation. These challenges include resolving ongoing human capital challenges, addressing research and development needs, reconfiguring and maintaining existing facilities, and enhancing the physical capacity of airports.

Resolving Key Human Capital Challenges, Including Involving Internal Stakeholders and Acquiring Expertise, Will Be Critical to NextGen's Success

Involving internal stakeholders, such as current air traffic controllers and technicians, in planning for and deploying new technologies will be important to NextGen's success. In our view, input from current air traffic controllers with recent experience controlling aircraft, who will be responsible for managing traffic in the NextGen environment, and from current technicians, who will maintain NextGen equipment, is important when considering human factors and safety issues. Furthermore, our work on past ATC modernization projects has shown that a lack of stakeholder or expert involvement early and throughout a project can lead to cost increases and delays.¹²

We have previously reported that active air traffic controllers were not involved in the NextGen planning effort.¹³ In following up on this issue, we found that some progress has been made. According to FAA, it has used active controllers as subject matter experts in NextGen development; representatives of both the controllers' and the technicians' unions have seats on the NextGen Management Board; and the controllers' union is participating in the NextGen Midterm Implementation Task Force. Controller union officials have likewise reported participating in several NextGen planning and decision-making groups, including the Institute Management Council,¹⁴ and acknowledged that active controllers serve as subject matter experts for

¹⁰Validation is the process through which a technology is shown to operate in a real-life environment with a desired level of confidence. Certification is a form of FAA approval for the use of a technology, such as aircraft equipment, in the national airspace system.

¹¹After studying the lead time required to prototype, validate, and certify new technologies, we concluded that neither JPDO nor FAA had sufficient resources to complete these types of tasks, and could not develop them internally without causing significant delays to NextGen-related capabilities. See GAO, *Response to Questions for the Record; Hearing on the Future of Air Traffic Control Modernization*, GAO-07-928R (Washington, D.C.: May 30, 2007). We discuss the human capital element of this challenge in greater detail later in this testimony.

¹²See GAO, *Air Traffic Control: FAA Needs to Ensure Better Coordination When Approving Air Traffic Control Systems*, GAO-05-11 (Washington, D.C.: Nov. 17, 2004) and GAO-08-1154T.

¹³See GAO-08-1154T.

¹⁴The Institute Management Council, consisting of 16 senior leaders from the aviation community, oversees the policy, recommendations, and products of the NextGen Institute—which was established by FAA and the National Center for Advanced Technologies to provide JPDO

NextGen working groups. However, these union officials have expressed concern that the union is not involved in selecting the subject matter experts. According to the technicians' union, it does not generally participate in NextGen efforts, although it has a liaison working on ADS-B and is seeking to participate in the NextGen Midterm Implementation Task Force.

Acquiring expertise in areas such as systems engineering and contract management is another human capital challenge FAA faces going forward. Because of the scope and complexity of the NextGen effort, the agency may not currently have the in-house expertise to manage the transition to NextGen without assistance. In November 2006, we recommended that FAA examine the strengths and weaknesses of its technical expertise and contract management expertise in light of the skills required to define, implement, and integrate the numerous complex programs inherent in the transition to NextGen.¹⁵ In response to our prior recommendation, ATO contracted with the National Academy of Public Administration (NAPA) to: (1) determine the mix of skills needed by the nonoperational (acquisition) workforce to implement NextGen and (2) identify the strategies for acquiring the necessary workforce competencies.

In September 2008, NAPA completed its study and reported to FAA. The study found that ATO will need to develop or strengthen skills in the areas of software development, systems engineering, research and development, strategic planning, financial budget analysis, and contract administration, among others. However, the study identified leadership as the single most important element of success for large-scale systems integration efforts like NextGen and highlighted leadership as a NextGen implementation challenge. The study, therefore, recommended that FAA tailor its leadership development program to focus on the specific leadership skills needed for managing this large, complex, evolving program, to include communication, collaboration, change management, and accountability and measurement. Strategies presented to ATO for consideration in acquiring the skills needed for the NextGen transition include aggressively marketing the NextGen vision, enhancing internal research and development skills, and working collaboratively with FAA headquarters to develop a more integrated approach to NextGen workforce planning.

According to an FAA official, FAA plans to fill a total of 378 NextGen positions in Fiscal Years 2009 and 2010. NextGen staffing needs can be difficult to address, a senior FAA official said, because historically NextGen skills have been in short supply and competitively priced in the marketplace. However, the current economic conditions could make hiring for these positions less difficult than it otherwise might be. If not adequately addressed, this situation could contribute to delays in integrating new technologies and transforming the national airspace system.

Addressing Ongoing Research and Development Needs Is Key to Keeping the Vision of NextGen on Track

As NextGen moves forward, applied research will be needed to integrate its five transformational technologies, as well as the legacy facilities and systems that will also be part of NextGen, to ensure that all the components work safely and reliably together. According to FAA, the funding requested in its Capital Improvement Program for 2009 through 2013 reflects the research and development and capital investments deemed necessary to deliver NextGen capabilities in the midterm. The funding requested for FAA NextGen research and development has significantly increased, from a total of \$83 million in Fiscal Year 2009 to about twice that amount in each of the next 4 Fiscal Years.¹⁶ FAA believes that this level of FAA funding for NextGen research and development will complement investments made by Federal partner agencies—particularly the National Aeronautics and Space Administration (NASA)—and will adequately support NextGen's implementation. In addition, the American Recovery and Reinvestment Act has increased NASA's budget for aeronautics research by \$150 million, although it does not indicate whether this additional funding will be focused on NextGen-specific research.¹⁷

NASA's aeronautics research has long supported FAA's air traffic modernization efforts. To help ensure that NASA's aeronautics research is effectively transferred

with access to private-sector expertise, tools, and facilities for application to NextGen activities and tasks.

¹⁵ *Next Generation Air Transportation System: Progress and Challenges Associated with the Transformation of the Next Generation Air Transportation System*, GAO-07-25 (Washington, D.C.: Nov. 13, 2006).

¹⁶ FAA has requested \$161 million in Fiscal Year 2010, \$164 million in Fiscal Year 2011, \$165 million in Fiscal Year 2012, and \$167 million in Fiscal Year 2013 for NextGen research. FAA has also requested additional funding for other research

¹⁷ Pub. L. No. 111-5, title II, 123 Stat. 115 (2009).

to FAA, the two agencies have developed a strategy that initially establishes four research transition teams, which are aligned with JPDO's planning framework. This strategy also outlines the two agencies' responsibilities for the research—FAA will develop user requirements, and NASA will conduct the fundamental research in each of the four areas and then transfer projects back to FAA for further development. According to FAA, its collaboration with NASA on the research transition teams has better focused NASA's investments on FAA's requirements. Research transition teams have not, however, been established between FAA and the other partner agencies.

Prioritizing the research and development needed for NextGen is also important to avoid gaps and delays. The most recent version of JPDO's Integrated Work Plan identifies the sequence of research that must be completed before specific NextGen capabilities can be completed. This research, however, cannot be fully prioritized without identifying the benefits that can be expected from the different capabilities and technologies. According to JPDO officials, they are developing a matrix that will identify benefits and costs and build a business case for all the components of NextGen over the next year that will help in prioritizing research and development.

Going forward, further research and development is needed in a number of areas to implement NextGen, according to FAA, stakeholders, and our analysis. For example:

- *Environmental Impact Research:* According to a JPDO analysis, the environmental impact of aviation will be the primary constraint on the capacity and flexibility of the national airspace system unless this impact is managed and mitigated. In proposed legislation reauthorizing FAA, \$111 million for Fiscal Years 2009 through 2011 may be used for a new FAA research and development program to help reduce aviation noise and emissions. This program—the Continuous Lower Energy, Emissions, and Noise (CLEEN) initiative—would facilitate over the next 10 years the development, maturation, and certification of improved airframe technologies. Aeronautics industry representatives and experts we consulted said that the program's funding levels may not be sufficient to attain the goals specified in the proposal. According to these experts, the proposed funding levels would allow for the further development of one or possibly two projects. FAA recognizes the implications of the proposed funding structure for CLEEN and characterizes the program as a "pilot."
- *Human Factors Research:* Human factors research explores what is known about people and their abilities, characteristics, and limitations in the design of the equipment they use, the environments in which they function, and the jobs they perform. Compared with the current ATC system, NextGen will rely to a greater extent on automation, and the roles and responsibilities of pilots and air traffic controllers will change. For example, both pilots and controllers will depend more on automated communications and less on voice communications. Such changes in roles and responsibilities raise significant human factors issues for the safety and efficiency of the national airspace system. Until Fiscal Year 2005, NASA was a primary source of Federal aviation-related human factors research, but NASA then began reducing its human factors research staff, reassigning some staff to other programs and reducing the contractor and academic technical support for human factors research. According to NASA, human factors research continues to be a critical component of its aeronautics research program, although its work is now focused at the foundational (earlier-stage) level. FAA plans to invest \$180.4 million in human factors research from Fiscal Year 2009 through Fiscal Year 2013. It remains to be seen whether or to what extent FAA's research and development, which is typically more applied than NASA's, will offset NASA's reductions in human factors research.
- *Weather Related Research:* Improved weather information is essential to realize key NextGen capabilities that depend on accurate weather information for decision-making. According to FAA, 70 percent of delays are attributable to weather every year. NextGen Network Enabled Weather (NNEW) is one of the five NextGen transformational programs for which current research and development efforts are needed, even though their full benefits may not be realized until after the midterm. NNEW is intended to provide weather support services for decision-making in the NextGen environment. More specifically, NNEW is FAA's contribution to the 4-dimensional weather cube¹⁸—a technology that will provide weather observations and analyses, including forecasts of expected weather conditions, for all users of the national airspace system. FAA is devel-

¹⁸The 4-dimensional weather cube describes the atmosphere in three dimensions (latitude, longitude, and altitude) and adds the dimension of time.

oping the requirements for this program, and the Department of Commerce, through its National Oceanic and Atmospheric Administration, will lead the development of the 4-dimensional weather cube, using the Department of Commerce's resources and those of the partner agencies. FAA expects to finish defining the requirements for NNEW in March 2009. After validating the requirements, FAA will solicit reviews from the relevant stakeholders on the extent to which their requirements are aligned with those of the other agencies. This is a collaborative effort whose success will depend on contributions from all parties. Delays in aligning agency requirements, as well as the lack of meteorological knowledge, could lead to delays in implementing NextGen systems.

Beyond these research efforts, FAA has continued to move forward in planning and conducting demonstrations of some key NextGen technologies. For example, a recently announced demonstration with U.S. Airways and Aviation Communications and Surveillance Systems at the Philadelphia International Airport will test ADS-B technology that allows an aircraft with the necessary avionics to transmit its own position as well as to receive information from other similarly equipped aircraft. FAA is providing \$6 million to purchase the necessary avionics equipment for the aircraft involved in the demonstration. FAA has also initiated projects to demonstrate the benefits of integrating NextGen capabilities. For example, in December 2008, FAA signed a memorandum of agreement with NetJets—an Ohio-based air service provider with a fleet of 600 aircraft. In this demonstration, FAA will test a number of NextGen technologies and procedures including ADS-B. The company will provide real-time data, allowing FAA to validate performance requirements. This demonstration will help FAA identify the costs and benefits associated with NextGen implementation.

Reconfiguring and Maintaining the Existing ATC System and Increasing Physical Capacity Are Also Key Challenges

To fully realize NextGen's capabilities, a new configuration of ATC facilities will be required. FAA has not developed a comprehensive reconfiguration plan, but says that preliminary efforts are underway to plan concepts for future FAA facilities. Going forward, it will also be critical for FAA to ensure the safety and efficiency of its existing ATC system, since it will be the core of the national airspace system for a number of years and some of its components will become part of NextGen. FAA faces an immediate task to maintain and repair existing facilities so that the current ATC system continues to operate safely and reliably. FAA has estimated a one-time cost of \$268 million to repair 400 existing terminal facilities. Once FAA develops and implements a facility reconfiguration plan, the costs of facility repairs and maintenance may be reduced. The American Recovery and Reinvestment Act of 2009 provides \$200 million to be made available within the next 2 years for improvements in power systems, air route traffic control centers, air traffic control towers, terminal radar approach control facilities, and navigation and landing equipment and indicates that projects that can be completed in 2 years should be given priority.¹⁹ The availability of these funds increases the importance of FAA's developing facility consolidation and reconfiguration plans to ensure that the funds are spent efficiently and effectively. FAA has acknowledged the need to keep long-term plans in mind so that it does not invest unnecessarily in facilities that will not be used for NextGen.

Finally, FAA has determined that, even after planned improvements have been completed at 35 of the busiest airports, 14 airports—including some of the 35 busiest—will still need enhanced physical capacity by 2025. Planning infrastructure projects to increase capacity, such as building additional runways, can be a lengthy process, and will require substantial advance planning and safety and cost analyses. Furthermore, without substantial reductions in emissions and noise around the Nation's airports and continuing efforts at all levels of government, including increased research and development activities, achieving the goal of safely expanding the capacity and efficiency of the national airspace system to meet 21st century needs may not be attainable.

Thank you, Mr. Chairman. I would be pleased to answer any questions that you or Members of the Subcommittee may have at this time.

APPENDIX I: RELATED GAO PRODUCTS

Next Generation Air Transportation System: Status of Transformation and Issues Associated with Midterm Implementation of Capabilities. GAO-09-479T. Washington, D.C. March 18, 2009.

¹⁹Pub. L. No. 111-5, title XII, 123 Stat. 115, 205 (2009).

Next Generation Air Transportation System: Status of Systems Acquisition and the Transition to the Next Generation Air Transportation System. GAO-08-1078. Washington, D.C.: September 11, 2008.

Responses to Questions for the Record; Hearing on the Future of Air Traffic Control Modernization. GAO-07-928R. Washington, D.C.: May 30, 2007.

Next Generation Air Transportation System: Status of the Transition to the Future Air Traffic Control System. GAO-07-784T. Washington, D.C.: May 9, 2007.

Joint Planning and Development Office: Progress and Key Issues in Planning the Transition to the Next Generation Air Transportation System. GAO-07-693T. Washington, D.C.: March 29, 2007.

Federal Aviation Administration: Key Issues in Ensuring the Efficient Development and Safe Operation of the Next Generation Air Transportation System. GAO-07-636T. Washington, D.C.: March 22, 2007.

Next Generation Air Transportation System: Progress and Challenges Associated with the Transformation of the National Airspace System. GAO-07-25. Washington, D.C.: November 13, 2006.

Senator DORGAN. Dr. Dillingham, thank you very much for your statement.

Next, we will hear from Joe Kolshak, who is a Senior Vice President of Operations at United Airlines.

Mr. Kolshak?

**STATEMENT OF JOE KOLSHAK, SENIOR VICE PRESIDENT—
OPERATIONS, UNITED AIRLINES ON BEHALF OF THE AIR
TRANSPORT ASSOCIATION OF AMERICA**

Mr. KOLSHAK. Thank you, Senator Rockefeller, Chairman Dorgan, and Members of the Subcommittee, for the opportunity to talk about the urgent need to modernize our Nation's air traffic control system.

I'll stress three key points about NextGen and air traffic modernization. First, the time to act is now. NextGen is NowGen. Next, with leadership and investment, key elements and benefits of NextGen can be delivered in the next 3 to 5 years. And finally, acceleration of NextGen will deliver real benefits for our economy, our customers, and the environment.

In my career, running operations in the Marine Corps, at United, and at other major airlines, and also as a pilot on the Boeing 777 and other aircraft, I've witnessed developments that have made commercial aircraft wonders of modern technology. Unfortunately, I also see the steady decline in the performance of the system that controls these modern aircraft. Our air traffic control system is the safest in the world; however, in terms of technology, it's outdated, it's limited, slow, and often cumbersome.

These limitations impose significant cost on our society in general, and the airline industry in particular. Air traffic delays are costing the U.S. economy over \$41 billion every year. This includes lost passenger time, missed business meetings, disrupted vacations, and so on. It also includes harm to the broader economy, those who depend on predictable air travel, such as the travel and tourism industry. And finally, it also includes cost to the airlines.

At United alone, annual delay costs approach \$600 million annually. Without a modern, efficient, ATC system, U.S. commerce is impaired and U.S. businesses will struggle to compete effectively in the global economy.

Imagine, if you can, surface transportation without the interstate highway system. It's where aviation finds itself today.

In our challenging economic times, it's even more important that we modernize the air traffic control system now. That's why we call it NowGen instead of NextGen.

In my written testimony, I detail key technologies and procedure changes that are available today and ready for accelerated deployment. They all have complicated names, but the services they deliver are actually quite simple.

They boil down to providing improved access to realtime information, both for controllers and pilots, and this information enables safer and more efficient spacing and routing of planes in the air and while taxiing on the ground. Unlike today's system that has its origin in the use of bonfires to guide airplanes, the plans we advocate use modern satellite technology to let pilots and controllers see the whole picture in realtime. This allows them to communicate better and to fly smarter.

It's not vastly different than the GPS systems available in cars today, which give realtime traffic reports and allow you to choose the best route to avoid congestion. And just like you can get weather reports for any city in the world on your iPhone or BlackBerry, these technologies better equip us to deal with weather conditions, which contribute to over 70 percent of all air traffic delays.

We can achieve success in the near term, but the government must accelerate its investment in NextGen elements that are proven and ready to deploy today. This investment will stimulate installation of facilities, avionics, and the development of new procedures.

The benefits of accelerating modernization of our ATC system are clear and compelling. That's why airlines, general aviation, business aviation, and the military all agree on the need to jumpstart NextGen.

By accelerating investment in our ATC infrastructure, it will create and retain thousands of jobs in all sector of the economy, and will improve the travel experience for customers and communities across the system.

For example, when United experiences air traffic delays at our hubs in Washington and Chicago, the impact is felt disproportionately by Bismarck, Charleston, and all of the other communities that connect to the system through our network. That's why targeted deployment of NextGen to those metropolitan areas and regions of the country where it's most needed to address congestion and delays is to vitally important.

Acceleration of NextGen is also a green initiative that will yield benefits for the environment, because we'll be using less fuel and reducing carbon emissions. United participated with the FAA in a demonstration flight using some of the procedures involved in NextGen. That one flight resulted in a savings of over 1,500 gallons of fuel and almost 33,000 pounds of CO₂ emissions. Imagine the benefits of implementing those procedures across the entire system each and every day.

In conclusion, Mr. Chairman, it's time to act. All industry stakeholders support moving NextGen forward now. With the leadership of this committee, the Congress, and the Administration, we can deliver key benefits of NextGen in the next 3 to 5 years. This action will create jobs, enhance air travel for our customers, and con-

tribute to a cleaner environment. In the 1950s, Congress and the Eisenhower Administration built a new Federal highway infrastructure. It was a national priority that took leadership and funding. Now's the time to do the same thing for the Nation's aviation infrastructure by delivering NowGen.

Thank you, and I look forward to your questions.
[The prepared statement of Mr. Kolshak follows:]

PREPARED STATEMENT OF JOE KOLSHAK, SENIOR VICE PRESIDENT—OPERATIONS,
UNITED AIRLINES ON BEHALF OF THE AIR TRANSPORT ASSOCIATION OF AMERICA

Introduction

The time to jump-start air traffic control (ATC) system modernization is now. A meaningful down payment over the next few years will pay dividends in the form of greatly improved system performance and corresponding public benefits.

The shortcomings of the existing ATC system are well known. Technologically, it is outdated and limited in its capabilities. It relies on ground-based radar for surveillance and navigation, and voice communications to relay instructions between controllers and pilots. Compared to modern and emerging technologies, our ATC system is slow and cumbersome. These limitations force operational procedures such as separation standards and indirect point-to-point routings that are inefficient because they appropriately put safety first. Consequently, as U.S. civil aviation has grown and become more complex—including scheduled commercial, nonscheduled business, public and private charter, air taxi and private recreational flying—the ATC system has become strained and, in some geographic areas, overwhelmed. This is especially true when severe winter or summer weather disrupts normal operations. The result is congestion and delay for all system users, unhappy passengers and shippers, and airlines who struggle to recover normal operations and rebook passengers when forced to cancel flights.

The current ATC system limitations impose significant costs on our society in general, and the airline industry in particular. The Joint Economic Committee estimates air travel delays impose \$41 billion annually in costs on the U.S. economy.¹ In the 12-month period ending September 2008, 138 million system delay minutes drove an estimated \$10 billion in direct operating costs for scheduled U.S. passenger airlines and cost airline passengers an estimated \$4.5 billion in lost wages and productivity. These figures do not capture the costs of extra gates and ground personnel to passenger airlines or the direct costs incurred by cargo airlines and their customers. The airline industry cannot survive, and the public will not invest in it, if these conditions remain *status quo*.

Looking forward, these problems will only worsen unless and until change occurs. By 2025, the Federal Aviation Administration (FAA) forecasts there will be approximately 30,000 more operations per day than the 2007 estimate of 44,000 daily operations. The current ATC system cannot handle this projected future demand, even if the forecast is reduced to account for current economic conditions. Even if the forecasted growth is significantly reduced, today's ATC system is so inefficient that it will not be able to handle a modest increase in activity.

Why Is This Important?

The ATC system is a critical national infrastructure that serves the American people and the commerce of the United States, and all system users rely on it, especially the scheduled airline industry. The airline industry is the foundation of the commercial aviation sector, which comprises airlines, airports, manufacturers and associated vendors. *U.S. commercial aviation ultimately drives \$1.1 trillion per year in U.S. economic activity and 10.2 million U.S. jobs.* By any measure, the U.S. airline industry is a valuable national asset and its continued economic health should be a matter of national concern. Without a modern, efficient ATC system, the airline industry will slowly strangle, U.S. commerce and productivity will be impaired and U.S. businesses will not be able to compete effectively in the global economy. For these reasons, modernizing the ATC system now is critically important to the growth and competitiveness of our economy.

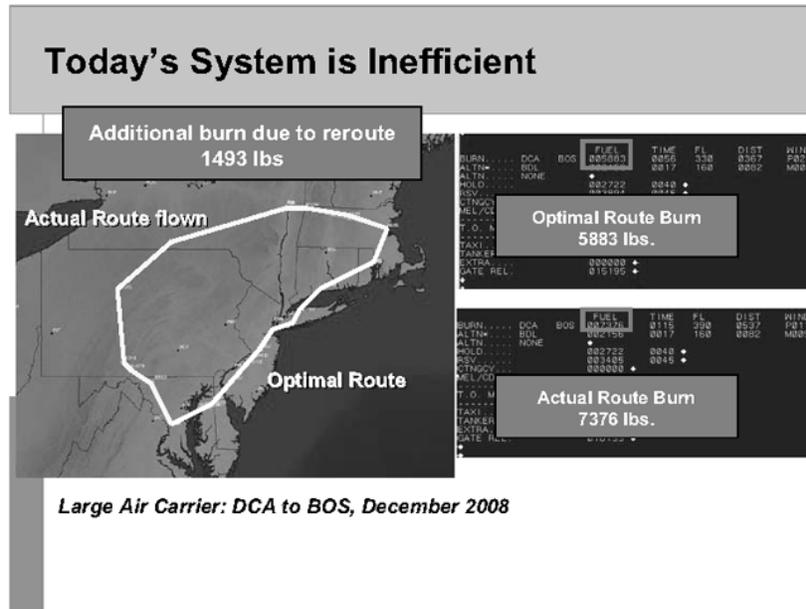
¹ http://jec.senate.gov/index.cfm?FuseAction=Reports.Reports&ContentRecord_id=11116dd7-973c-61e2-4874-a6a18790a81b&Region_id=&Issue_id=

ATC Modernization—NextGen—Will Provide Critically Needed Benefits

The FAA ATC modernization project—the Next Generation Air Transportation System (NextGen)—will usher in a new era of air traffic management and control that promises enormous benefits for all stakeholders and the American people. Public benefits include improved operational efficiency, reduced fuel consumption and emissions and lower operating costs for airlines. ATA strongly supports NextGen because it addresses numerous critical needs:

- *Capacity.* The current ATC system is saturated and, in some locations, cannot provide the capacity to meet public demand for convenient, safe air transportation. This situation inhibits competition and industry growth. It also is the source of unnecessary congestion and delays, and compounds the effect of weather-related delays. NextGen will enable more precise spacing of aircraft and flight paths, which will allow FAA to handle safely and efficiently the traffic growth that it forecasts.
- *Efficiency and Productivity.* NextGen will enable more efficient flying. Today's ground-based radar system requires planes to fly over specific points on the ground to maintain radar and communications contact. Navigational aids, radar and controllers are all terrestrial. They are linked to form a complex network system that supports airways, through which aircraft fly. Today's system also requires spacing to accommodate the time it takes for radar to detect objects. Consequently, aircraft fly indirect routings and aircraft spacing—required for safety—wastes capacity. Today's ATC system cannot, and never will be able to, take full advantage of available technology or integrate and fully exploit emerging technology.

The environmental and economic impact of today's inefficient ATC system is illustrated below. The flight in this example burned an additional 1,493 pounds of fuel (218 gallons). This added an extra 4,560 pounds of carbon dioxide (CO₂) that was released into the air and cost the carrier an extra \$688 in fuel (given razor-thin margins, this is significant).



In contrast to today's ATC system, NextGen will enable: optimized, direct routings between airports; reduced aircraft spacing; continuous descent arrivals, precise arrival and departure routings (known as RNAV and RNP procedures), and closely spaced approaches on parallel runways in instrument flight rule conditions. These are just a few of the operational benefits of NextGen.

These efficiency enhancements will drive significant improvements in productivity—both in terms of asset utilization and personnel. That, in turn, will re-

duce operating costs, which will help keep fares down and enable those savings to be plowed back into wages and benefits and operating capital.

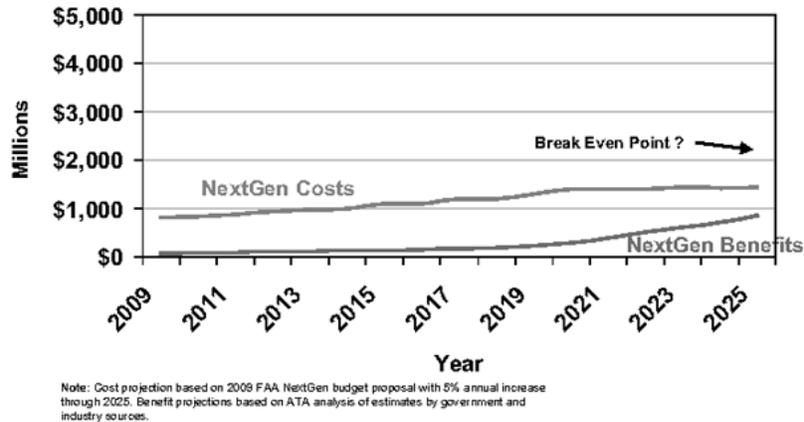
Improved ATC efficiency also will benefit private aircraft owners. Corporations use private aircraft with the expectation that such use is efficient. While we disagree with that proposition, ATC modernization will provide corporate aircraft owners the same kind of efficiency benefits that commercial airlines will enjoy if their aircraft are properly equipped. Even if they are not properly equipped, they still will enjoy a spin-off benefit simply from operating in the same airspace as more efficient commercial aircraft.

- *Environmental Benefits.* More efficient operations also will use less fuel, increasing aircraft fuel efficiency and reducing greenhouse gas and other emissions. It was estimated initially that full implementation of NextGen would reduce emissions significantly. The environmental benefits of ATC modernization are real and important. Improved fuel efficiency also will reduce operating costs and contribute to improved financial conditions that, like the productivity improvements discussed above, will benefit the public and employees.
- *Operational Integrity and Customer Satisfaction.* Closely linked to capacity, efficiency and productivity is operational integrity. By expanding capacity and enabling more efficient operations, NextGen will enable better on-time performance and improved customer satisfaction. Today's outdated ATC system contributes to delays and disruptions, such as unnecessary weather-related delays, that could be avoided and will be avoided when NextGen is implemented. With improved operational integrity comes fewer delays, fewer missed connections, fewer misplaced checked bags and more satisfied customers.
- *Safety.* The NextGen satellite-based system will look and act much like a network to which aircraft and ATC are interconnected. It will provide more precise information to both controllers and pilots about aircraft locations, both in the air and on the ground, and will enable aircraft to constantly know one another's locations. This locational awareness and corresponding digital communications capability will provide critical real-time flight status information not available today. Some of the technology and operating procedures already have been tested and produced dramatic results. A sharp drop in aircraft accidents in Alaska occurred under the Capstone Program, introduced earlier this decade, which utilizes ADS-B technology, a foundational technology for NextGen.
- *Scalability.* NextGen will be considerably more nimble than today's facility- and labor-intensive system. Accordingly, it will be much easier for the FAA to scale the system to meet demand from all aviation sectors, whether that demand is a steady growth curve or fluctuates from time to time. Automation and digital data communications will make it easier for the FAA to adjust the system as needed.
- *Improved Financial Performance.* Modernization will respond to legitimate shareholder expectations that the airlines they invest in will earn a positive return on investment. The current ATC system hobbles the industry's ability to achieve financial stability because of the costs it drives by being inefficient. As noted above, these failures lead to costly delays and congestion.

The Current NextGen Plan—Delayed Benefits

While we strongly support NextGen, the current FAA plan does not produce significant benefits—the capacity, efficiency and economic benefits described above—for the traveling and shipping public or for system users until 2025. For system users—airlines, business aviation and general aviation—this delay presents a special problem. The plan contemplates significant stakeholder investment, in addition to FAA investment, but no real benefit for many years. Without a timely return on investment, there is little incentive for airlines and other users to invest in new equipment and training. In short, the current FAA plan does not make a strong business case. Airlines, air taxis, charter operators and corporate aircraft owners have a fiduciary responsibility to their shareholders and owners to achieve a reasonable return on their investment in this context, just as they do with respect to any other major capital expense.

Current NextGen Cost/Benefit Projection



This is particularly troublesome given the fragile state of the U.S. airline industry. 2008 saw U.S. airlines lose an estimated \$8 billion (final, audited results are not yet available) on top of the \$31 billion lost since 2000. Airlines reduced operations sharply and were forced to slash 28,000 jobs in 2008; additional reductions are already in place for 2009 and softening demand will require even further reductions as carriers continue to cut back operations. Should jet fuel prices move sharply upward, the industry could easily see 2009 losses approaching the magnitude of losses in 2008.

The NextGen Solution: Accelerate Ready Capabilities to Drive Early Benefits

There is a real and achievable solution, and that is to advance the point in time when the investment in NextGen begins to pay off for both the public and vested stakeholders. If the public and aviation stakeholders begin to realize the benefits in a few years instead of 10 or more, then the NextGen business case improves dramatically.

To accomplish this critical shift, the government must accelerate its near-term investment in NextGen, with a corresponding reduction in later years, in order to leverage existing technology in the near term. This investment will stimulate accelerated manufacture and installation of ground infrastructure facilities, required avionics, and development and certification of new operations procedures. This proposal includes only those elements that are proven and ready to deploy:

- *Automatic Dependent Surveillance-Broadcast (ADS-B)*—ADS-B is a critical component of NextGen. By relying upon satellite and additional technology, ADS-B enables an aircraft to constantly broadcast its current position simultaneously to air traffic controllers and other aircraft. Tremendous safety, security, capacity and environmental improvements are realized. Unlike ground radars, ADS-B offers much more precise data on an aircraft's position in the sky or on the runway, including altitude, category of aircraft, airspeed and identification. ADS-B has two components. ADS-B "Out" and "In". ADS-B "Out" continuously transmits an aircraft's position, altitude and intent to controllers. ADS-B "In" is the reception of the transmitted data by other aircraft, which allows pilots to have a complete picture of their aircraft in relation to other traffic, both in the air and on the ground. ADS-B has the potential to reduce delays, reduce fuel burn through more efficient routings, and increase capacity—all while improving safety. The current FAA plan does not mandate deployment until 2020.
- *Area Navigation (RNAV)*—enables aircraft to fly on any path within coverage of ground or space-based navigation aids, permitting more access and flexibility

for efficient point-to-point operations. Aircraft are already equipped but accompanying arrival and departure procedures have not been adequately developed.

- *Required Navigation Performance (RNP)*—like RNAV, RNP enables aircraft to fly on any path within coverage of ground- or space-based navigation aids, but also includes an onboard performance monitoring capability; RNP enables closer en route spacing without intervention by air traffic control, and permits more precise and consistent departures/arrivals.
- *Electronic Display Upgrades*—will allow the display of traffic information that becomes available with ADS-B deployment and reduce the risk of runway incursions. Whether upgrades to existing forward displays or the addition of a supplemental display (such as an Electronic Flight Bag), users will be able to see other traffic while taxiing and have access to surface navigation tools, electronic versions of airport maps and pilot handbook materials.
- *Ground-Based Augmentation System (GBAS)*—GBAS is the next-generation technology to support precision landings. It provides additional information to aircraft to allow GPS to be used for landings in low-visibility conditions. This minimizes schedule disruptions due to weather, and also enables more environmentally friendly procedures and increased safety during ground operations.

In addition to accelerating the government's investment in NextGen, we also propose *targeted deployment* to those metropolitan areas and regions of the country where it is most needed to address congestion and delays, such as Chicago, San Francisco, Los Angeles, New York/Philadelphia and Atlanta. Deploying these capabilities in high-value locations before expanding to other areas will maximize NextGen benefits for the greatest number of people.

To support the earliest possible delivery of benefits and further investment by carriers, we also endorse the FAA "best equipped/best served" principle included in the governing principles of the NextGen 2009 Implementation Plan. Under this principle, consistent with safe and efficient operations, FAA will provide priority in the National Airspace System to Next-Gen equipped aircraft.

Accelerated and targeted deployment will produce significant benefits for the flying public in terms of airspace capacity and efficiency. It will lead to improved reliability and on-time performance, thereby greatly diminishing (if not eliminating) the single biggest source of the public's dissatisfaction with flying. It should also drive improvements in other customer service areas such as checked baggage delivery and long taxi-out times.

Other Challenges Also must Be Overcome to Realize NextGen Benefits

Investment, equipment and technology development/deployment are critical to delivering the benefits that NextGen promises. But they are not the only critical factors. The operational, environmental and economic benefits of NextGen can still be lost, and the investment in equipment and technology wasted, if other important challenges are not met head-on by the FAA. It is essential that each FAA organization executes its NextGen responsibilities in a timely fashion and that they all work together pursuant to a coordinated and unified strategy that prioritizes NextGen implementation. These challenges include:

- *Promptly complete airspace redesign.* FAA has underway a major overhaul of the NY/NJ/PHL airspace that is essential to improving the flow of traffic into, out of and through these metropolitan areas. It will significantly improve operational efficiency in this region and the entire NAS. Because it changes noise patterns, however, it has met stiff local political and public opposition and is the subject of multiple legal challenges. It is imperative that FAA push through these political and legal challenges and stay the course. And it must stay the course as it implements airspace redesign initiatives elsewhere in the NAS, such as Chicago, Denver and the West Coast corridor.
- *Develop new separation standards and approve new operations procedures.* For NextGen to deliver new capacity and efficiency, the FAA must develop new, reduced separation standards that take advantage of NextGen technological capabilities. In addition to separation standards, FAA also must establish criteria for the development and approval of new operations procedures such as simultaneous operations on closely spaced parallel runways, curved approaches, multiple precise departure paths, continuous descent approaches and optimized profile descents. Bureaucratic roadblocks and turf battles must be avoided. Inconsistent application of separation standards at the air traffic control facility level needs to be addressed. New standards and procedures must be viewed as going hand in glove with new technology.

- *Controller acceptance and implementation of new procedures.* FAA must partner with its controller workforce and make them part of the NextGen process. If controllers do not accept new separation standards and utilize new precision operations procedures, then the equipment investment for NextGen will be wasted. FAA must find a way to resolve the contract dispute with the controllers, which to date has served as a roadblock to controller input into NextGen development.
- *Maintain a sufficient constellation of satellites to meet FAA safety standards.* There is an assumption that the GPS satellite constellation servicing NextGen surveillance, navigation and communications functions will be adequate to meet stringent FAA safety standards. However, in some models, the minimum number of satellites FAA assumes for its performance-level safety analysis is not sufficient. FAA and the Department of Defense must come to agreement on the minimum satellites needed for NextGen to provide the performance level required by FAA safety criteria, and Congress must provide the necessary funds.

Conclusion

We have arrived at a pivotal moment for U.S. aviation. Industry stakeholders support the FAA NextGen program—an event not to be overlooked—and the FAA has developed a comprehensive implementation plan with clear benefits. The plan needs to be accelerated by an immediate boost in funding to jump-start equipment deployment on the ground and in the air. We urge the Subcommittee to make the rapid, successful implementation of NextGen happen now.

Senator DORGAN. Mr. Kolshak, thank you very much.

Next, we will hear from Dale Wright, who is the Director of Safety and Technology at the National Air Traffic Controllers Association.

Mr. Wright?

STATEMENT OF DALE WRIGHT, DIRECTOR OF SAFETY AND TECHNOLOGY, NATIONAL AIR TRAFFIC CONTROLLERS ASSOCIATION

Mr. WRIGHT. Thank you, Chairman Rockefeller, Chairman Dorgan, and Ranking Member DeMint, for the opportunity to testify.

I retired as an air traffic controller, in September 2007, with 32 years experience. I'd first like to state unequivocally that NATCA supports NextGen, and we believe that NATCA must be an active participant in its development.

According to the GAO, NextGen is a high-risk effort. It is highly complex, has many interdependent projects, requires a large investment of money, time, and other resources, but it is imperative, for both the safety of the NAS and the investment of the taxpayer dollars, that this project be undertaken in the right way.

First and foremost, the FAA must collaborate with users and stakeholders. Collaboration with NATCA is especially important, as our members will be the primary users of NextGen technology. Because of their front-line air traffic control experience, NATCA members are best qualified to provide insight into the needs of the system. Doing so on the front end rather than the back end will save the agency time and taxpayer money, and result in a better product.

In Europe, EuroControl has undertaken a modernization projected called SESAR, which is similar in size and scope to NextGen. Leaders of EuroControl recognize the importance of including front-line air traffic control workforce into this project's development. Unfortunately for NextGen, the FAA's taking the opposite approach. Although NATCA has reached out many times to offer our expertise, the FAA has rejected our offers. They made it abun-

dantly clear they do not value the professional knowledge and expertise that NATCA brings to the table.

So strong is our commitment to the success of NextGen that when it became clear to us that NATCA would have no direct involvement with the FAA, we sought inclusion indirectly through private-sector industry workgroups. The private-sector aviation community, recognizing the benefits of our inclusion, welcomed us with open arms. At last week's House Aviation Subcommittee hearing on NextGen, representatives of both ATA and GAMA testified about the importance of controller involvement throughout the development and implementation of NextGen.

Thus far, the FAA's go-it-alone strategy has yielded results that are incomplete, unsafe, and ineffective. For example, the FAA has refused to work with NATCA on the subject of airspace redesign for the New York, New Jersey, and Philadelphia metropolitan areas. As a result, phase one of the program, dispersal headings out of Philadelphia, was implemented with serious flaws. Rather than learn a lesson from phase one, the FAA is set to implement phase two, which involves more significant changes to airspace and procedure, still without NATCA involvement.

Our experience with the End Route Automation Modernization—that's ERAM project—seems to be heading the same direction. NATCA believes ERAM is necessary for the future of air traffic control. Once perfected, ERAM will handle significantly a larger volume of data and provide a more seamless backup than the current system. However, less than 2 months ago, officials on the ERAM team disclosed that ERAM had yet to remain stable and functional for a full 24 hours of continuous operational testing.

Earlier this month, the FAA asked NATCA for assistance in addressing the 109 critical errors facing ERAM. We had hoped this gesture of outreach signified a change in agency policy, but thus far we've run into the familiar obstructionism. At this time, it is unclear whether the agency intends to work with NATCA, but we remain eager to participate.

We would also like to work with the FAA to ensure that NextGen incorporates the redundancies necessary for the system in security of the NAS. The FAA's plans require transition to a single-source satellite to provide navigation and surveillance to the NAS. This leaves the system unacceptably vulnerable to natural disaster, attack, or technological failure. The current radar system has necessary redundancies. Should one radar site fail, overlapping sites can provide surveillance without compromising safety or interrupting service. Similar redundancy must be incorporated into NextGen plans.

We'd also like to help ensure that the FAA effectively addresses the human-factor issues brought about by NextGen. Their proposed best-equipped, best-served incentive policy, for example, significantly increases the complexity of ATC operations, a particular concern with an understaffed and inexperienced workforce operating the system. Such problems should be mitigated and avoided entirely if the FAA would collaborate with NATCA.

Last, we are eager to work with the FAA to address problems facing the current air traffic control system. We must reach a mutually acceptable collective bargaining agreement with the FAA so

that we can begin to address the staffing crisis that continues to deepen. We've lost 46,000 years of experience in the last 2½ years. Training has stalled and fatigue in the workforce is undermining the safety throughout the system.

We at NATCA recognize the severity of the issues facing today's air traffic control system, and we're eager to help the FAA address the issues of system capacity, delays, safety, and sustainability, but we also caution them not to abandon what we call NowGen. The FAA must begin to look at the members of the controller work force, not as an obstacle, but the valuable resource they are.

This concludes my comments, and I stand by to answer any questions you may have.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Wright follows:]

PREPARED STATEMENT OF DALE WRIGHT, DIRECTOR OF SAFETY AND TECHNOLOGY,
NATIONAL AIR TRAFFIC CONTROLLERS ASSOCIATION

Introduction

The National Air Traffic Controllers Association (NATCA) is the exclusive representative of more than 15,000 air traffic controllers serving the Federal Aviation Administration (FAA), the Department of Defense and the private sector. In addition, NATCA represents approximately 1,200 FAA engineers, 600 traffic management coordinators, 500 aircraft certification professionals, agency operational support staff, regional personnel from FAA's logistics, budget, finance and computer specialist divisions, and agency occupational health specialists, nurses and medical program specialists. NATCA's mission is to preserve, promote and improve the safety of air travel within the United States, and to serve as an advocate for air traffic controllers and other aviation safety professionals. NATCA has a long history of supporting new aviation technology, modernizing and enhancing our Nation's air traffic control system, and working to ensure that we are prepared to meet the growing demand for aviation services.

NATCA's Recommendations

It is our understanding that this hearing is the first of several on the topics covered by FAA Reauthorization. As this hearing is focused on modernization, NATCA's remarks are intended to specifically address the FAA's efforts in implementing the Next Generation Air Transportation System (NextGen). We look forward to the opportunity to testify before you in the future and are prepared to address the many other important issues facing the FAA including the need for fair dispute resolution between labor and management, realignment of FAA facilities and services, staffing and the need for scientifically based standards, the designee program and the FAA certification process, and other topics.

NATCA remains, as ever, completely committed to the safety and efficiency of the National Airspace System (NAS). New technology has the potential to improve safety, expand capacity, and increase efficiency of the NAS. Therefore, we support the FAA's willingness to undertake the large-scale and long-term research, development and modernization project that it has labeled NextGen. Yet the complexity and the risk of this program should not be underestimated. The GAO has stated that NextGen is a high risk effort because of its dollar cost and complexity.¹ Therefore it is imperative that the FAA proceed in a way which maximizes the chances of success. At present, there are several outstanding shortcomings with the FAA's methodology and plans that must be addressed at this early stage of the process.

1. *The FAA must collaborate meaningfully with stakeholders*—The inclusion of NATCA is critical to the success of NextGen and all projects relating to modernization, technology and procedures. The Government Accountability Office and the Inspector General of the Transportation Department have both testified before Congress that controller involvement prevents cost overruns and implementation delays. NATCA must be included in all stages, from inception to implementation.

¹House Transportation and Infrastructure Subcommittee on Aviation Summary of Subject Matter for hearing on *Air Traffic Control Modernization and the Next Generation Air Transportation System: Near-Term Achievable Goals*. March 16, 2009.

2. *NowGen must not be neglected as we prepare for NextGen*—The current air traffic control system has fallen into disrepair. Both the human infrastructure, including staffing levels of air traffic controllers, inspectors, engineers, and other aviation safety professionals, and physical infrastructure, such as poorly-maintained and deteriorating air traffic control facilities, need attention in the near term.

3. *Human factors must be addressed*—Several of NextGen’s proposals raise serious concerns regarding human factors, including the increased complexity and safety risk inherent in a best equipped, best-served policy. These issues must be addressed during the development stages in order to avoid delays, cost overruns, and safety failures.

4. *Safety requires redundancy*—NATCA is concerned that the system being proposed by the FAA, which is centralized and lacking a viable backup, is unacceptably vulnerable to attack or natural disaster. Human intervention must not be the first and only layer of redundancy. The FAA must build redundancy into the system in order to ensure that in the event of an attack, natural disaster, or technological failure, safety is not compromised.

Collaboration is Critical

The participation of NATCA throughout all stages of NextGen’s development and implementation is critical to the success of this project. NATCA’s members are frontline workers who are able to provide vital insight to help the team identify and address human-interface issues and other concerns. Doing so on the front end rather than during implementation will save the Agency time, taxpayer money and resources while avoiding potential damage to the integrity of the air traffic control system. Because NATCA’s members have an intimate understanding of frontline air traffic control, they are uniquely qualified to provide insight into the needs of the system, the utility of the FAA’s proposed technology, and the usability of the products included under the NextGen umbrella. As Peter Bunce, President and CEO of General Aviation Manufacturers Association (GAMA) said, “If we are going to have full implementation [of NextGen] somewhere in the range of 2025, it is absolutely imperative that we still get the controllers and pilots together and decide what type of architecture is actually going to exist in the end state.”²

The FAA’s go-it-alone strategy has come under criticism throughout the aviation industry. Last month, the FAA announced that it has committed to launching a NextGen Implementation Panel, through the RTCA Inc. (formerly the Radio Technical Commission for Aeronautics). Despite this gesture, to date we have received no indication from the FAA that the Agency has any intention of meaningfully collaborating with NATCA.

During the late 1990s and into the early part of this decade, the FAA completed more than 7,100 projects to install and integrate new facilities, systems and equipment into the NAS, as well as more than 10,000 hardware and software upgrades. During this time, NATCA had representatives on more than 70 modernization and procedure development projects³ through the Controller Liaison Program. This program allowed controllers to provide crucial insight and guidance for the development and implementation of some of the most effective technological and procedural advancements including: Advanced Technologies and Oceanic Procedures (ATOP), Display System Replacement (DSR), User Request Evaluation Tool (URET), Voice Switching Control System (VSCS), Domestic Reduced Vertical Separation Minimum (DRVSM), and Standard Terminal Automation Replacement System (STARS). Despite its success, the Liaison Program was terminated in 2005. Throughout the rest of the Bush Administration, the FAA resisted any meaningful input from NATCA—to the detriment of the NAS.

The labor-management environment that developed during the Bush administration continues to make meaningful collaboration nearly impossible. The contempt with which all levels of agency management has treated and continues to treat the air traffic controller workforce makes it clear that the Agency does not value the professionalism of NATCA’s members. It is our hope that after the imposed work rules are addressed by the Obama Administration and NATCA and the FAA reach a mutually-accepted collective bargaining agreement, we can again return to an era of cooperation and collaboration that will best serve the needs of the FAA, air traffic controllers, stakeholders, and the flying public.

²Peter Bunce, President and CEO of GAMA, testimony before House Transportation and Infrastructure Committee, Subcommittee on Aviation, March 18, 2008 hearing on “ATC Modernization and NextGen: Near Term Achievable Goals.”

³National Air Traffic Controllers Association, *2002 Air Traffic Modernization Tools*.

Status of Near-Term NextGen Collaboration Efforts: ERAM

One of the earliest NextGen projects to be deployed will be the switch from the Host computer system, which currently serves as the technological backbone of en route air traffic control, to En Route Automation Modernization (ERAM). Host, which was originally deployed in the 1980s, is the mainframe computer processor which provides data to display terminals at en route air traffic control positions. It is expected to become unsustainable within the next 2 years, as the availability of new technology has made replacement parts for older computers harder to find. It is also incapable of handling the satellite-based ADS-B system around which NextGen has been developed. In contrast, ERAM is designed to process data from both radar and satellite sources. Rather than rely on a single processor, ERAM will be a network of computers in which the old Host display terminals will be replaced by individual PC processors. Once it is properly implemented, this distributive processing will allow the system to handle a significantly larger volume of data and provide a more seamless backup system than the one currently in place.

While NATCA supports ERAM as a good concept and necessary for the future of air traffic control, confidence is low in the product in its current state. ERAM testing has yielded more than 40,000 problem reports (PRs), over 100 of which are considered to be Initial Operating Capability (IOC) critical, meaning they must be resolved prior to deploying the system for use with live traffic. As of less than 2 months ago, officials on the ERAM team disclosed that ERAM had yet to remain stable and functional for a full twenty-four hours of continuous operational testing. Additionally, air traffic controllers have come across significant problems with the human interface of ERAM, as they found the new formats cumbersome, confusing, and difficult to navigate. NATCA is very concerned about the risk to the NAS if ERAM is implemented before these problems are comprehensively addressed. Short-term, piecemeal fixes or work-arounds are unacceptable. ERAM must be deployed only when the technology is stable and fully functional because failure of ERAM, particularly during peak traffic hours, would create extreme confusion and put the safety of the flying public at risk.

This February, the FAA has approached NATCA with what we hoped would be a genuine invitation seeking our collaboration in the implementation phase of ERAM. We embraced the opportunity to substantively contribute to finding solutions cooperatively with the FAA. Unfortunately, despite the Agency's repeated promises to work with NATCA in a more collaborative manner on the ERAM issue, we are running into the same obstructionist attitude that we have become so familiar with over the last 8 years. NATCA has acted swiftly and eagerly, submitting comprehensive proposals about the terms of our collaboration within 9 days of receiving the full ERAM briefing from the Agency, and we are prepared to work with the Agency to come to an agreement. For their part the FAA has required weeks of delay to respond to our proposals, while engaging in unfair labor practices in soliciting bargaining unit members to work on the transition team. At this time, it is unclear as to whether or not the Agency is prepared to reach agreement or work with NATCA.

NATCA is disappointed with the Agency's stance on collaborating with our organization. As with all NextGen and modernization efforts, we believe that our expertise would serve the Agency and the flying public well. We remain committed to continuing the effort to reach an agreement with the Agency over the deployment of ERAM.

Status of Near-Term NextGen Collaboration Efforts: Airspace Redesign

In the 1990s, the FAA collaborated with the National Air Traffic Controllers Association (NATCA) to address the issue of airspace congestion. Working together the group identified chokepoints, analyzed weaknesses in the system, and developed a multilateral and comprehensive approach to improving the system. However, during the Bush Administration the FAA abandoned this collaborative approach and instead chose to unilaterally implement piecemeal changes to air traffic control functions and procedures. Recent events pertaining to airspace redesign for the New York, New Jersey and Philadelphia areas have also shown that the FAA still does not intend to include NATCA in this project.

Last year, the FAA implemented Phase 1 of the NY-NJ-PHL airspace redesign effort, which included new dispersal headings for Philadelphia International Airport (PHL) departures. These new procedures were implemented without input from system users including air traffic controllers. As a result, the new procedures were plagued by several serious inadequacies, including a lack of published procedures, incomplete testing, insufficient training for both controllers and pilots, and frequent miscommunication between controllers and pilots.

Now the FAA is ready to begin implementation of Phase II, which will involve the terminalization of airspace currently controlled by Boston Air Route Traffic Control Center (ARTCC) and New York ARTCC. This shift is highly complex and will require changes not only to procedures but also to technology, personnel, facilities and training. Yet it appears that the FAA has not learned its lesson from Phase I. Despite outreach attempts from NATCA, the FAA has refused to collaborate with the frontline controller work force.

History has shown us that successful modernization efforts require the input and involvement of all stakeholders, and airspace redesign is no exception. NATCA believes that without the collaboration of the air traffic controller workforce in developing and implementing the airspace redesign, the FAA's plans will be expensive, unsafe, inefficient, and unlikely to significantly improve the capacity of the New York area airspace. This is a belief not limited to air traffic controllers or unions. Jim May, President and CEO of the Air Transport Association (ATA) spoke about the importance of "controller acceptance of implementation and new procedures" at a hearing before the House Transportation and Infrastructure Subcommittee on Aviation. Of airspace redesign he said, "you've got to bring Pat [Forrey, President of NATCA] and his guys into the process . . . We can't do New York without his folks."⁴ With NATCA's help, the FAA may be able to avoid the shortcomings that were present during Phase I of airspace redesign and, by so doing, may be able to transition more smoothly to the new procedures and reduce the risk to the flying public during the transition.

NowGen: Human Infrastructure

While NATCA believes that NextGen may hold some promising plans and technology for the future of air traffic control, we are concerned that the Agency's focus on NextGen comes at the expense of the current air traffic control system, or NowGen. There are some very pressing problems facing the air traffic control system of today that can be addressed using available technology and infrastructure.

Air traffic control facilities across the Nation are severely understaffed as a result of the wave of retirements and resignations following the Agency's unilateral imposition of work and pay rules on the air traffic controller work force. Rampant fatigue in the workforce is undermining safety across the system as those controllers that remain are required to work excessive amounts of overtime, have fewer opportunities for rest on and off the shift, and are often required to do a job designed for two to four controllers when Radar Associate positions are eliminated and positions are combined. The FAA's recent hiring efforts intended to combat the staffing problem have resulted in an unsafe ratio of trainees, a training backlog, and an overreliance on developmentals, or trainees, to work live traffic.

Over 46,000 years of experience has been lost since the imposed work rules.⁵ Along with that experience, vital institutional knowledge and qualified instructors have been sacrificed over the past two and a half years. The FAA must make addressing the workforce issue its top priority; returning to the bargaining table to reach a legitimate and mutually-acceptable collective bargaining agreement would go a long way toward stabilizing today's air traffic controller workforce and setting a solid foundation for the training and development of the air traffic controller workforce of tomorrow.

NowGen: Physical Infrastructure

In addition to the deterioration of the human infrastructure, the FAA must contend with the deterioration of the physical infrastructure. According to a recent report by the Department of Transportation Inspector General, 59 percent of FAA facilities are beyond their 30-year design life, while all 23 En Route centers are over 40 years old. Several air traffic control facilities including Detroit Metropolitan Airport Tower and TRACON (DTW), O'Hare International Airport Tower (ORD), Kansas City Tower/TRACON (MCI), Miami ARTCC (ZMA), and Memphis ARTCC (ZME) have reported problems with mold contamination. At DTW inspectors have confirmed the presence of stachybotrys, a toxic form of mold believed to be a contributory factor in health problems experienced by controllers at the facility, including cases of occupational asthma as well as seven cancer diagnoses during the past 6 years.

⁴Jim May, President and CEO, Air Transport Association. Testimony before House Transportation and Infrastructure Committee, Subcommittee on Aviation. March 18, 2008 hearing on "ATC Modernization and NextGen: Near-Term Achievable Goals."

⁵Calculation assumes 25 years experience for every retiree. Twenty-five years of services is the minimum for retirement eligibility for most air traffic controllers.

The FAA has also fallen behind in the installation of vital runway incursion prevention technology. Airport Surface Detection Equipment-Model X (ASDE-X) is a developed and proven surface radar system that has been used to great effect where it has been installed. Unfortunately, the FAA has allowed this demonstrated technology to take a back seat to NextGen and is on track to miss its delivery benchmarks. While the FAA estimated that ASDE-X would be deployed at the 35 busiest airports by the end of 2010, to date they have installed only 13 of the 35 (having taken 4 years to install the first 11),⁶ and several of those that have been installed are still experiencing serious implementation glitches.

The FAA must make the maintenance and appropriate equipage of existing air traffic control facilities a priority. Air traffic controllers must be provided with safe and secure facilities and up-to-date equipment so that they can continue to maintain the safest and most efficient air traffic control system in the world.

Potential Advantages of NextGen Technology and Systems

NATCA believes that there is great potential in Automatic Dependent Surveillance—Broadcast (ADS-B). As the FAA has stated, satellite-based technology is capable of providing a more accurate depiction of aircraft location and eliminating the lag time of traditional radar scans. This degree of precision can help ensure greater safety and efficiency by allowing air traffic controllers the ability to make better-informed decisions regarding aircraft movements. If aircraft were equipped with ADS-B displays, pilots would have additional tools with which to process and understand their location and flying conditions, allowing pilots to maintain greater situational awareness, particularly during periods of poor visibility.

This capability will give controllers greater flexibility and provide predictability to the users. For example, controllers will be able to more frequently instruct pilots to proceed to the airport visually, utilizing the ADS-B in weather currently requiring instrument flight rules (IFR). A visual approach, which is granted at the discretion of air traffic controllers, requires pilots to utilize a simple “see and avoid” method of separation, allowing them to follow more closely than instrument guided approach standards permit. With current technology, controllers may only grant visual approaches during good weather and when visibility is unobstructed, as pilots must safely see the runway, ground, surrounding terrain, and other aircraft in the vicinity. With ADS-B displays, pilots would be able to artificially “see” other aircraft even during inclement weather, giving controllers greater flexibility to use these less complex and more efficient approach rules, increasing the arrival rates regardless of the weather. There would no longer be a need to reduce arrival rates during IFR weather. The users could more accurately predict scheduling, reduce delays, and increase capacity.

Concerns over NextGen

Based on the public documents that the FAA has made available on NextGen, NATCA has several outstanding concerns for both the long and short term that we believe the FAA must address comprehensively before it can begin the roll-out of any major NextGen technology or policy changes. As previously stated, we believe that these and other issues can be most effectively addressed in a collaborative environment, and we sincerely hope that NATCA can be a part of developing the solutions to the problems facing the current air traffic control system and plan for the future system. Below are the concerns NATCA believes must be addressed immediately, which will be discussed in greater depth in the sections that follow.

1. *The FAA must retain a backup system:* Redundancy is the essential element of any safety operation. The FAA’s published plans contain no viable backup should the satellite fail due to natural or criminal activity. Limited frequency availability further complicates this situation.
2. *Safe and viable plan for equipage:* The success of NextGen is dependent on the equipage of thousands of aircraft with new technology, an expensive undertaking that would be a major financial strain on airlines, general aviation and business aviation, particularly in the current economic climate. The FAA has tried to address this by instituting a new “best equipped, best served” policy for air traffic control. This policy has serious implications for safety, as it adds an untenable level of complexity to air traffic control operations. If the FAA wishes to incentivize equipage, it must do so in a way that does not compromise safety.

⁶Dillingham, Gerald, *Aviation Safety: FAA Has Increased Efforts to Address Runway Incursions*. Government Accountability Office Testimony before the Subcommittee on Aviation, Committee on Transportation and Infrastructure, House of Representatives September 25, 2008.

3. *Full consideration of human factors:* Many of the proposed changes to the air traffic control system place significant demands on the people who make the system work. The usability of the technology and the accompanying procedures must be a priority.

4. *Research before rulemaking:* Many of the plans and promises made in the FAA's NextGen documents are based on assumptions about technology that has yet to be developed. While the ideas are a good basis for research and development projects, it is misleading for the FAA to describe its plans for operations as if the required technology were already available.

Redundancy: The Need for a Viable Backup System

While we believe ADS-B has tremendous potential and is capable of providing precise, accurate, and instantaneous information on aircraft positions to air traffic controllers, it is particularly vulnerable due to its single-site source. ADS-B is satellite-based technology, with information broadcasting from a single source satellite orbiting the earth. While this allows it to be more precise than the current ground-based radar, the singularity of its source makes it vulnerable to natural disasters and criminal or terrorist acts. If the satellite were to cease functioning for any reason, the entire U.S. air traffic control system would be crippled.

The current ground-based radar system gathers its information from numerous radar sights located throughout the country. If one radar sight were to fail, another site could act as a back up. For example, if a terminal radar site were to fail, Center Radar, or CENRAP, from the nearest en route radar site would be able to provide the relevant data. In most cases when this occurs, FAA separation requirements are increased from three miles to five miles, but safety is maintained and service is uninterrupted.

Until redundancy can be incorporated into the new technology, the easiest option for creating the system redundancy necessary to maintain the safety of the NAS is to maintain the existing ground radar coverage as a backup for the ADS-B system. However, due to financial considerations, the Agency wants to decommission many of the current radar sites, which would result in an incomplete backup system with gaps in coverage.

Further complicating this is the issue of frequency congestion. ADS-B transmits its information in the same frequency spectrum as the current radar systems, TCAS, ASDE-X, and other critical aviation safety technology. There are simply not enough frequencies available to transmit all of the necessary information. According to a briefing before the Aviation Rulemaking Committee (ARC) on February 24, 2009, the FAA would have to decommission all existing radar sites and reduce TCAS surveillance to 60 percent in order to safely utilize ADS-B⁷ in future NextGen applications. This further limitation of the available redundancy makes the NAS more vulnerable to failure and puts the safety of the flying public at risk.

Before ADS-B is implemented, the FAA must develop a safe and viable means of providing a backup system. Redundancy and workable backup systems are vital to the safety of the NAS, and must not be discounted in the fervor to introduce new technology.

Near-term Redundancy Concerns: FAA Realignment Initiatives

In the near term, we have similar concerns regarding the loss of redundancy due to facility and service realignment initiatives. By proceeding recklessly with de-consolidation initiatives, the FAA has delivered a serious blow to redundancy in knowledge and training. In combined tower/Terminal Radar Approach Control (TRACON) facilities each air traffic controller is trained on all aspects of arrivals and departures. With this overlapping knowledge, controllers are able to more safely and efficiently coordinate with one another and control aircraft. The redundancy in training also gives managers more flexibility in staffing. This redundancy is being removed through the FAA's realignment initiatives, diminishing the safety and efficiency of air traffic control operations and making facilities more vulnerable to the effects of the staffing crisis.

The FAA is also moving forward on a number of consolidation initiatives, in which the FAA would first split tower/TRACON functions in current combined facilities and then consolidate the radar functions into a larger facility. In these instances, not only is training and knowledge redundancy sacrificed, but security also becomes a serious concern. As with the single ADS-B site, consolidating air traffic control facilities and eliminating radar capabilities at many airports leaves regions vulnerable to attack, natural disaster or technological malfunction. If a consolidated facil-

⁷ Capezuto, Vincent, *Surveillance and Broadcast Services: Aviation Rulemaking Committee Briefing*, Federal Aviation Administration, February 24, 2009.

ity were to fail, not only would a single airport be out of service, but the entire region would be shut down to air travel as well.

The House Transportation and Infrastructure Committee recently introduced the H.R. 915, the FAA Reauthorization Act of 2009, which created a process for evaluating realignment decisions and involving all stakeholders in the planning process. NATCA believes that this is the correct approach and urges this Committee to include similar language in their companion legislation. Working together, stakeholders can help mitigate the redundancy loss and ensure that realignment initiatives are undertaken only when they present an operational benefit to users, improve safety, efficiency and capacity, while also saving taxpayer money.

Equipage: A Major Hurdle in Tough Economic Times

In order to utilize the technology and procedures that create the foundation of NextGen, aircraft must be equipped with new technology. For general and business aviation, the process of equipage may be cost-prohibitive. Encouraging voluntary compliance for these fliers may prove to be a fruitless effort, and mandatory equipage may cripple the general aviation industry beyond repair. One NATCA member and private pilot echoed the sentiments of many when he said, "I'll stop flying before I spend \$35,000 on new equipment for my \$50,000 plane." Particularly during these difficult economic times, when private pilots are struggling to pay for regular maintenance and fuel costs, the added expense will be cost prohibitive to most.

For the commercial airline industry, moving forward with NextGen means undergoing the expensive process of retrofitting a fleet of aircraft, a major challenge for airlines struggling to continue operations despite the economic downturn. Early equipage difficulties may be exacerbated by the FAA's history of changing technological requirements and delaying or abandoning modernization efforts. American Airlines, for example, retrofitted its fleet to install the Controller Pilot Data Link Communication system (CPDLC) only to see the FAA abandoned its efforts in 2004, leaving the airline to foot the bill for technology it would never use.

Airlines may be reluctant to equip their fleets until they can see a clear operational or economic benefit and until the FAA has demonstrated a firm commitment to a particular set of equipage standards. NextGen will be delayed until the FAA is able to effectively address the legitimate concern of airlines and aircraft owners and convince them that the technology is a good investment.

"Best Equipped, Best Served": Implications on Human Factors

In an attempt to create artificial economic incentives for early equipage, the FAA has announced that it will implement a policy that would "provide 'best-equipped, best-served' priority in the NAS to early adopters." This has serious implications for safe and efficient operations and for the workload and complexity for air traffic controllers.

Currently, air traffic controllers provide service on a first-come, first-serve basis. Air traffic controllers instruct aircraft to merge onto airways or disburse to their destinations in the order which comes most naturally, the order in which they arrive. Giving priority to particular aircraft would require complex maneuvering on the part of air traffic controllers, who would have to vector aircraft around one another in order to give preferential treatment. This is an unnecessary level of complexity introduced into the already complex air traffic control environment. As with any additional complexity, it brings with it an increased risk in terms of both safety and delays.

Air traffic controllers are also taught to maximize the efficiency of the NAS to the maximum extent practicable without sacrificing safety. This often means granting requests from pilots to proceed directly to particular navigation points of reference, VORs, rather than continuing along the prescribed route. Currently, this is done whenever air traffic and weather conditions permit. As there is no way to increase the use of these on-the-fly improvements to efficiency, the only way to provide incentives is to instruct controllers to avoid giving direct routes to aircraft without the new equipment. This means decreasing the overall efficiency of the NAS, and increasing flight delays for unequipped aircraft.

Lastly, differential treatment from air traffic control based on level of equipage requires the controller to know the level of equipage. This would mean an additional piece of information in an already-cluttered data-block. According to a Civil Aerospace Medical Institute (CAMI) study, the quantity of information in the display has a direct relationship to the time it takes for a controller to scan that display. Similarly, when a display is cluttered with information, it takes additional time to scan

and parse out the relevant data.⁸ Therefore, adding this additional information to the data blocks will increase the complexity of air traffic control even before one accounts for the preferential maneuvering.

Human Factors Considerations for “Trajectory Management”

The FAA’s NextGen plans include increased automation and eventual self-separation of aircraft, resulting in a shift in the “traditional responsibilities and practices of pilots/controllers.” Under the proposed system, air traffic control would shift to what the FAA is euphemistically referring to as “Trajectory Management.” Essentially, air traffic controllers would discontinue active air traffic control and shift instead to air traffic monitoring and route management. This could have serious implications for the safety of the NAS.

Studies have shown that “when acting as a monitor of an automated system, people are frequently slow in detecting that a problem has occurred that necessitates their intervention. Once detected, additional time is also needed to determine the state of the system and sufficiently understand what is happening in order to be able to act in an appropriate manner. The extra time associated with performing these steps can be critical, prohibiting performance of the very activity the human is present to handle.”⁹ Safe air traffic control depends on the ability to quickly assess situations and make split second decisions.

Training and experience would also be a serious issue in this scenario. After this changeover of duties is completed, it won’t be long before the system is staffed entirely by individuals with no active air traffic control experience or on the job training. Even those who might remain in the profession and remember active air traffic control would quickly fall out of practice. Currently, controllers and managers who are working off the floor are required to work positions for 16 hours to maintain currency. Maintaining this level of currency would be impossible should automated separation become the standard. This too, would make it difficult for air traffic monitors to safely perform air traffic control functions should automated separation fail.

Research Before Rulemaking

At this stage of NextGen’s progress, it is difficult to talk about near-term benefits of the system. Although this Committee is justified in looking for short-term improvements to help alleviate delays and improve capacity of the NAS, NextGen may not be the best place to look. Right now, NextGen is little more than a very ambitious research and development project. While the technology being developed may eventually produce great benefit to the system, it is misleading for the FAA to speak of plans as if the technology already existed.

For example, on January 29 of this year, the FAA published a PowerPoint presentation entitled “Delivering NextGen: Trajectory Based Operations.” This document included statements such as “ANSP uses scheduling tools and trajectory based operations to assure a smooth flow of traffic and increase the efficient use of airspace,”¹⁰ implying the availability of 4-D scheduling tools (three traditional directions plus time) that are, in fact, still in the early stages of developments. It is still unknown when these scheduling tools will be fully developed or even how they will function, yet the FAA continues to publish descriptions of how flight paths will be changed and how the new procedures will look.

To create and outline the procedures at this early stage of the development process is both disingenuous and irresponsible. The FAA is misleading its stakeholders into thinking the process is already further along than it actually is. It is also spending time, money and manpower developing procedures and plans when it is unknown precisely how the necessary tools will function. This means that FAA is either developing broad and non-specific procedures, which are largely useless except as a public relations tool, or they are developing specific procedures which will likely need to be rebuilt once the technology is available.

Conclusion

In NextGen, the FAA has undertaken a large-scale and long-term research and development project to overhaul the technological infrastructure of the air traffic control system. This ambitious undertaking has serious implications for the future of the National Airspace System and should therefore include the meaningful participation of all NAS stakeholders.

⁸Xing, Jing, *Information Complexity in Air Traffic Control Displays*, Civil Aerospace Medical Institute, Federal Aviation Administration, September 2007.

⁹Parasuraman, R. and Mustapha Mouloua, *Automation and Human Performance: Theory and Applications*. Lawrence Erlbaum Associates, 1996.

¹⁰Federal Aviation Administration, *Delivering NextGen: Trajectory Based Operations*, January 29, 2009, pg 4.

NATCA supports the FAA's modernization efforts and is eager to be a part of the team developing and planning the technology that will bring us into the next generation of air traffic control. We look forward to working with the FAA to help them address the serious outstanding issues including human factors, equipment and redundancy concerns. It is essential for us to be included as partners in this ongoing modernization effort.

Senator DORGAN. Mr. Wright, thank you very much.

Finally, we will hear from Mr. Kallenbach, the Vice President of Marketing at Honeywell Aerospace. And he had been recommended to us, as well, from the general aviation community for his testimony. So, we welcome you here.

**STATEMENT OF T. K. KALLENBACH, VICE PRESIDENT
MARKETING AND PRODUCT MANAGEMENT
HONEYWELL AEROSPACE**

Mr. KALLENBACH. Chairman Dorgan, Ranking Member DeMint, Chairman Rockefeller, Members of the Subcommittee, good morning. Thank you for the opportunity to comment on and discuss the future of air traffic management.

I think we can all agree, our Nation's air traffic control system is incapable of meeting the growing demands for air transportation, and it is in need of true transformation. In fact, as the fifth member of this panel, I think we all agree, we do need to transform it.

Further, we should be able to agree, government and industry, working together, have demonstrated advanced operational capabilities that could reduce today's congestion, improve safety, and expand capacity ahead of growing demand. Working together with this committee, we know we can transform our air traffic system, yet as a nation we have been unable to broadly implement these capabilities and systematically reduce congestion. And in our minds, waiting until 2025 is simply unacceptable.

The next-generation air transportation system, or NextGen, must be a national priority with the necessary leadership, commitment, and resources to act and make it a reality.

We know civil aviation is a key economic driver in our country. This strong economic impact is a result of America's historical leadership in aviation, leadership since the advent of flight. NextGen provides us with another opportunity to continue our leadership by implementing technologies, standards, and procedures that can transform the world's air traffic system.

We are positioned to be a global leader in air traffic modernization, but if we do not act, we will relinquish that position. Leadership requires action, implementation requires action, global harmonization requires action.

In the 2003 FAA Reauthorization Bill, Congress created the Joint Planning and Development Office to establish a vision and the initial plan for NextGen. It is now time to implement that vision. And for this, we need to transform the organizational approach.

Because of NextGen's complexity and scope, it is critical to centralize the overall planning and execution responsibility. We need a single NextGen implementation office, with strong leadership, direct accountability for the successful deployment of NextGen. And this central office must be measured with metrics that reflect our system performance, not measure the implementation activity.

For example, rather than measuring the number of new runways, we should measure the operations per day on the existing runways. Rather than measuring on-time arrivals, which are typically enhanced by block-time expansion, we should measure gate-to-gate times. Rather than measuring RNP procedures published by the FAA, we should measure the number of operations and the savings created by flying those procedures.

Equally important, this central office must have visibility to accomplish its mission, including coordination with NextGen contributions from partner agencies, industry, and global harmonization.

At the same time this office is being mobilized, we need to accelerate the deployment of capabilities that are fully available today and that we know will be an important part of the evolving NextGen system. These capabilities include Automatic Dependent Surveillance Broadcast, or ADS-B, Required Navigation Performance, or RNP, Continuous Descent Arrivals, or CDA, and Ground-Based GPS Augmentation Systems, or GBAS.

And just to touch on a couple of examples of how these are being applied today, over a 12-month period Qantas flew more than 8,000 RNP procedures into Brisbane, Australia, saving a total of 42,000 flight minutes—excuse me—4,200 flight minutes, 65,000 gallons of fuel, and 685 tons of CO₂ emissions. SAS airlines has flown more than 1,300 continuous descent arrivals to Arlanda, Sweden, with a total savings of 78,000 gallons of fuel and 830 tons of CO₂ emissions. In our written submission, we've included a number of other examples of real savings.

NextGen can fuel America's economic growth, lower energy use, and protect our environment. It also affords us an opportunity to be a leader in the development of the global aviation infrastructure.

We cannot wait until 2025 for results. Improvements are needed today, and solutions are on the shelf, waiting to be deployed.

Mr. Chairman, I'd like to conclude by offering four specific recommendations for consideration:

First, in 2009 establish and fund a centralized NextGen implementation office, fully accountable for implementation.

Two, accelerate ADS-B OUT forward to 2015 from its current 2020, and provide funding that satisfies the cost-benefit analysis.

Three, install GBAS technology in the top 20 most congested airports by 2011, and the top 50 most congested airports by 2013.

And fourth, and final, set and measure RNP adoption rates, beginning in 2009, with a 20-percent year-over-year increase until 90 percent of commercial flights are using RNP procedures.

Our shared vision for NextGen is clear. There is broad industry and government agreement on the technologies and the path forward. The aviation industry looks to the Congress and the FAA for the focused leadership and action to implement NextGen.

Thank you, and I'll be happy to answer any questions.

[The prepared statement of Mr. Kallenbach follows:]

PREPARED STATEMENT OF T. K. KALLENBACH, VICE PRESIDENT, MARKETING AND
PRODUCT MANAGEMENT, HONEYWELL AEROSPACE

NextGen Must Be a National Priority

We know that our Nation's air traffic control system is incapable of meeting the growing demand for air transportation and is in need of a true transformation. Incremental change in today's world of satellites and computer power is simply unacceptable. Government and industry stakeholders have developed and demonstrated new operational capabilities, enabled by new technologies, that could keep airport and airspace capacity ahead of demand. Yet, as a nation, we have been unable to implement these changes fast enough to eliminate system inefficiencies and the resulting congestion and delays. None of us can sit on our hands and wait for someone to provide "the answers," as it is incumbent on all of us to work together to transform our aviation system. Whatever the obstacle—process, laws, regulations, funding—each must be attacked immediately. This Subcommittee will confront this issue head on as you craft the next FAA authorization bill—and we urge you to develop proposals that will truly drive the kind of ATC system that we know can be built and installed today. Waiting until 2025, as some plans call for, is simply not acceptable to everyone who flies, and every person connected with the aviation industry.

The benefits of change are clear—in terms of economic and environmental benefits and the impact on travelers. It is time that we make the implementation of the Next Generation Air Transportation System (NextGen) a national priority and provide the necessary leadership, commitment, and resources to make it a reality.

Specifically, we recommend:

- Establishing clear and strong leadership, including a fully responsible and accountable NextGen Implementation Office.
- Accelerating the wide-scale deployment of available capabilities including Automatic Dependent Surveillance—Broadcast (ADS-B), Required Navigation Performance (RNP), Continuous Descent Arrivals (CDA), and the Ground-Based Augmentation System (GBAS).

NextGen is a Key Element of the U.S. Transportation Infrastructure

There has been a great deal of discussion recently on the urgent need to revitalize our Nation's infrastructure. Much of that attention has been focused on our roads and bridges, rail networks, and telecommunications—critical components, to be sure. Aviation's contribution to our infrastructure is just as important, however, and air traffic management is a foundational element of that infrastructure.

Airports are the most visible component of the aviation infrastructure. Revitalization of airports via new or upgraded terminal buildings, taxiways, and runways provides tangible evidence of congestion relief. The rest of the infrastructure—the "highways in the sky", with the "on-ramps" and "off-ramps" that connect our Nation's airports—is less easily visualized and yet key to the efficient operation of the air transportation system. Adding "lanes" to these "highways" and more efficient "on-ramps" and "off-ramps" doesn't involve pouring concrete, but rather requires implementing advanced, yet existing, technologies, including: space-based navigation, digital communications, automation and advanced displays supporting air traffic controller and pilot decision-making. This virtual infrastructure, implemented via software and electronics instead of concrete and steel, demands equal attention as a national priority.

NextGen is a Strong Engine for the U.S. Economy

Aviation's impact on the U.S. economy cannot be understated. The FAA estimates that civil aviation contributes 11 million jobs and \$1.2 trillion in economic activity, amounting to 5.6 percent of the U.S. Gross Domestic Product (GDP).¹ On the other hand, the Congressional Joint Economic Committee calculates that the cost of air traffic delays to the U.S. economy in 2007 was \$41 billion.² To put this in perspective, rough estimates of the total cost of implementing the NextGen system have been on the order of \$50 billion—a little more than 1 year's cost of the delays NextGen can and should eliminate.

Aviation is also a strong contributor to the U.S. balance of trade. In 2007, aerospace contributed \$61 billion in net exports,³ the top industry performer. This

¹ The Economic Impact of Civil Aviation on the Economy, FAA, October 2008.

² Your Flight Has Been Delayed Again—Flight Delays Cost Passengers, Airlines, and the U.S. Economy Billions, Joint Economic Committee Majority Staff, Chairman—Senator Charles E. Schumer, Vice Chairman—Representative Carolyn B. Maloney, May 2008.

³ The Economic Impact of Civil Aviation on the Economy, FAA, October 2008.

strong economic driver is a result of America's historical leadership in aviation—leadership that has existed since the advent of flight. NextGen provides us with an opportunity to maintain that leadership by developing, demonstrating, and implementing the technologies, standards, and procedures that will transform the world's air traffic systems. Alternatively, if we choose to not act aggressively, we stand to be eclipsed as other regions, including Europe, Australia, and China, move to deploy new systems to meet their growing air transportation needs. We are positioned to be a global leader in air traffic management modernization, but if we do not act, we will relinquish that position.

NextGen Will Have a Positive Environmental Impact

Our aging air traffic system also has a significant impact on energy use and the environment. The aviation industry continues to make great strides in improving the efficiency of aircraft operations. Over the past 30 years, airlines have more than doubled their average fuel economy.⁴ The industry continues to invest in more efficient airframes, engines, and systems, with a laser focus on reducing operating costs and achieving carbon-neutral industry growth.

At the same time, the air traffic system in which we are required to operate creates inefficiencies that are estimated to be between 10 and 15 percent. For the airlines alone, this inefficiency resulted in more than 10 million metric tons of carbon dioxide emitted unnecessarily in 2008. This is equivalent to the annual emissions from the electrical use of more than 1.2 million U.S. households. This does not have to be the case; these emissions are preventable.

Technologies and Procedures can be Deployed to Save Fuel and Reduce Emissions

Required Navigation Performance, Continuous Descent Arrivals, and Ground-Based Augmentation Systems are three technologies that have been shown to provide significant environmental benefits. Operational use of these capabilities should be accelerated.

Required Navigation Performance and Continuous Descent Arrivals are Key Technologies

Performance-based navigation using Required Navigation Performance (RNP) and Area Navigation (RNAV) relies on Global Positioning System (GPS) and inertial navigation technology to allow aircraft to fly accurate paths independent of classical ground-based navigation infrastructure. This enables flight paths between cities that are more direct, with fewer miles flown, and approach and departure procedures that are shorter and involve little, if any, intervention from air traffic controllers. The result is significant decreases in distance and time flown.

Practical, "real world" demonstrations of RNP's effectiveness abound:

- Australia's Qantas Airlines, for example, has its fleet of Boeing 737s flying more than 100 RNP procedures each day. These procedures in Brisbane alone cut approximately 15 miles and more than 1,600 pounds of CO₂ emissions on every approach.
- Southwest Airlines recently operated a Boeing 737 demonstration roundtrip between Dallas Love Field and Houston Hobby using RNP procedures, yielding 904 lb. of carbon dioxide savings, part of its \$175 million program to implement RNP fleet-wide.
- Since 2005, Alaska Airlines, an early RNP pioneer, has documented 5,300 flights that avoided diversions by using RNP procedures. In 2008, these "saves" resulted in cost savings of \$8 million.

Another procedural improvement that relies on the use of RNP is Continuous Descent Arrivals (CDA). These procedures couple the lateral accuracy provided by RNP with the vertical accuracy provided by the aircraft's Flight Management System (FMS) and flight controls. The flight path is coordinated with air traffic control via data link communications. The resulting descent is flown from cruise altitude to final approach with few, if any, level segments and the engines operating continuously at or near idle power.

- UPS uses these procedures at Louisville, with reported savings of between 250 and 465 pounds of fuel (37–69 gallons, 780–1456 pounds of CO₂) per arrival.

⁴Measured in Revenue Passenger Miles per Gallon of Fuel—Air Transport Association, <http://www.airlines.org/economics/energy/fuel+efficiency.htm>.

- SAS Airlines have flown more than 1300 Continuous Descent Arrivals to Arlanda, Sweden, with average fuel savings of 410 pounds of fuel (60 gallons, 1279 pounds CO₂) per arrival.

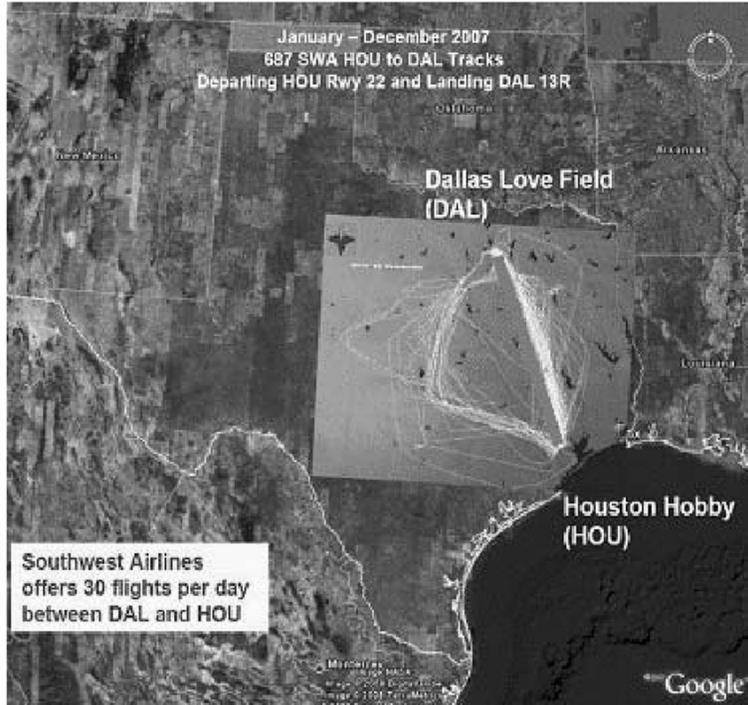


Figure 1—Southwest Airlines operations between Dallas and Houston (Yellow—Non-RNP ground tracks; Red—RNP direct route)

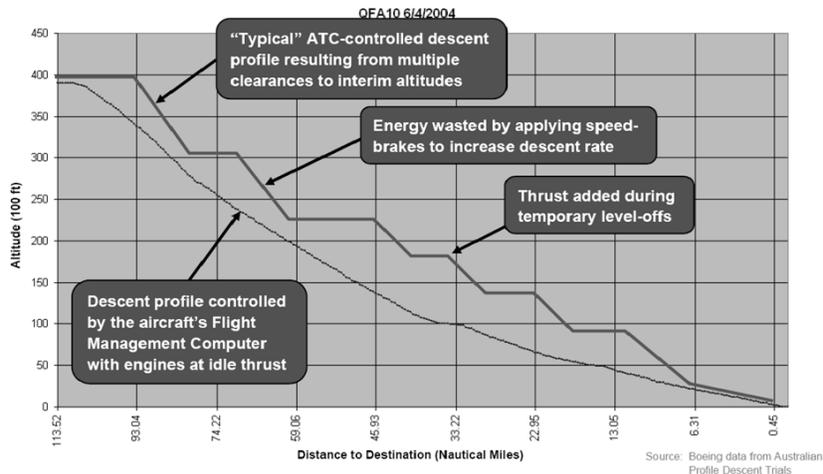


Figure 2—CDA versus a classical ATC “step down” descent profile
 Combining the benefits of RNP and CDA over the entire flight magnifies the benefits. This has been demonstrated in trials on both trans-Atlantic and trans-Pacific

routes. In the Pacific, the Asia and South Pacific Initiative to Reduce Emissions (ASPIRE) has sponsored several flights between Australia/New Zealand and the U.S. An Air New Zealand Boeing 777 flying from Auckland to San Francisco shaved 5 minutes off the flight and saved 1200 gallons of fuel, producing 11.5 metric tons less CO₂.

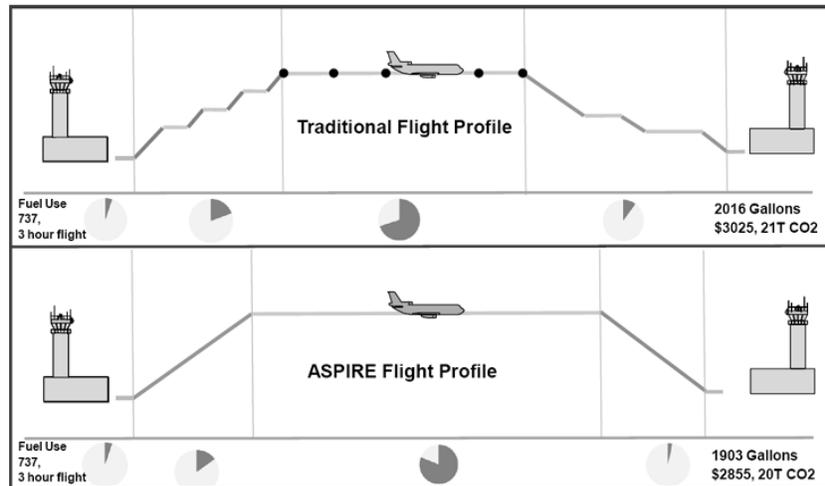


Figure 3—ASPIRE Versus a Traditional Flight Profile

Ground-Based Augmentation System Reduces Costly Diversions

The GPS Ground-Based Augmentation System (GBAS) is the next-generation precision landing system technology, a 21st century alternative to the 1950s-era Instrument Landing System (ILS) currently in operation. GBAS technology utilizes a ground system installed at an airport to identify and correct small errors in GPS satellite signals and transmits this information to arriving and departing aircraft. This high-integrity, extremely precise positioning data is coupled with GBAS-provided approach paths and aircraft avionics to guide the aircraft to the runway in low visibility conditions.

Due to limitations with current ILS equipment, airports routinely lose capacity as visibility decreases. Fifteen of our top U.S. airports experience greater than 25 percent reduced capacity when ceilings are below 200 feet.⁵ In these situations, aircraft are often forced to wait in holding patterns—burning extra fuel or even worse, diverted to alternate airports. GBAS technology provides precision approach capability to all runway ends, maximizing airport capacity in all visibility conditions and minimizing delays and diversions—ultimately saving fuel and reducing emissions—while also contributing to a safer operating environment.

⁵ Airport Capacity Benchmark Report 2004, FAA.

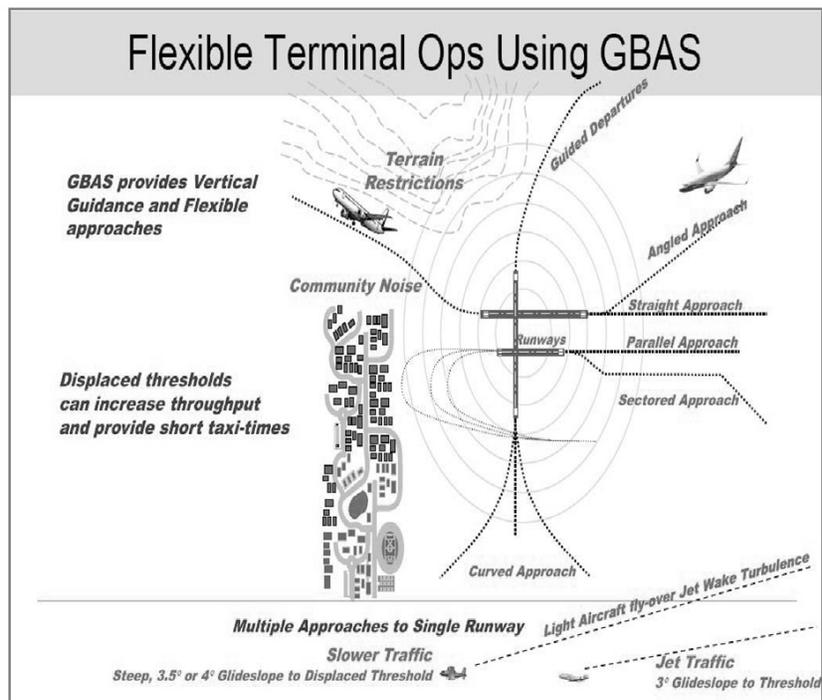


Figure 4—GBAS provides many benefits in the airport terminal area

The Need to Establish a NextGen Implementation Office

In the last FAA reauthorization bill, Vision 100—Century of Aviation Reauthorization Act of 2003, Congress created the Joint Planning and Development Office (JPDO) to coordinate across government and industry stakeholders, establish a NextGen vision and operational concept, and develop an integrated plan for its deployment. JPDO has since successfully achieved these objectives.

It is now time to implement NextGen. And for this, we need to rethink the organizational approach.

NextGen is a multifaceted system requiring the functional integration of many different subprograms and developments, which will require significant investment over many years. For a project of this complexity and scope, it is critical that overall planning and execution responsibility be centralized. The current structure, which spreads the decision-making for program requirements, timing and investment priorities across numerous organizations, has resulted in inefficiencies, confusion, and delays that we simply can no longer afford.

We need a single NextGen Implementation Office with strong leadership, directly responsible and accountable for the successful deployment of the NextGen Air Transportation System. This Office must:

- turn the JPDO's Integrated Plan into a detailed Implementation Plan;
- establish the year-over-year investment required;
- be provided with the resources necessary to get the job done;
- directly manage the FAA's NextGen programs;
- identify clear and agreed-to metrics that track performance to NextGen goals, and
- be held accountable for achieving results.

It is especially important to ensure the primary metrics used to measure NextGen results reflect air transportation system performance and not implementation activity. For example:

- Rather than measuring the number of new runways built, we should be measuring the operations per hour on our existing runways.
- Rather than measuring the on-time arrival rate associated with continually increasing “block times”, we should be measuring the average gate-to-gate times and fuel burned between key city pairs.
- Rather than measuring the numbers of procedures (*e.g.*, RNP, LPV) published by FAA, we should be measuring the number of operations using these advanced procedures and the average distance flown and fuel burned in key terminal areas.

As with the JPDO, it is expected that this office will reside within FAA. However, it must have sufficient visibility to accomplish its critical mission, including coordination of the important NextGen contributions from partner agencies and industry and the alignment of NextGen development and deployment with the international community.

Accelerate Deployment of Off-the-Shelf Capabilities to Improve Near-Term Performance

At the same time that this office is being set up, we need to accelerate the deployment of capabilities that are fully available today and that we know will be an important part of the evolving NextGen system. These capabilities include Automatic Dependent Surveillance—Broadcast (ADS-B), Required Navigation Performance (RNP), Continuous Descent Arrivals (CDA), and the Ground-Based Augmentation System (GBAS).

Automatic Dependent Surveillance—Broadcast (ADS-B) is the next-generation surveillance technology that will augment and decrease dependence on our aging and costly radar infrastructure. ADS-B uses GPS-based aircraft position information, broadcast from aircraft via data link to a ground network and other aircraft for use by controllers and other pilots. The first step in ADS-B deployment is getting the information from the aircraft to the ground—commonly referred to as “ADS-B OUT”. Australia is using ADS-B for routine surveillance across much of their airspace today. Over 60 percent of the international flights operating to and from Australia are already equipped with the ADS-B OUT capability and are benefiting from ADS-B surveillance services in airspace covering over 50 percent of the Australian continent. Australia’s civil aviation regulator has also issued a rule requiring ADS-B capability for all aircraft operating above 29,000 feet by 2013. Similarly, Europe has published a proposed rule for all aircraft to have ADS-B OUT capability by 2015. In addition, Canada is actively deploying ADS-B today to control aircraft operating over Hudson Bay.

The FAA is well on its way to deploying the nationwide infrastructure needed to receive the ADS-B information and integrate it with controller displays. A ground network and associated service is expected to be fully deployed by 2013.

ADS-B avionics are well-defined by industry standards and available for most aircraft today. However, there is very little incentive for aircraft operators to equip their fleets now since the primary benefit of ADS-B OUT is to the FAA in the form of reduced costs from decommissioning a large number of the secondary surveillance radars. Unfortunately, the FAA’s proposed rule for airborne equipage will not be fully effective until 2020, deferring FAA’s cost savings.

Rather than wait until 2020 for FAA savings to kick in, the requirement for ADS-B OUT capability in the U.S. should be accelerated to at least align with Europe’s 2015 requirement. Additionally, to ensure that overall cost-benefit can be established, the FAA should be provided with the funding needed to equip the necessary aircraft with ADS-B OUT capability. This would greatly accelerate the benefits to the FAA, while jumpstarting a key NextGen enabler. With a fully-deployed ADS-B OUT capability, the business case for user investments in the second step, “ADS-B IN” will be stronger and far easier to make. This capability is the key to capacity and safety improvements needed in the future.

Another technology that is ready for implementation now is *Required Navigation Performance (RNP)*. As discussed earlier, RNP provides the ability to fly precise and repeatable paths, enabling shorter and more effective arrival and departure procedures. For example, during a 12-month period, more than 8,000 RNP approaches at Brisbane saved 34 Qantas 737–800s a total of 4,200 minutes of flying, 65,000 gallons of fuel and 621 metric tons of CO₂ emissions. Average delays at the airport were reduced by 30 seconds for all arriving aircraft, which benefit from the fact that the RNP 737–800s are shaving between 10 and 23 nautical miles off their approach path to the runway, compared with an existing visual approach.⁶ Effective fuel-sav-

⁶*Aviation Week and Space Technology*, April 28, 2008, page 56.

ing procedures are essential to motivate aircraft operators to invest in these upgrades.

To be clear, RNP technology exists and is being used *today*. In Australia, there have been in excess of 31,000 RNP approaches and departures flown to-date.⁷ We simply need to accelerate the development of RNP procedures. While the FAA has been developing RNP procedures for several years, they remain the exception rather than the norm. One mechanism for acceleration is to enlist the support of third-party procedure developers. There are already several qualified sources for this service and they could be effectively employed to augment the existing FAA resources.

Continuous Descent Arrival (CDA) is another capability that can be exploited more rapidly. Many aircraft are already equipped with the basic systems needed to execute CDA procedures. With the significant cost savings resulting from CDAs, other operators will be strongly motivated to invest in upgrades if they could routinely use these procedures. As described earlier, numerous trials, including SAS (Sweden), UPS (Louisville, KY) and ASPIRE (Pacific Rim to Los Angeles/San Francisco), have demonstrated the procedure's benefits. Routine use of CDAs will require some modification to airspace structures, as well as providing tools and training to air traffic controllers. The solution is well-understood; the issue at hand is dedicating the resources needed to put this capability to use in routine operations at more airports across the U.S.

One final technology that should be accelerated is *Ground-Based Augmentation Systems (GBAS)*. FAA approval for the initial version of the GBAS ground station is anticipated by May of this year. Ground stations are already deployed in Sydney, Australia; Bremen, Germany; Malaga, Spain; Guam; Seattle and Moses Lake, Washington; and Memphis, Tennessee. Newark, New Jersey and Minneapolis, Minnesota are planning ground station deployments in 2009. Boeing 737s and Airbus A380s are already coming off the production line with the necessary avionics to support GBAS. Boeing's 787 and 747-8 will be equipped for GBAS as well, and plans are in place for upgrades to most production Boeing and Airbus aircraft.

The FAA has been very supportive of this technology, and it is now time to accelerate the installation of GBAS systems at our Nation's largest airports. As with other NextGen technologies, a clear business case for aircraft upgrades cannot be made without the availability of, or at least a strong commitment to, the installation of GBAS ground stations and supporting operational procedures.

Airspace Restructuring Around Airports is Essential

Finally, it is important to keep in mind that none of these NextGen capabilities can be successfully deployed, nor the benefits fully achieved, without restructuring the routes aircraft fly as they arrive and depart from our Nation's airports. Using RNP, CDA, and GBAS, these new routes are often more community-friendly, creating less noise and emissions. For example, Figure 5 shows the flight paths for RNP (green) and Non-RNP (red) aircraft approaching Brisbane runway 01 via the "River" noise abatement procedure.

⁷Airservices Australia.

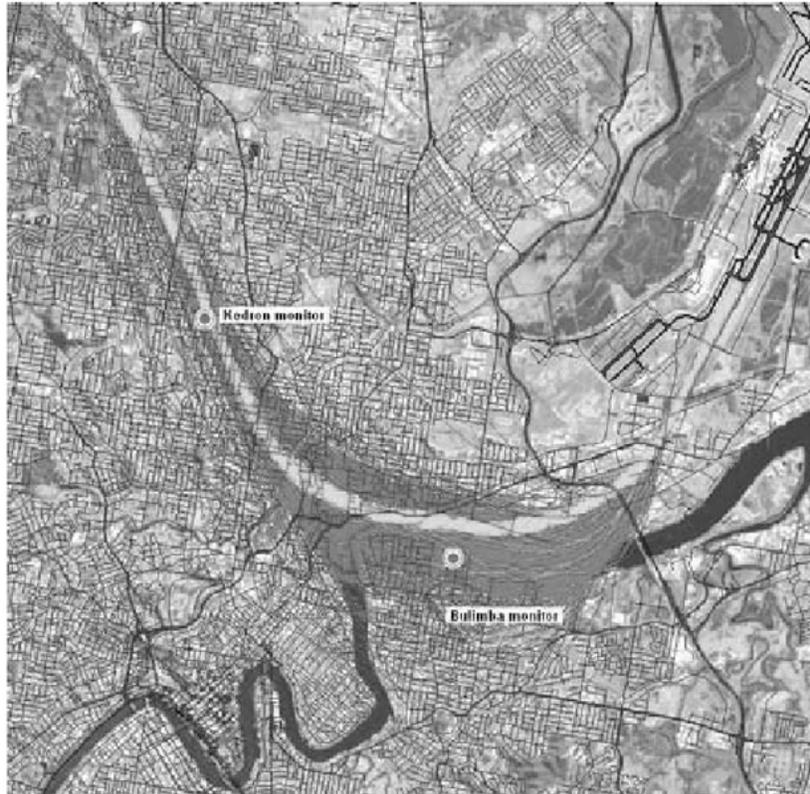


Figure 5—Example of the RNP “River” approach to Brisbane runway 01—03/08

The RNP approach allows tracking at lower altitudes over non-residential areas such as, in this case, the Brisbane River and industrial areas. With RNP (green), the precision to stick to the river and not “creep” over neighboring residential areas is quite clear.

While it is understandable that local communities have strong interests in where these virtual “off-ramps” and “on-ramps” are located, it also needs to be clearly understood that these changes are needed to achieve the broader community benefits of overall reduced noise and emissions. An example of this dynamic is the on-going effort to reduce congestion in the New York terminal airspace. Four of our Nation’s most delay-prone airports are located within this airspace and effects from these delays routinely ripple throughout the U.S. Efforts to provide congestion relief via airspace redesign to take advantage of new capabilities and procedures has been in work for over a decade, delayed in part by opposition from local community groups. The support and leadership of Congress is absolutely critical in developing the community consensus needed to aggressively deploy NextGen capabilities.

We Must Accelerate NextGen Implementation

The NextGen Air Transportation System is needed to fuel our economic growth, lower energy use, and protect our environment. We must make it a national priority and provide the structure, leadership, and resources needed to be successful. We need not wait for 2025 to see results, and in fact, we must not. Improvements are needed today and solutions are on the shelf waiting to be deployed.

We offer the following recommendations:

1. Establish and fund a fully responsible and accountable NextGen Implementation Office in 2009.
2. Accelerate the requirement for ADS-B OUT capability to 2015 and provide the funding needed to satisfy the cost-benefit analysis.

3. Install GBAS technology in the top 20 most congested U.S. airports by 2011 and top 50 most congested airports by 2013.
4. Set and measure an RNP adoption target beginning in 2009 with a 20 percent year-over-year increase until 90 percent of commercial flights are using RNP procedures, including Continuous Descent Arrivals.

Our shared vision for NextGen is clear. The aviation industry now looks to the Congress and FAA for the focused leadership required to implement this much-needed advance in our transportation infrastructure.

Senator DORGAN. Mr. Kallenbach, thank you very much for your testimony.

Well, Mr. Krakowski, the standards, the development of standards, it seems to me, is essential for those that are going to run the system, those that are going to use the system. What can we expect, in terms of the development of standards, in terms of time?

Mr. KRAKOWSKI. There clearly is a lot of standards work going on, there has to be, in order to make sure that, when we make this transition, that it's done safely, that it is completely understood by everybody who's going to operate in the system, as well as have the redundancy necessary to make sure that it operates safely.

The RNP procedures that have been talked about already have standards. A lot of the standards actually exist to run operations today, as the panel described.

So, I think we're not really creating anything necessarily new, in terms of operating standards; it's going to be more of a refinement.

I'll give you a good example. We space aircraft farther apart right now, because radars don't have the fidelity to allow them to fly closer. ADS-B will give us that fidelity. With ADS-B, we can have closer separation standards, and then increase capacity and efficiency, as well.

So, if you want to have really far-reaching standards changes that make a difference, this modernization effort, particularly with ADS-B, is critical.

Senator DORGAN. Mr. Wright, you were a controller for 32 years, how long will a modern jet—excuse me—how far will a modern jet travel before the next sweep on the radar?

Mr. WRIGHT. It's according to if it's a terminal, which is 6 seconds, or an en-route radar, which is 12 seconds. So, basically you're looking at where it's at in the approach. If it's on 240 knots, then it's going to go a lot faster than it would if it's on approach, at 130 knots. So, it all depends on the speed.

Senator DORGAN. So, because you don't see that airplane constantly—

Mr. WRIGHT. Right.

Senator DORGAN.—you see it intermittently, and because of the speed, the result is, you need more spacing—

Mr. WRIGHT. It's the update. Yes, that's why the en-route environment uses 5 miles between and we use 3 miles in a terminal. There's a PRM scope that uses a—it's a very quick update that they use on runways that are not separated by a mile or so, so it updates quicker. It's all about the update of the radar.

Senator DORGAN. But, the—NextGen would change all of that, because you know where that airplane is at every point.

Mr. WRIGHT. With ADS-B, we get an update a second.

Senator DORGAN. Right.

Mr. WRIGHT. So.

Senator DORGAN. Mr. Krakowski, Mr. Wright's not very happy with the FAA. He says you're not consulting with them, you're not accessing information they have that could be helpful to you. What's the story?

Mr. KRAKOWSKI. Yes, actually, relative to NextGen, I'd like to just set a little bit of clarity around this. We have a NextGen Management Board, which is the highest level of leadership in the FAA, to oversee the NextGen rollouts, particularly in implementation. NATCA has had a seat on that board for 2 years now, and they're increasing their participation. Last year, they participated at about 61 percent, this year at about 80 percent. And we welcome that. And we particularly find Mr. Wright's input very, very valuable.

The RTCA Task Force that was just commissioned, NATCA has membership on those programs, as well.

Senator DORGAN. Yes, but this is—but, Mr. Wright's criticism is more specific than that. He's talking about the input that he thinks should have been required with respect to that East Coast routing—I forget your description of it—but, was not sought, and not welcome, apparently. Is there something going on here that we don't understand? Because it doesn't make sense to me that you wouldn't want everything everybody has to offer to give you the best possible product.

Mr. KRAKOWSKI. Yes. I come from an environment, from the airline industry, where we had really great cooperation, on a technical level and a safety level, with all of the labor unions. Clearly, the labor dispute, which has occurred some years ago, has created a drag on the relationship, in our ability to work together. We are looking forward to changing that, particularly under the new Administration.

There are union contractual issues that define how that relationship works, and we've got some work to do there.

Senator DORGAN. I understand. But, from my perspective, I would hope everyone that you have the potential to work with that can contribute in a positive way to this would say, "I'll tell you what, the FAA reaches out so much we're tired of hearing from them." I mean, I just—I hope that you will make an extra effort here so that we don't, in the future—I don't know who was at fault here, but we don't, in the future, hear anybody complain about their input not being sought. We should seek everybody's input, discard that which is not valuable. But, boy, we ought to reach out in every direction.

Mr. Kallenbach made a suggestion, a central office of implementation. Dr. Dillingham, he makes the point that you've got—you know, you've got a lot of different areas working here, there ought to be some central office to coordinate implementation. What do you think of that?

Dr. DILLINGHAM. Mr. Chairman, we have made a similar point, that there needs to be one central office with, in fact, the way we suggested it was direct reporting to the Administrator. This situation is really complicated, at this point in time, because recently the ATO reorganized itself and positioned the JPDO in a different place than we had suggested. Now, we're not saying that that reor-

ganization doesn't have some merit, but that situation is further complicated by a recent executive order that established yet still another organizational framework, in terms of different roles and different responsibilities.

We've said, at this point, that, you know, whatever organization is put in place, clearly the place where the buck stops is important, but more important than that is the outcome of how—whatever the organization is, the focus ought to be moving NextGen along.

Senator DORGAN. Senator DeMint will be back momentarily, and let me call on the Chairman of the full Committee, and then I'll go back and forth, by order of arrival.

Senator Rockefeller?

The CHAIRMAN. Thank you, Mr. Chairman.

I, like Chairman Dorgan, am very intense about this subject, and I'm kind of tired of talking about it. Everything that the President talks about—and that is, you know, carbon release and wasted time and damage to the economy and frustrated people and people not having reason to have confidence in their government, et cetera—all comes together in not having NextGen, NowGen, whatever you want to call it.

Now, some people are using the excuse that we don't have the money for it. And I consider that to be way off the mark. We have to do this, and we have to do it right away.

So, my question to you is, why are we so slow? I mean, I can—you know, we've got labor-management disputes—I'm actually also, like the Chairman, tired of those, because everybody's got disputes and—I had people in my office yesterday complaining about something which would probably derail the FAA Reauthorization, and therefore any effort to do NextGen. I think NextGen is absolutely priority number one.

So, is the lack of money, lack of focus, lack of concentration, lack of anybody appointed, anybody serving in the Federal Administration, appointed by this Administration—are any of those things problems, or is there any possible excuse for not doing this right away?

Any of you.

Mr. KOLSHAK. Senator Rockefeller, if I could address your question.

From the airline's perspective, the issue we have is the required implementation timetable is too long. So, when I look at 2020 and 2025, and looking at capital, it's very hard for me to go to the CFO of the company and ask for tens of millions of dollars for equipage when it's not going to be required, and, more importantly, the benefit—I will not gain the benefit for another 10 or 15 years.

And the example that I would use is the old adage, "Build it and they will come." We've come, and they haven't built it. We are retiring, by the end of this year, United Airlines, 100 aircraft that we've spent over \$20 million on equipage that we will not have fully utilized. And that's a difficulty that we have without some type of a benefit that goes hand-in-hand with the equipage and the expenditure.

The CHAIRMAN. Does anybody think that the Europeans—they've got their SESAR system—that they're going to slow down their

progress because of economic difficulties? Does any one of you believe that they're going to do that?

VOICE. I don't.

VOICE. No.

Mr. KRAKOWSKI. Senator, I just came back from Europe and meeting with EuroControl in the European Union, and I can tell you, in some aspects they're actually a little ahead of us, in some aspects they're behind us, but the political will is there. It's going to be interesting, because, with all the different countries and sovereignties involved there, they have a very complicated situation that has to come together. But, we are working with them. It's important that we work with them, because we don't want Joe's pilots to have different systems.

The CHAIRMAN. I'm not talking about working with them, I'm just talking about their—nothing is going to stop them.

Mr. KRAKOWSKI. It doesn't appear.

The CHAIRMAN. And if they're behind us in a couple of things, I didn't know about that. If they're ahead of us, I certainly didn't know about that. The point is, they're not going to stop, so we're going to fall farther and farther behind unless we have the intensity and the political will to make sure that there's money in the budget to do this. It would be nice if we had somebody at the FAA who was actually in office, would you not agree, Senator Nelson? Would that be helpful?

And I'm just losing patience. We've got to find a way to pay for this. It's not equally done. We have all kinds of disputes, which just build upon—they become a part of culture. How are we going to develop our culture of disagreement to a finer art form this year so that we can not get something done? I'm sick of it.

Dr. DILLINGHAM. Chairman Rockefeller, if I could answer your original question about, why is it taking so long? I mean, as you well know, there was a history at the FAA of cost overruns and schedule delays for the foundational systems or legacy systems that we're talking about now. And the Congress, you know, mandated the establishment of the ATO, which Mr. Krakowski is, in fact, in charge of now. So, you know, that had to be overcome.

And, at the same time, this is a very complex undertaking. And so, add that to overcoming the history and the changes that have been taking place, both organizationally and technologically, it's a contributing factor.

But, we are now at a point where we are beyond planning. We are now at a point where these are the kinds of things that can be done now so that 5 years from now you can see a definite impact on the system efficiency and capacity. What's going to be important is, once this plan comes out from RTCA, that it is, in fact, implemented and we don't get into that death spiral again.

The CHAIRMAN. Yes. I'd just close, Mr. Chairman, by saying we could make the decision, which lots of the Nation carries out on, is not to give young children, 3 years and below, something called EPSDT, which is early screening for various diseases and things, and say, "Well, we don't have enough money to do that now." And, in fact, that was—that has been the case. We paid, big-time, in the future.

You're saying, "Well, I can't go to my board now." There's always an excuse. There's always a reason. The world has changed. Everything has changed. And if we're going to get this system built, somebody's going to have to step up and say, "I'm going ahead." I think, on this Committee, we're prepared to do that, but we'd like to be matched by some of the people in the industry itself and at the FAA.

Mr. WRIGHT. Chairman Rockefeller, I also serve on the board of the International Federation of Air Traffic Controllers, which is worldwide, and it appears to us that SESAR—they have their funding more set, and they don't do what we call "double work" like we do here in the States. We find certain committees that I'm on, then we find another committee that's doing the same work. And I believe the task force should take care of that, but, in the past, there has been a lot of double work going on.

The CHAIRMAN. OK. So, that's another excuse. And I'm just saying I'm tired of excuses, and so is this Committee.

Thank you, Mr. Chairman.

Senator DORGAN. Senator Brownback?

**STATEMENT OF HON. SAM BROWNBACK,
U.S. SENATOR FROM KANSAS**

Senator BROWNBACK. Thank you, Mr. Chairman.

I'd ask consent that my opening statement be included in the record.

Senator DORGAN. Without objection

[The prepared statement of Senator Brownback follows:]

PREPARED STATEMENT OF HON. SAM BROWNBACK, U.S. SENATOR FROM KANSAS

I want to thank all the witnesses today for your willingness to come before our Committee to speak on one of most important issues facing our Nation's transportation sector.

As you know, my home State of Kansas has been at the forefront of aviation manufacturing for the past century—both in the commercial and general aviation sectors. Keeping this in mind, I implore you to continue engaging stakeholders from all sectors of the aviation industry in your decisionmaking process. Your decisions will, without a doubt, have major economic implications for thousands of my fellow Kansans.

I believe, and I'm sure you'll agree, that the largest obstacle to a seamless implementation of NextGen technology is current economic constraints. The two main questions being: how much will all of this cost, and who is going to pay for it? I believe that while it's imperative for us to continue moving toward modernization, we do so in a way that will not impose unfair costs on specific sectors of the aviation industry, or even worse, the taxpayer.

Again, thank you all for your work on this issue and willingness to testify today. I look forward to hearing your statements.

Senator BROWNBACK. Gentlemen, thank you very much for being here. I appreciate, particularly, the Chairman for holding this hearing. This is one of these things that have been bouncing around for a long period of time, as all of us are very familiar with. It was bouncing around when I was first on the Commerce Committee, went off, and now I'm back, and now it's still bouncing around. So, I have some familiarity with it.

I am curious on what you're saying here on the FAA's projection, that you handle, currently, about 50,000 flights every day, and you're projecting, 2025, at somewhere between double to triple that

number of flights. What percent of that do you feel like you can get if you have efficiently implemented NextGen operation, versus how much just new physical air, landing strips, and places are you going to have to handle that? Have you broken that down?

Mr. KRAKOWSKI. A lot of those numbers were made some years ago in the early planning phases. The devil in the detail is how it's distributed. And that's an important issue. We are virtually delay-free when there's good weather in this country, with the exception of the New York area. If there's bad weather, of course, delays occur because of that. If the system evolves, where the traffic comes back or increases at those levels in really hot-pocketed areas, and we haven't built the runways, and we haven't done all the NextGen work necessary, the delays are going to be hard to handle.

Senator BROWNBAC. Well, what percent of those delays can you handle by NextGen? I mean, if a fully implemented system—I'm just curious, how much more can you increase the capacity with NextGen?

Mr. KRAKOWSKI. So, this will determine, on separation standards, as I was talking about earlier, where we can actually bring airplanes closer together. If we can build new runways—and we have, you know, built 14 of them in the last few years—that's going to be a really big help to the system, as well.

Senator BROWNBAC. Do you know the breakdown on the number?

Mr. KRAKOWSKI. I can give it to your Committee, sir. We'll get it to you.

Senator BROWNBAC. OK.

Dr. DILLINGHAM, you've worked on the physical infrastructure issues. Have you looked at the runway issues, too, along with the radar systems, or not?

Dr. DILLINGHAM. Yes, Senator. The latest information that we have comes from the FAA and indicates that, with full implementation of NextGen and the runways that are planned now, that somewhere around 60 percent of the capacity will be handled. So, you will still have, you know, potentially significant delays.

One of the things that is very important is the need to build additional runways, and to start that process now, because—

Senator BROWNBAC. Regardless of NextGen—

Dr. DILLINGHAM. Regardless of NextGen, regardless of the 14—the runways that are currently planned, there still needs to be more development. And the issue, of course, is—in a worst-case scenario, you could have a Boston, where it took 40 years to build a runway, or, in a best-case scenario, it's like 10 to 12 years. So, these are the kinds of things that need to be dealt with now; otherwise—you know, NextGen is not a silver bullet.

Senator BROWNBAC. It just—the reason I ask that is, the general aviation industries headquartered in my State's fabulous, global dominating industry, one that has been hurt some by Congress lately, in making fun of business jets. You know, we look at it as, this is a business efficiency issue, and we sell a number of jets, haven't been selling very many of those lately; we'd love to sell a few more. But, the point of it is, too, if you can't get into a place, it doesn't matter. You're still selling a savings of time and effi-

ciency, and if you can't get into someplace, if you don't have the airport, if you don't have the system to be able to move people into it, if you can't get into high-concentration markets, you've hurt yourself. Or if you can't get out and back, because often it's going from a high-concentration market into a low-concentration, then back, same day. And you really need to focus on getting both of those. And that's something I would hope that we could do in this committee, is focus on what we're doing to make sure we keep that system—the total capacity, the physical capacity, the spacing and the NextGen moving together, because we're looking, I think, at a real crunch, whenever the economy picks back up, and these new, lighter-weight aircraft, moving forward, if we really don't focus on this, you're going to have a huge amount of delays in a lot of places. And I think we can just see that coming if we don't get it done.

Thank you, Chairman.

Mr. KALLENBACH. If I could add one thing. When you talk about new runways, part of this is making use of the existing runways that we have that become impaired by weather. So, for instance, to Senator Lautenberg's early remarks, Newark actually has a runway that can become impaired by weather. And so, it's like losing a runway. One of the things that NextGen and ground-based augmented GPS can do for you is allow you to use that runway during poor weather and, in effect, giving you an additional runway without having to build infrastructure. That's one of the concepts and one of the reasons we want to move forward on some of these technologies.

Senator BROWNBACk. Well—and I'm—I am all supportive of that. Absolutely. I just say it's not—it's not going to be enough, still, at the end, with the projections of what we're looking at. And so, you've still got to move forward.

Mr. KALLENBACH. Yes, sir.

Senator BROWNBACk. And we need this. We need NextGen. We need to do it now.

Thanks, Chairman.

Senator Dorgan. Senator DeMint?

Senator DEMINT. Thank you, Mr. Chairman. I apologize for having to step out for a minute, so if I missed something, let me know.

I share a concern of the Chairman when I heard what Mr. Wright said, and compared to Mr. Krakowski, that the working relationship might not be what we want, and I would hope, in the future, that the Committee and all of you involved with the technology and the management could continue along the way that Mr. Krakowski talked about, this continuous improvement model, where we're constantly upgrading.

And that's really the core of my question. I know we are moving from one technology to what you referred to as NextGen, and I'd like to hear you talk a little bit about what the technical components of that are. But, I'm interested in how we can move from where we are in a continuous quality-improvement-type approach, substituting the new technology for the old and continuing to have improving efficiency while we do that, and, at the same time, make sure we don't tie ourselves into a technology that is antiquated, that we're flexible enough and that the way we build this system

is that it can continuously improve, which has not—at least in the past, been how government operated. We've heavily invested in one system, and that system stayed the same way for years, and we were so built into it, we could not come in and add improvements.

So I'll start with you, Mr. Krakowski. How do you see us integrating NextGen and still operate the old system and bring both along and, at one point, jump off to new technologies?

Mr. KRAKOWSKI. Yes. Thank you, sir.

This is why we have to be very, very careful. What we are proposing to do with NextGen is going to be tricky. This is the first major overhaul of air traffic since the 1950s, 1960s. The actual gear on the airplanes, how controllers work airplanes, how pilots use the system, is going to change fundamentally, and we're going to be living in a period of time where you're going to have mixed equipage, mixed capabilities. You can't just turn it on with a lightswitch. So, we have to evolve it across the system—

Senator DEMINT. Right.

Mr. KRAKOWSKI.—in a organized fashion, which is one of the reasons the RTCA Working Group's important, because we went out to industry and we asked the question, Where are your pain points? Where are you willing to invest in equipage? Where are you willing to change policies, standards, work with us, to start rolling it out across the country in an organized fashion? So, the work ahead over the next few months is going to be very directive to where we put those resources. And I think that's the right way—in order to keep the system safe, we have to do it that way.

Senator DEMINT. Mr. Wright, what would be your comments?

Mr. WRIGHT. Well, my—I brought this little book with me that we did years ago, and it shows the modernization projects that the union worked with the FAA on. And my goal would be to get back to where I can do another book that's more than 2 pages long, to where we can sit down at the front end. The RTCA, we do participate in that. We are—we paid money to join RTCA, to be able to participate. What we'd like to return to is a—more of when a project is being designed, that a front-line controller is included in that design. We feel that'll cut down the troubles during implementation. We'd like to return to that.

Senator DEMINT. Yes.

Mr. WRIGHT. We feel that would be smoother, save more money, and it would take less time to get it implemented.

Senator DEMINT. And I'll go back to you, Mr. Krakowski. Is the union wedded to the old technology, or are they dragging their feet moving to the new technology? What's the conflict, here?

Mr. KRAKOWSKI. Yes, I would like to put a little clarity around one issue, though. We have had controllers who have worked traffic involved in every one of our modernization projects. Now, there's a nuance. They may not necessarily be representing the NATCA—the controller union's institutional point of view. But, we stress test in our labs, with working controllers, all these new technologies, like ERAM, that we put out.

So, I think the difference is, for clarity, we do have controller involvement of people working traffic in all of these efforts. It is unfortunate, and I agree with Mr. Wright, we need to get the union formally back into a better process than we have now. I think that

would be healthy for everybody. But, we have had controller involvement.

Senator DEMINT. Thank you very much.

Thank you, Mr. Chairman.

Mr. WRIGHT. Could I follow up, please?

Senator DEMINT. Sure.

Mr. WRIGHT. The only problem with the controller involvement is when it's a person that's selected, they go into these projects, they don't understand the project, they're—you know, we had trouble last year with the inspectors being "yes" people, and that's what we kind of feel like—if we have a union person there, we'd give them the authority to sign off on things and they represent the whole bargaining unit, not just themselves.

Senator DEMINT. Good.

Mr. WRIGHT. Thank you.

Senator DORGAN. Well, we're going to hold a hearing with respect to the air traffic controller issues, but let me just say that this stuff has to stop. I mean, you all work for the same team, paid by the same taxpayers. And Chairman Rockefeller indicated that, you know, he's tired of delay and so on. All of us are tired of delay, and we're tired of some of the battles that go on. This stuff really has to be put to an end and—

Mr. WRIGHT. I agree.

Senator DORGAN.—and we'll have a hearing, and we'll explore those issues. But, at the end of that, my hope is that Senator DeMint and I see air traffic controllers and the FAA working hand-in-glove, working together as a team to produce the very best product that can be produced and can move us into the future as quickly as is possible.

So, I appreciate, Senator DeMint, your questions.

Senator Begich?

Senator BEGICH. Mr. Chairman, thank you very much for your comments.

It is my first Committee, and I have to be frank with you, I'm tired already of the back-and-forth. You know, I—as a mayor for 5 and a half years, you know, we dealt with management issues, we dealt with labor issues, and it's clear to me there's just a full lack of communication between the organizations. I mean, you believe one thing, you believe one thing. I want to just echo the Chairman's comments that we just—you've got to get beyond whatever the old battles are. You know, there's a new Administration, there's going to be a new contract, more than likely. There'll be more stabilization over in the FAA to get things done. But, I just—I want to add that just to the record.

But, I have a question. Mr. Dillingham, I don't know if you can answer this, but, you know, I liked what Mr. Kallenbach said here. You know, he had some very simplistic ways to kind of move forward. And it seems like, as I went through your report—and correct me if I'm wrong, but the JPDO was statutorily set up to kind of set the vision, set the plan, set the activity in action. It's really now time for a project manager, people who actually know how to implement things, because, at least my way of looking at life as a—again a mayor that just happens to be a Senator, is how I describe myself—we have a lot of visionaries, but then you've got to get peo-

ple to actually turn the dial and make it happen. Is that what's missing here, or are we trying to move what we—when I say “we,” statutorily that's been set up, kind of moving it around to fit the box, versus let's just clean out the box and say, “Now it's time to move to the next stage?”

Dr. DILLINGHAM. I think you're right, Senator. There is a consensus—if not a consensus, there are certainly several important stakeholders that are suggesting just the remedy that you have just talked about, is a program office, someone that is in charge—totally in charge of NextGen. Again, now, ATO has made that organizational change, and they have established a senior vice president for NextGen. It's just not clear that how this is all going to work has been communicated to the stakeholders. I think there is a communications problem here, as well.

And I want to say, again, you know, various kinds of organizational structures may work; it is—you know, it's the end product that's important. And at this point, we are now turning the corner to implementation. You're right, the planning, at this stage, is, in fact, over, and now they're going to have to start planning for the next NextGen, because this is never going to stop. I mean—

Senator BEGICH. Right.

Dr. DILLINGHAM.—there's going to be another revision. And that speaks to Senator DeMint's issue about, you know, How do we not end up with antiquated technology, and so forth? And that's a part of making that vision an integral part of the current situation, as well.

But, the short answer is yes.

Senator BEGICH. And—

Mr. KRAKOWSKI. Senator, if I may?

Senator BEGICH. Yes.

Mr. KRAKOWSKI. The establishment of the Senior Vice President position for NextGen—and Vicki Cox is sitting behind me—she's accountable for all things NextGen at the FAA. One of the reasons we did this is the 14 runways that we've built since 2001, for the most part, came under budget, on time. The rigor of work and the organization, particularly with the new Director of Implementation and Integration that works for Vicki, is going to use a process that has served us well. That's why we have confidence in it.

Senator BEGICH. OK. When you say “served us well,” what do you mean by that?

Mr. KRAKOWSKI. Well, we opened three runways in November, on time and under budget, or at budget, and the FAA's not had a great history of doing that. We're off the GAO high-risk list, because we've cleaned up our act. The processes that worked under Ms. Cox and her organization helped get us here. So, I actually think we're in a better place.

Senator BEGICH. Do you need the JPDO anymore?

Mr. KRAKOWSKI. Absolutely. The JPDO does a number of important things for us. They created the long-term vision, they created the interagency discussions across a broad spectrum of stakeholders, and they're also kind of our long-range radar. When they see technologies changing, if they see something way off in the distance that might suggest, “Hey, maybe we shouldn't make this in-

vestment or go in this direction exactly the way it's planned," we're going to need them in there, as well.

Senator BEGICH. And if I can jump back to one quick thing. Mr. Wright made the comment about the right person to be on those committees, from his organization. Do you select them, or does the union select them?

Mr. KRAKOWSKI. The union typically selects them. Now, if we offer up or the union is sponsored into it through agreement, it's the union's choice.

Senator BEGICH. But, you don't have any objection if the union says, "Here's the person we want on any of the committees that relate to NextGen," do you?

Mr. KRAKOWSKI. It's a place I've been to. Thirty years in the air-line industry, that was common practice, so—

Senator BEGICH. OK, so you don't have a problem with that.

Mr. KRAKOWSKI. No, sir.

Senator BEGICH. OK.

I'll end there, because my time's expired.

Mr. KOLSHAK. Senator, if I could just add one thing, is that, you know, the project management concept is—from the industry's view, we concur, it's very important. You know, if this needs to be a national priority—when you look at the importance of NextGen, you look at the amount of spend that people have projected, it is too important to be tasked to several organizations within the FAA. No disrespect meant to Mr. Krakowski. We in the industry feel that it should be treated similar to how the national interstate highway was treated when Eisenhower embarked upon it, is—he appointed an administrator to oversee and adopt the National Interstate Highway System. And we concur with Mr. Kallenbach's view of it.

Senator BEGICH. Thank you very much, Mr. Chairman. I do agree, I mean, I've—if I can just say one quick comment, Mr. Chairman, and that is, I know when I did a major project—I love my architects, they have great design, great thought, but once the projects started, they were there off to the side, they did not help implement the program, because I would have ended up three times the cost, because they have great dreams, but I have to be practical about implementation.

Thank you.

Senator DORGAN. Senator Nelson?

**STATEMENT OF HON. BILL NELSON,
U.S. SENATOR FROM FLORIDA**

Senator NELSON [presiding]. Thank you, Mr. Chairman.

It's my understanding, in December, that the FAA started installing Automatic Dependent Surveillance Broadcasts, ADS-B, in South Florida. Would you share that with the Committee?

Mr. KRAKOWSKI. Absolutely. ADS-B is the primary moving force for NextGen which gives us the capacity increases and the efficiency and the safety we're expecting. We chose Florida as a test bed because of the wide variety of traffic and weather that occurs there. A lot of light airplane traffic, high-intensity military operations, and, of course, a very robust airline system, as well. We also have the Embry-Riddle University, one of the premier aviation

academies here in the country. So, we think we've got the right kind of environment to really start testing this system with equipped airplanes.

A key part of the work in 2009 is going to be the human-in-the-loop testing. How do pilots work with this system? How do controllers work with this system? How far do you take automation? What do you do with it? And we're very pleased to be doing this in Florida.

Senator NELSON. So, what do you do, install some of the heads-up equipment in the cockpit and, in South Florida, you're broadcasting off of the satellites instead of through your normal communication? Is that what's—what you're going to do?

Mr. KRAKOWSKI. The way it works is that the GPS receiver on the airplane picks up its position from satellites, but then it precisely transmits that position to the ground network that's been established in Florida, which is the ADS-B system. And that's what really creates the robustness of it.

Senator NELSON. So, there's no new equipment that you have to put on the aircraft.

Mr. KRAKOWSKI. You do need ADS-B equipment, yes, in order to do it. So, ADS-B is a technology attached to GPS to make this all work so the ground stations can see the airplane correctly. But, more importantly, and one of the really neat things, as a pilot—

Senator NELSON. Is so the pilot can see.

Mr. KRAKOWSKI. And not only that, we can see other airplanes, we can see—

Senator NELSON. Now, how do you—

Mr. KRAKOWSKI.—weather—

Senator NELSON.—test the system, since eventually FutureGen is going to have all of that in all the cockpits so that a pilot could have awareness of everything around him right in his cockpit—how do you test that since it's only going to be a few airplanes that have this?

Mr. KRAKOWSKI. Well, again, we have to lay this out and roll it out carefully, because you are mixing a modern system with an older system.

Now, what's really interesting is, some of the airlines are already creating some capabilities with the electronic flight-back, so they've got great capabilities, on the ground and in the air, to see other airplanes, see weather. So, it's incrementally going out there, but we also need to determine what works and what doesn't work successfully. It's one of the reasons we have Embry-Riddle involved with us, to make some of those determinations.

Senator NELSON. OK. Now, I want to shift to a labor issue in Florida. In Orlando, you split the functions between the tower and the radar functions, but in Miami you kept them together. Now, if you're testing ADS-B in Miami, where radar and tower are together, but what you've done around the rest of the country is split the functions, explain that.

Mr. KRAKOWSKI. Well, the splitting of the Orlando facility solved a number of issues. And I remember the phone call with you, sir, on this. We had some serious staffing problems at that facility. It took the complication of having controllers qualify in multiple posi-

tions and reduce that vulnerability. So, that was the primary reason we did it down there.

But, looking forward, ultimately the current configuration of TRACONS, radar rooms, control towers, and en-route centers is going to change with NextGen. We don't need separate TRACONS, and we don't need separate en-route centers. NextGen provides the ability for us to combine all that. So one of the key things about Florida is, we're going to have to figure out and work to understand how that comes together. It's one of the reasons we're doing the test there.

Senator NELSON. OK. So, you're saying that there's no difference with regard to splitting it, or not splitting it, with testing ADS-B.

Mr. KRAKOWSKI. No, we don't think there's an issue, sir.

Senator NELSON. OK. Now, tell me, has the experience factor in Orlando gone down as a result of separating the two functions in Orlando?

Mr. KRAKOWSKI. We don't believe the experience factor's gone down. We actually think what it's done is, since you split the specialties to radar and tower, it actually created a better ability for people to become fully qualified in each of the two sectors.

Senator NELSON. Mr. Wright, that's not what I hear from labor.

Mr. WRIGHT. No. Well, I worked in a—I worked in the Atlanta tower and at the Charlotte tower, both worked radar and tower. And what we feel is that you get a workforce certified quicker if you only have to certify on the tower, but what you lose is controller expertise and knowledge of the full operation. And that's what concerns us, is the—used to, the controllers worked tower and radar, they could help each other out, they knew what was going the other function. You lose that when you split it.

Senator NELSON. The Chairman of the Aviation Subcommittee in the House of Representatives, Congressman Costello, has said that when he visited the Orlando tower, that only one controller out of ten had on-duty over-1-year experience. Now, what do you say about that, Mr. Krakowski?

Mr. KRAKOWSKI. I'm not aware of that—

Senator NELSON. All right, would you check—

Mr. KRAKOWSKI. I would have to get—

Senator NELSON.—and get back to this—

Mr. KRAKOWSKI. Yes.

Senator NELSON.—Committee in a timely fashion for the record?

Mr. KRAKOWSKI. Yes, I will—

Senator NELSON. And the record will remain open for that.

Senator NELSON. Senator Thune?

**STATEMENT OF HON. JOHN THUNE,
U.S. SENATOR FROM SOUTH DAKOTA**

Senator THUNE. Thank you, Mr. Chairman. And I appreciate today's Subcommittee hearing, because there is no question that transforming our Nation's current air traffic control system is absolutely critical if we are to improve safety and plan for the anticipated growth in the amount of flights that our Nation's air traffic control system's going to be handling into the future.

However, to make NextGen a reality is going to take a considerable amount of time and money, both from the Federal Government

and from the users of our Nation's air traffic control system. And, while changing the current ground-based systems for air traffic control to satellite-based systems represents a host of new capabilities, the delays that we've experienced in the past have raised a lot of questions from the user community that have to be addressed for this transformation to be effective.

And I guess my question—and I'd direct this to any of the panelists, and I appreciate your insights today—is that, seeing that the FAA has noted that two-thirds of its assets are beyond their useful life, how much longer can we wait to fully embrace NextGen technologies, both in terms of safety and handling the air traffic volume that's expected to exist in the future?

Mr. KRAKOWSKI. We agree that we need to get moving on this quickly, because we do have old facilities. We're keeping them put together—or, you know, we're keeping them operating safely, but it does take more time, resources, and money to keep doing that with the old facilities every year. So, the NextGen effort, if we can accelerate, it's going to be very helpful.

Senator THUNE. How much time would you say we have, I mean, in terms of just the safety issues and the volume issues that we're dealing with?

Mr. KRAKOWSKI. Well, the volume issues have some relief right now, because the industry's down. It will probably take a few years for that to catch up, which is why this is really a good time to try to get this moving quicker, so when the traffic does come back, I have new facilities, some groundbreaking on some new facilities, some modernization efforts going in there. This is the worst time I can think of to lay back and not spend the money.

Senator THUNE. Anybody else care to comment?

Mr. KOLSHAK. If I could just add to Hank's point, is that now is the time, is—one, as you mentioned, Senator, the crumbling infrastructure, and two, with capacity being in a lull right now, one of the highest costs that we have in the airlines for equipage isn't the equipment itself, generally, it's the out-of-service time, it's pulling aircraft down to equip them. And now, just with the natural drop in demand, we have more capacity that's pulled down that we could equip. And the important thing is, is that this is real—we talk about NextGen, and people's eyes roll back because they think of this futuristic Star Wars—is that really there are some elements that we can accelerate, available technology, today—in GPS, in ADS-B transponders—that we could realistically equip our fleet with in the next 2 to 3 to 4 years and start to derive benefit. So, the timing is crucial, and we're certainly more than willing to pay our way there, but we've got to see the benefit of doing so.

Mr. KALLENBACH. And I think that—if I may—on the technology front especially, the comment was made earlier about ADS-B and the equipage rates. One of the things that is very easy to do is to accelerate the mandate of ADS-B from, currently, 2020 in the U.S. to 2015, which also harmonizes us with Europe. And that's still a reasonable time-frame to equip. It's a time-frame that we can then realize the benefits across the system, because everybody will be equipped.

And that's back to your point earlier, Senator, where you need to have everybody in to get the benefits. And I think, in some ways,

we tend to look for the grand solution, but just the acceleration of that mandate, just that piece, would accelerate the equipage, which would then generate the demand for more features, and we'd be well ahead, by at least 5 years, from what the current timescale is. And that's an action, I think, that we can take immediately and get going on it. And to line up with the capital budgets of things like the airlines, 6 years is a very reasonable planning horizon; whereas, 12 years gets way too far out.

Senator THUNE. If we—so, from the Committee's standpoint as we work to reauthorize the FAA bill this year, what is the one improvement that you would like to see the FAA make regarding its ongoing efforts on NextGen?

Mr. KOLSHAK. Well, first off, the controllers—the figures you put out, and Senator Brownback said earlier, if you want us to work two to three times traffic, we know we need the equipment. We need to see progress toward that as we move along, because as traffic increases, our system can't handle it. You're asking the controllers to work more airplanes, and we're already working as many planes as we can with the present system. So, as we go into this year, we'd like to first see, as the project gets more defined, where it's going, a direct path. Like has been said by the Committee members, the controllers run the advanced automation system from 15 years ago; it was coming along, and then it just went away. And we want to believe in the project, and we want to see a defined path next year of the—of where it's going.

Senator THUNE. Thank you, Mr. Chairman.

Thank you all very much.

Senator DORGAN [presiding]. Senator Thune, thank you very much.

Let me thank all the witnesses today. You have heard, from the Chairman of the Committee and others, the passion about trying to move on this. I said earlier, the issue is one of price and pace. How do we decide to raise the funding for it and meet the funding needs, even now, during more difficult times? And how do we find ways to truncate the time that's required to begin implementing this?

Mr. Krakowski made the point that, you know, you don't just flick a switch in the morning and you've changed the entire system. I understand that. I mean, we've had an aviation system in this country that has developed over time. One point, many, many years ago, nobody had a transponder. And then, you know, everybody just sort of flew, looking out the window, and then got transponders, and so, you can—you've got some controllers up there taking a look at little dots on a screen; and, you know, the development of general aviation, the development of commercial aviation, and now the newer issue of, How do you integrate into our airspace unmanned aerial vehicles? We're doing that substantially in a war theater, in Afghanistan and Iraq, with Predators and Global Hawks. But, having Homeland Security fly Predators on our borders raises other issues of integrating it into the airspace, which makes, I think, this next-generation—or NextGen, NowGen, whatever you call it, so much more important, and so much more urgent than it was, from a time standpoint.

So, we have asked you to come and give us your perspective from many different centers, and we appreciate that, and we'll hold other hearings and try to move this forward.

I do want to make one final point. We—there's a lot about the Congress that everybody's frustrated about, even those who serve in this body. You know, we're over on the floor now on a national service bill. We had to file cloture on the motion to proceed to go to a bill. It's unbelievable to me. You know, as—and then, after you get cloture, 30 hours post-cloture—I mean, this is not a huge, controversial piece of legislation. This Congress isn't working so well, and we need to find a way to make it work better.

On issues like this, we can't, at the end of this Congress, say, "Well, we just missed it, we couldn't get this done, we couldn't reach agreement." We need to move forward. If this country's going to keep its lead in technology and science and—particularly the new technologies—we need to be determined to make that happen. So, this is one of those areas of new technology and modernization and capability that this Congress, Republicans and Democrats, working together, have to dedicate themselves to achieve. To not achieve this and not move forward on this would be inexcusable, in my judgment. So, we're going to push very, very hard to make this happen.

Let me thank you again.

This hearing is adjourned.

[Whereupon, at 11:18 a.m., the hearing was adjourned.]

A P P E N D I X

GEBHARDT & ASSOCIATES, LLP
Washington, DC, March 24, 2009

Hon. BYRON L. DORGAN
Chairman,
Aviation Security, Safety, and Operations Subcommittee
Washington, DC.

Dear Senator Dorgan:

As the FAA contemplates modernization of the air traffic control system, we wish to call to the Aviation Subcommittee's attention the cautionary tale of the FAA's 2005 privatization debacle, in which the FAA undermined the effectiveness of the Air Traffic Control System by contracting out Flight Service Controllers. The result has been a sharp decline in essential services to general aviation pilots in need of weather, navigation, and rescue services. The FAA also seriously harmed a dedicated and experienced Federal employee workforce based on illegal age discrimination.

Our law firm represents over 200 of the 1,900 former Federal Air Traffic Controllers wrongfully fired by the Federal Aviation Administration in 2005 because they were deemed an "aging work force."¹ These Controllers not only lost their Federal employment but also their ATC retirement benefits.² We are urging you to support restoration of lost ATC retirement credits to the Controllers and a set aside of \$100 million in the FAA budget to pay claims of age discrimination in the case of *Breen v. LaHood*, C.A. 05-0654 (RWR) (D.D.C.).

Our expert economic analysis, by the former Chair of the Economics Department of Georgetown University, estimates that a judgment against the FAA would total at least \$85 million, and most likely more in light of recent Controller layoffs by Lockheed Martin.

The fired FAA Controllers have been working closely with Congress to fashion a bill to restore lost ATC retirement credits and provide reemployment opportunities for the Controllers, much needed measures to address the devastating loss of employment and retirement benefits by the Controllers and one which we hope you will support.

We request that this letter be placed in the record and that you take up this issue with your colleagues. Please feel free to contact me if you need any further information.

Sincerely,

JOSEPH D. GEBHARDT

cc: Randy Lueders
Frank Eastman

¹The FAA terminated this aging workforce from Federal service in the largest Reduction-in-Force (RIF) in U.S. Government history. Many of the fired Controllers were within a few years of retirement when the FAA contracted out their jobs to Lockheed Martin, which did not give them any retirement credit. The FAA's RIF and contracting out to Lockheed Martin eliminated the ATC retirements of nearly 2,000 long-time government employees.

²The Congress's previous attempt to address this issue in 2005, the Snowe Amendment, P.L. No. 109-115 (S.Amdt. 2150 to H.R. 3058), provided limited relief to almost 100 Controllers, but also set a precedent for allowing Controllers to accrue Federal retirement benefits while working at Lockheed Martin.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JOHN D. ROCKEFELLER IV
TO HANK KRAKOWSKI

Question 1. What specific modernization efforts is the FAA pursuing over the next 5 years that will improve the ATC system and its management?

Answer. FAA's near-term NextGen implementation efforts are targeted across three broad areas: airfield development, air traffic operations, and aircraft capabilities. Together, these efforts will increase capacity and operational efficiency, enhance safety and improve our per flight environmental performance. We are moving forward with a dual-pronged approach: maximizing the use of available capabilities in today's aircraft and ground infrastructure, while working aggressively to develop and deploy new systems. We believe this approach allows both government and industry to extract the greatest value from existing investments, while moving the industry to gain exponential benefits in the mid-term and beyond.

Looking forward for the next 5 years, the FAA has additional runway and taxiway improvement projects planned at a number of airports, including Dulles, Houston, Denver, Philadelphia, and Chicago. In addition, the FAA is pursuing improvements that will allow improved efficiency and capacity from existing runways. For example the FAA is currently pursuing a near-term rule change that will allow us to safely restore lost capacity and efficiency in inclement weather at airports with operations to closely spaced parallel runways. This offers the potential to improve poor weather operations at a number of airports with reduced delays throughout the NAS.

The FAA continues to make progress with our transformational programs—ADS-B, SWIM, Data Communications, NextGen Network Enable Weather and the NAS Voice Switch—and significant upgrades are planned over the next 5 years. These are the long-lead time acquisition programs, so we won't realize benefits from these programs in the very near term; but they are progressing on schedule through the acquisition process. Of the five initially identified as transformational NextGen programs, ADS-B is most mature; but all are projecting substantial advances between now and 2013.

Question 2. What are the schedules and performance metrics that will be used to track these problems?

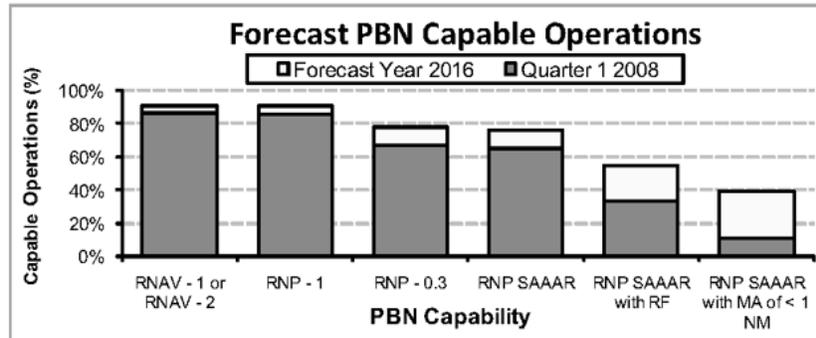
Answer. High level schedules and metrics for NextGen programs for FY09 can be found in the FAA's NextGen Implementation Plan. For managing the specific details, the FAA uses disciplined portfolio and program management processes to track the schedules and associated metrics (*i.e.*, costs, obligations, implementation progress, performance, etc.) to ensure that NextGen implementation remains on track. These tools are supported by a comprehensive NAS Enterprise Architecture that provides the framework and technical strategy for the integration and transition of NextGen capabilities. NextGen capabilities are implemented by applying System Engineering discipline to define requirements, align implementation schedules across programs and minimize program risk.

Question 3. What is the demand for FAA to develop RNP/RNAV routes over the next 3 to 10 years? How many total RNP/RNAV routes does the industry need the FAA to develop at the top 35 airports? Does the FAA have the resources and staff needed to meet this demand? If not, what resources does the FAA need to accomplish meaningful implementation of RNP/RNAV at the top 35 airports?

Answer. Based on forecast aircraft equipage, there is sufficient Performance-Based Navigation (PBN)-equipped capability in the Part 121 airlines to use the expected growth in procedure development. The equipage levels are already high enough for the future demand of RNAV. For RNP procedures, equipped capability levels are at 60 percent (approximately the minimum equipage needed for air traffic to run a beneficial operation) and forecast to increase to close to 80 percent by 2016. This also meets the demand for RNP procedures.

To fulfill the needs of industry, the FAA will have to develop a minimum of 1,200 new PBN procedures during the next 10 years at the top 35 airports.

Forecast Equipped Capability at the Top 35 Airports



We are migrating away from site-by-site (or runway-by-runway) procedure implementation process toward a NextGen readiness concept that would include development of an integrated system of PBN routes and procedures by geographic area (incorporating metro areas and outlying airports). The key difference is that funding requests would combine airspace, environmental, and procedure development. This concept delivers optimum benefits for the air traffic and carrier communities. Funding would run from \$10–\$15 million for each geographic area and would include procedure development, airspace redesign, and associated environmental assessments or studies.

Question 4. I understand the FAA contracted with ITT to begin the installation and use of ADS-B ground installations in 2007. What has been accomplished under this contract to date? Is the contract currently on schedule and within budget? Are there any performance problems with this contract?

Answer. To date, ITT, Corp. has met all outlined program milestones. In just over a year after the contract was awarded, the FAA made an In-Service Decision (ISD) on November 24, 2008 that commissioned ADS-B essential services which improve situational awareness—*i.e.*, Traffic Information Service-Broadcast (TIS-B) and Flight Information Service—Broadcast (FIS-B). Pilots flying in equipped aircraft can see live traffic on displays; and receive free, real-time graphical weather displays from the National Weather Service, along with critical flight information, such as temporary flight restrictions and special-use airspace.

Eleven ADS-B radio stations were installed at the following locations: Lakeland Linder Regional Airport, Hardee, Okeechobee, Dade-Collier Airport, Key West, St. Cloud, Sebastian Municipal Airport, Hobe Sound, Boca Raton Airport, Homestead Dade Marina, and Florida Keys Marathon Airport.

The ISD decision cleared the way for the vendor to install ground stations and transmit broadcasts for operational use across the nation, starting on the East and West Coasts and portions of the Midwest, with 340 ground stations scheduled to be operational by September 2010.

The FAA's ADS-B contract is on schedule and on budget. As with any initial production, there are issues relating to radio station performance with the system and adjustments will be made as required. The program office is working closely with the vendor to make these changes. Additionally, with all large scale programs there are risks. Currently, the program office has identified risks in the deployment and implementation of ADS-B, is monitoring them, and has planned mitigations for each risk.

Question 5. In testimony before the House Transportation and Infrastructure Committee last month, both the DOT Inspector General and Dr. Dillingham testified that one stumbling block to wider scale acquisition of NextGen equipment by the airlines is the FAA's failure to specify technical requirements. For example, "ADS-B In" equipment must be FAA-compatible. But the FAA has not yet finalized its requirements for this equipment. Because of this, airlines have waited before investing in this new technology. For which core NextGen programs (ADS-B In and Out, DATACOM, etc.) does the FAA need to finalize technical requirements for users, and when do you expect the FAA to issue these standards?

Answer. The standards do need to be developed in order for equipage to occur.

“ADS-B Out”¹ is well defined by the FAA with planned operational use for air traffic separation services. The FAA plans to mandate “ADS-B Out” by a rule in 2010 with compliance required by 2020. The aviation community—consisting of avionics manufacturers, aircraft manufacturers, airlines, and the Department of Defense (DoD)—commented and provided input on the Notice of Proposed Rulemaking (NPRM) through the Aviation Rulemaking Committee (ARC). However, the aviation community and FAA realize additional large scale benefits reside in “ADS-B In.”² “ADS-B Out” provides immediate benefits in non radar airspace and supplements the availability of air traffic separation services in existing radar airspace. Additionally, “ADS-B Out” is the enabling function for “ADS-B In.” The current activities for publishing the Technical Standard Order (TSO) for “ADS-B Out” will be compatible to future “ADS-B In” applications. “ADS-B In” has multiple functions. The first function is the ability for aircraft to receive traffic and weather information on a cockpit display within a specific ADS-B service volume from the ground infrastructure. Currently, this is being used operationally in the NAS and the FAA is moving forward with confidence for nationwide deployment. Additional information to the cockpit, including traffic, weather, and flight information can be employed to accrue additional safety benefits (reduction in fatal accident rate), increased efficiency of flight (including fuel savings), and an increase in capacity of the NAS. Inclusion of avionics into the cockpit also provides a notional opportunity for industry to develop additional services, including runway safety and incursion prevention.

A core set of high value aircraft-to-aircraft applications of “ADS-B In” are expected to be completed by FY 2010. As noted in the ARC report published in September 2008, the ARC recommends that the FAA, in partnership with industry, consider establishing a program for “ADS-B In” by 2012. The ARC further recommends that this program defines how to proceed with “ADS-B In” beyond the voluntary equipage concept in the current NPRM. Finally, the ARC recommends that the final rule preamble be modified to include the intention to move toward and encourage “ADS-B In” in the future. The ARC report recommendation emphasizes their understanding that ADS-B “in” has high value benefits.

As stated in the 2009 NextGen Implementation plan, Datacom requirements should be completed in 2014 and Paired Guidance Approaches have requirements planned to be complete in 2015.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BILL NELSON TO
HANK KRAKOWSKI

Question 1. As you answered my question regarding the FAA’s decision to split the radar and tower functions at Orlando (MCO), you indicated that air traffic control modernization will essentially mean the end of terminal radar approach control and en route centers. Could you elaborate on the implications this would have on staffing and experience levels?

Answer. The FAA expects that new technologies will result in a more automated system that will, over time, change the role of controllers. The phase-in of these new technologies and the phase-out of older technologies is a long-term gradual process currently under development. The FAA is still determining how the changes in technology will change the controller workload.

Determining air traffic controller staffing is a dynamic function based on traffic volume, operational complexity, future FAA forecasts, hours of operations, controller retirements and other attrition losses. As the FAA moves toward general service delivery facilities, it is envisioned that future air traffic controllers will be trained in areas of specialization ranging from basic and minimally complex entry level positions to more complicated and demanding areas of specialization matched to the correct experience level.

As we move closer to finalizing the design and implementation of the general service delivery facilities, we will be in a better position to anticipate staffing/experience levels. We will continue to provide Congress with our annual updates and staffing projections through our Controller Workforce Plan, FAA’s 10-year strategy for the Air Traffic Controller Workforce.

¹ ADS-B Out is defined as the transmission of the aircraft position into a unique digital code and combines it with other data from the aircraft’s flight-management system—the type of aircraft, its speed, its flight number, and whether it is turning, climbing or descending. The code containing all of this data is automatically broadcast from the aircraft’s transponders once a second.

² ADS-B In is the ability for aircraft to receive traffic and weather information on a cockpit display within a specific ADS-B service volume and also the ability to do aircraft-to-aircraft applications.

Question 2. We have spoken about the levels of experience at the Orlando International Airport since the recent split of TRACON and radar functions. Have you investigated the severe dip that has reportedly occurred as a result?

Answer. The split did not result in a severe decline in experience levels. Prior to the split, 47 percent of controllers had more than 5 years of experience. Today, 41 percent of controllers in the tower and 59 percent of TRACON controllers have more than 5 years of experience respectively.

Question 3. It is clear that we are at a crossroads; we are looking forward to a total reevaluation of how our Nation's airspace works and how new technologies will affect our airspace users, and we are trying to find the best ways to implement NextGen quickly and to pay for it efficiently—yet we cannot abandon the safe upkeep of our current system until we know the next one works. In light of this, why are we going ahead with realigning facilities and services like radar and tower functions? Shouldn't we postpone further realignments until Congress can enact a comprehensive review and evaluation process?

Answer. The decision to realign facilities is based on operational needs. As technological advances have allowed greater radar coverage and multiple radar inputs, opportunities for increased services, efficiency, and cost savings necessitate our ongoing examination of alternative operational arrangements.

Realigning radar and tower functions does not impact the quality or the amount of training controllers receive in each environment, and it increases proficiency by reducing the number of positions that controllers are required to learn. The effects to the operation are virtually seamless.

Facility realignments enhance the safety and security for our customers, since controllers are more focused and more familiar with the areas under their control. The FAA has successfully realigned some of the busiest facilities in the country including Las Vegas, Nevada; Atlanta, Georgia; Chicago, Illinois; Dallas, Texas; and Minneapolis, Minnesota.

The FAA supports a review and evaluation process that is transparent and reasonable and we look forward to working with the Congress to develop the process. However, we must continue to move forward to address our operational needs. As the FAA implements NextGen, we will continue to analyze each of our facilities to make the best decisions for safety, operations, and employees.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK WARNER TO
HANK KRAKOWSKI

Question 1. Given the technological advances that come with a GPS-based air traffic control system, the NextGen system could allow for safer flights and increased traffic into National Airport. As you testified at the March 25th hearing, the FAA and airlines will be able to route flights more precisely and efficiently, resulting in reduced flight times, delays and congestion at airports. Do you believe implementation of the NextGen system offers the ability to safely restore general aviation at National Airport?

Answer. One of the outcomes of the NextGen system is heightened situational awareness and enhanced air surveillance tools for air navigation services. However, the Department of Defense and Department of Homeland Security determine the security and response time requirements necessary to protect the National Capital Region (which includes Ronald Reagan National Airport).

Question 2. The current air traffic control system forces European flights into the Washington, DC area to follow an indirect flight pattern toward the west in order to reach an air traffic control point before landing. This situation creates inefficiencies in terms of flight times and fuel usage. Keeping community interests in mind, can the NextGen system facilitate a more direct and efficient eastern approach to the Washington, DC area airports?

Answer. As the FAA considers future airspace redesign in the Washington, D.C. area, it will review all stakeholder requests for improvements. However, these requests must also be reviewed in light of security issues in the National Capital Region airspace. Security in the airspace is governed by the Departments of Defense and Homeland Security.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK BEGICH TO
HANK KRAKOWSKI

Question 1. What incentives for accelerated early aircraft avionics equipage is the FAA pursuing?

Answer. The FAA has been working with Industry through the ADS-B Aviation Rulemaking Committee (ARC) to accelerate early equipage of ADS-B. Specifically, two of the ARC recommendations focus on benefits/equipage:

- Recommendation #9: Leverage the benefits of ADS-B information to incentivize equipage by establishing agreements with specific operators.
- Recommendation #10: Continue to establish agreements with local and state governments to leverage the benefits of ADS-B.

Since receiving these recommendations, the FAA met with multiple operators to determine potential incentive mechanisms to include in potential agreements. Most recently the agency has signed approximately four agreements with entities to accelerate equipage and NextGen. Below is the list of the agreements and their objectives:

1. Honeywell was awarded approximately \$3 million to develop requirements, standards and human factors analysis in relation to surface applications.
2. ACSS was awarded approximately \$6 million and partnered with U.S. Airways to create standards, flight demonstrations and prototypes in relation to surface applications.
3. The agency signed a separate agreement with U.S. Airways and ACSS to develop a plan to accelerate NextGen capabilities.
4. An agreement was signed between the FAA and NetJets to develop a plan to accelerate NextGen capabilities.
5. The most recent agreement was signed with United Airlines to work together on advancing the concept of In-Trail Procedures (ITP) using ADS-B capable avionics.

Additionally, the program office is reviewing potential agreements with the various states (California, Wisconsin and Minnesota) to provide ADS-B services where currently they are not receiving any services.

Question 2. What is the FAA doing to accelerate the deployment of RNAV and RNP procedures?

Answer. With a solid foundation of routes and procedures in place, we are exploring ways to accelerate Performance-Based Navigation (PBN) and Next Generation Air Traffic System (NextGen). We are migrating away from a site-by-site (or runway-by-runway) procedure implementation process toward a NextGen readiness concept that would include development of an integrated system of PBN routes and procedures by geographic area (incorporating metro areas and outlying airports). The key difference is that funding requests would combine airspace, environmental, and procedure development. This concept of integrated design and implementation makes sense and may help to reduce the departure delays that continue to impact the public and industry. This concept delivers optimum benefits for the air traffic and carrier communities.

This concept provides integrated RNAV and RNP procedure design, coupled with airspace and environmental changes, ensuring optimal configuration of operations between airports. These changes will result in increased predictability and increased efficiency, capacity, throughput, and safety in terminal radar approach control operations.

Question 3. An important component of the transition to NextGen is having enough qualified engineers to implement and install the technology as well as oversee facility upgrades and maintenance. How will the proposed Engineering Services Efficiency Plan (ESEP) impact the FAA's readiness to implement NextGen?

Answer. The Engineering Services Efficiencies Plan is specifically designed to position the engineering organization to enhance its ability to support future requirements. NextGen is an increasing component of this expected workload. The implementation of ESEP will allow an increase in our field workforce to improve our ability to manage facility upgrades that will be needed for NextGen in conjunction with our ongoing modernization and sustainment of the existing NAS. In addition, the plan also includes a strategy for centralized design engineering that will enhance our efficiency and capability in this area, enabling us to leverage our existing resources to better meet the challenges of the future. This is standard industry practice.

We are also developing an enhanced training program for incoming engineers to improve our ability to meet increasing needs.

Question 4. What are the FAA's plans for implementing ADS-B in the non-radar areas of the lower 48?

Answer. Remote locations and hostile terrain environments can make it cost prohibitive or even physically impossible to install and maintain a radar site. ADS-B services could be provided at a lower cost and could provide Air Traffic Control (ATC) the ability to use radar-like separation and services to ADS-B equipped aircraft. This will result in a higher IFR arrival acceptance rate, a reduction in departure delays, and increase overall safety. In order to realize the full benefits of increased surveillance capabilities, additional equipment such as communications and automated weather stations may be needed.

The largest area of non-radar airspace that the FAA plans to implement ADS-B is the Gulf of Mexico. This area sees almost as much daily traffic as the busy East-Coast corridor. In addition to commercial carriers flying between the United States and Mexico, there are 5,000 to 9,000 daily helicopter operations to oil rigs. An agreement signed in 2005 between the FAA, Helicopter Association International, oil-platform operators, and helicopter owners is enabling the agency to install ADS-B ground stations on oil platforms, with installation and maintenance transportation provided by helicopter owners. The helicopter owners and operators are voluntarily equipping early with ADS-B-capable avionics. In return, the FAA will provide a range of new services where radar coverage has never been possible.

In addition to the Gulf of Mexico, the FAA plans to provide ADS-B services wherever radar coverage exists today by 2013. Recognizing there may be coverage gaps in certain areas, the FAA, in cooperation with state and local governments, will review these gaps and determine if there are additional areas that may be cost effective to supplement ADS-B coverage. In addition, the FAA plans to work with the Department of Defense (DoD) to explore using ADS-B in Special Use Airspace (SUA).

Question 5. Will the FAA reaffirm its commitment to working with the Alaskan aviation community to accelerate the deployment of ADS-B technology and infrastructure to more fully realize the safety benefits of the Capstone Program?

Answer. The Capstone Project ran from 1999—2007 in Alaska and it demonstrated a 47 percent reduction in aircraft accidents for ADS-B equipped aircraft operating within the Yukon-Kuskokwim (Y-K) Delta area. This was a factor in obtaining additional funding for the deployment of Surveillance and Broadcast Services (SBS) throughout the Nation. The FAA integrated the Alaska Capstone Program into the SBS program in January 2007 to streamline the national ADS-B deployment and accrue safety benefits more quickly in Alaska by accelerating ADS-B deployment in the state.

Since that time, the FAA continued with deployment in Alaska and added services in Anchorage, Fairbanks, Kotzebue, and Cantwell in September 2008—a year ahead of schedule. The agency is continuing to meet its commitment to deploy in the areas of Selawik, Point Hope, Kivalina, Nome, Savoonga, Moses Point, and Shishmaref. Deployment in these areas will be complete by the end of Fiscal Year 2009.

The FAA is fully committed to deploying ADS-B in Alaska and across the Nation. The FAA's SBS Alaska office will maintain communications with the Alaskan aviation community and state officials to address Alaska's unique aviation challenges.

Question 6. What can be done this year to expedite the installation of the ground-based infrastructure for the ADS-B component of this important safety-enhancing system?

Answer. The ADS-B infrastructure deployments cannot be further accelerated in FY2009. The deployment is aggressively proceeding as planned within the scope defined in the baseline. All major program milestones continue to be met. Furthermore, the FAA is utilizing funding provided in FY2008 and FY2009 to expedite aircraft to aircraft applications and 3 nautical mile separation in the en route environment.

Question 7. What is the FAA doing to prepare for the incorporation of Unmanned Aerial Vehicles (UAV) into the NextGen system and the Nation's airspace?

Answer. The integration of Unmanned Aircraft Systems (UAS) poses technical, operational, and regulatory challenges that must be addressed to meet increased demands by both Government and industry for access to the National Airspace System (NAS). These challenges provide unique opportunities to enable future technologies that may very well play an important role in the Next Generation Air Traffic System (NextGen). There are many ongoing supporting activities that focus on immediate, near-term, and long-term objectives and goals. In general, these activities include:

1. Certificates of Waiver or Authorization (COA) and Experimental Airworthiness Certificates to address current needs;
2. Rulemaking activities to enable small UAS commercial operations; and
3. Development of standards for “sense and avoid” and “control and communications” technologies to enable file-and-fly capabilities in the longer term.

The FAA is responsible for ensuring UASs are safely integrated into NAS air traffic control procedures, airport operations, and infrastructure, and with existing commercial, military, and general aviation users of the system. To enable immediate UAS access to the NAS, the FAA reviews applications from Government agencies and private-sector entities on a case-by-case basis. Federal, state, and local government agencies apply for COAs, while private-sector entities apply for Experimental Airworthiness Certificates. In either case, the proposed UAS operation is reviewed and evaluated to ensure the operator has acceptably mitigated all safety risks.

All users of the NAS, including UASs, must be capable of complying with the general operating rules as stated in title 14 of the U.S. Code of Federal Regulations. For full access to the NAS, UASs will need to perform at a level equivalent to manned aircraft operations. Current UASs are unable to comply fully with these requirements, due to undeveloped enabling technologies in the areas of sense and avoid and command and control. The FAA is leading the lengthy standards development process under the auspices of RTCA Special Committee 203. Development for these technologies will be a lengthy, time-consuming, and resource-intensive effort. The need to harmonize these standards both domestically and internationally makes this an even greater challenge.

To address the shorter term industry needs, in early 2008, the FAA established an Advisory Rulemaking Committee (ARC) comprised of members from the UAS industry, aviation associations, and other Government agencies. The ARC was tasked to develop final recommendations to address commercial and private/recreational (remote control model) operations in limited areas of the NAS. These recommendations were submitted to the FAA on April 1 and are anticipated to provide the framework for rulemaking efforts in support of small UAS operations. These regulations will address requirements for certification and operation of small UASs, operator qualifications, and UAS registration. The final rule is expected to be issued in the 2010/2011 timeframe.

Question 8. Does the FAA support the creation of a single program office to facilitate the implementation of NextGen?

Answer. A Senior Vice President was appointed to lead NextGen and Operations Planning in the Air Traffic Organization in May, 2008, so this objective has been accomplished.

Question 9. What steps can the FAA take to better communicate with industry and other stakeholders to ensure that they fully understand the content and objectives associated with implementing NextGen?

Answer. The FAA recognizes that it is imperative to communicate effectively with the stakeholder community to keep it informed of NextGen plans and progress. For example, the Air Traffic Control Assn. which represents many members of the industry involved in air traffic control, hosted a forum in September, 2008 to allow the FAA to hear a broad range of industry views on critical NextGen implementation issues and the community’s needs for the NextGen Implementation plan. As a result of this meeting, the FAA issued a new NextGen Implementation plan this year that answers many of the key questions raised in the ATCA forum. These include what NextGen will look like in 2018, what NextGen will deliver in the mid term (2012–2018), what aircraft avionics equipage needs will emerge through 2018 and what the FAA plans to deploy in the near-term to make the best use of existing resources. In a second initiative to communicate with stakeholders, the FAA has launched the NextGen Implementation Task Force through the RTCA industry forum to tackle the most significant issues surrounding NextGen implementation including how to achieve the most benefits and how to address business investment issues in the mid-term. The FAA looks forward to receiving the Task Force’s consensus recommendations on ways to capture NextGen benefits as early as possible. The group’s final report is due to be complete in August, 2009.

Question 10. What can be done to eliminate confusion over avionics equipment standards for the aviation industry?

Answer. The NextGen Implementation Plan (NGIP) identifies a series of initiatives involving avionics. These initiatives are in varying stages of development, with some already in implementation and others in the initial research and development stages. The FAA recognizes the need to clearly identify the avionics equipment standards for each initiative within NextGen, and has provided a high-level over-

view of standards in appendix A of the NGIP. The majority of avionics standards are developed by industry through the Federal Advisory Committee of the Radio Technical Commission for Aeronautics (RTCA, Inc.)

In the case of transmission of ADS-B data (ADS-B Out), the FAA published a notice of proposed rulemaking in 2008 that will eliminate confusion over the ADS-B transmission standards. We plan to publish the final rule in April 2010.

For reception and use of ADS-B data (ADS-B In), we will publish the standards for situation awareness displays by the end of 2009. The FAA is investigating strategies to accelerate the schedule for more advanced applications, currently scheduled to be completed in 2012.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JOHN ENSIGN TO
HANK KRAKOWSKI

Question 1. I believe that moving from a ground-based national airspace system (NAS) to one based on satellite technology is a critical development for aviation. Redundancy within the NAS is crucial to maintain a consistent and high level of safety and to avoid unnecessary delays. Compared to ground facilities, however, satellites are much harder to service, repair, or replace. What steps is FAA taking to ensure sufficient redundancy within a GPS-based NextGen environment? What is the vulnerability of such a system to space events like solar flares that currently disrupt other satellite activities?

Answer. Moving to a National Airspace System (NAS) based on satellite technology provides a significant improvement in performance for aviation, as well as new technical issues and vulnerabilities. Satellite-based navigation relies on the global positioning system (GPS) and the wide area augmentation system (WAAS) for vertically guided approaches down as low as 200 feet above a runway. The GPS constellation and the leased geostationary satellites used for WAAS are redundant and highly reliable. Solar flares and ionosphere disturbances do cause temporary outages of vertical guidance over short periods during the 11 year solar cycle. The FAA plans to eliminate these outages by including the new GPS L5 signal into WAAS in concert with the GPS modernization program, underway by the United States Air Force. The FAA also plans to retain a portion of the ground based navigation and surveillance systems to provide a backup for area navigation and surveillance to avoid unnecessary delays or disruptions to the air traffic system. Radar will be used as an initial backup. As articulated in the January 2007 Surveillance/Positioning Backup Strategy Alternatives Analysis Final Report, the FAA will reassess the ADS-B backup strategy prior to making an investment decision for radar replacements beyond 2020. This may provide a differing approach based upon the additional operational experience gained with ADS-B and emerging technologies that are deployed, such as Galileo, the satellite navigation system, and GPS-3, which could support an alternate backup.

Question 2. As the FAA repairs and maintains its outdated infrastructure, is the FAA taking steps to ensure that existing facilities can easily and efficiently be reconfigured in the future for NextGen technology? If so, what are those steps?

Answer. The FAA is working to address future NextGen facilities capabilities on a number of fronts. Current facilities will be upgraded to accept NextGen capabilities as they are deployed in the near term. In the meantime, the FAA is exploring future concepts for NextGen facilities. In addition, by developing and implementing the NextGen Voice Switch, facilities will have the flexibility to respond to increased demand and continuity of service needs.

Question 3. Several years ago, NextGen was estimated to cost \$40 billion—\$20 billion for infrastructure and \$20 billion for airlines. Is there a more recent cost estimate?

Answer. A special JPDO/Industry team estimated the range from \$15 to \$22 billion for the development of NextGen. This range of figures is just for capital expenditures, not life cycle costs. A similar range has been cited for the cost of avionics. These preliminary figures were based on rough estimates and a great deal of NextGen system definition work has occurred since then. Estimates now under development represent a much more structured and verifiable cost estimating process. All known NextGen programs and activities are being identified, their costs gathered or developed, adjustments (in terms of program maturity) are being applied, and then the overall data is being evaluated for completeness. There will also be sensitivity analysis to account for changes in the aviation environment, demand, and funding levels. On this basis, it will be possible to apply useful confidence levels to programs with known requirements. It should be noted that requirements for many key NextGen programs such as Data Communications and System Wide In-

formation Management as well as requirements for a common automation platform have not been established. This means that a final, highly accurate cost estimate will not be available until these programs have fully developed requirements.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. JOHN D. ROCKEFELLER IV
TO DR. GERALD L. DILLINGHAM

Question. Several industry stakeholders have called for the development of clear performance metrics to track the modernization of the ATC system. Further, stakeholders have noted these metrics should focus on the performance of the ATC system, not FAA activities. What special metrics does GAO believe should be used to track the FAA's progress in modernizing the ATC system?

Answer. We agree that it is critical to have clear and transparent metrics to manage and track the implementation of NextGen. You can't manage what you can't measure. Metrics are important to manage any system, but especially one of NextGen's size and complexity. The transformation from the current radar-based air navigation system to the satellite-based NextGen will require the cooperation and participation of multiple stakeholders, including four cabinet-level agencies and other Federal organizations, commercial and general aviation, and aircraft and avionics manufacturers. In addition, integrating a new technology or new procedures into the National Airspace System requires coordination within several FAA lines of business. For example, a change in procedures that would allow the use of closely spaced parallel runways at airports, which could in turn increase capacity and efficiency, would require coordination among FAA units to develop the appropriate standards, procedures, and regulations; the aviation safety unit, which will need to certify the safety of the procedures; and controllers and pilots, who will need to be trained. All of this must take place before the new procedures can be implemented.

Through our work, which has included interviews with key stakeholders, we have found a consensus emerging that the transformation to NextGen should focus first on implementing capabilities that are available in the relative near-term and mid-term (2012–2018), and can help address the current system's capacity and efficiency challenges. We agree with those stakeholders who say that the metrics should focus on "outcomes" rather than process. A focus on outcomes is particularly important to demonstrate to the airlines that they will derive real benefits from purchasing and installing NextGen avionics on their aircraft. Furthermore, as early-adopting airlines start to equip their aircraft with those avionics, identifiable returns on investment, such as operational benefits and cost savings, will be important to create further incentives for other airlines to equip their aircraft. Therefore, specific metrics should be developed to measure the impact of specific improvements introduced in the National Airspace System. Such metrics could include reductions in jet fuel consumption associated with specific system operational improvements, increases in the number of take-offs and landings during bad weather, reductions in flight times for NextGen-equipped aircraft, or reductions in delays attributable to NextGen-enabled capabilities at specific airports.

At the request of this Committee and other Congressional Committees, we are planning to begin a study on the development and use of appropriate metrics for measuring progress in the implementation of NextGen capabilities.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK BEGICH TO
DR. GERALD L. DILLINGHAM

Question 1. Does GAO support the creation of a single program office to facilitate the implementation of NextGen?

Answer. During our work for this Committee, industry and some government stakeholders often advocated the creation of a single program office because this organizational structure is familiar to them. For example, when Boeing decides to build a new aircraft, it establishes a program office. The program office is given responsibility, authority, and a budget for all aspects of the aircraft program. The National Aeronautics and Space Administration adopted a similar structure for the moon landing program, establishing a program office with responsibility and accountability for achieving the mission.

We agree that having a single office in charge of NextGen would have many advantages. For example, it would help to create clear accountability for outcomes and encourage the establishment of clear lines of communication with the numerous stakeholders involved in NextGen. FAA's recent reorganization reflected an effort to put a single office in charge of NextGen. According to the Chief Operating Officer of the Air Traffic Organization, there is now one "team" with one person in charge

to plan, implement, and oversee NextGen. That one person is the Senior Vice President for NextGen and Operations Planning. However, as we have recently reported, this position does not have budget authority over several key NextGen projects and is not as highly placed within FAA's organization as other FAA executives with responsibilities for NextGen-related activities who are Associate Administrators. Furthermore, this reorganization—along with the creation under Executive Order 13479 of a new support staff for the Senior Policy Committee within the Office of the Secretary—has led to significant uncertainty about the roles and responsibilities of the Director of the newly created support staff, the Senior Vice President, the Director of the Joint Planning and Development Office, and other advisory bodies associated with NextGen.

One option to address concerns about the current organizational structure for NextGen would be to create an Associate Administrator for NextGen. Establishing this new position would elevate the NextGen program office in FAA's organizational structure. However, further reorganization could be disruptive and likely to result in uncertainties as new roles and responsibilities created by the reorganization are defined and agreed upon. Therefore, we believe that the outcomes of the current organizational structure are of more immediate concern than the structure itself. In our view, the focus should be on the extent to which the current structure results in the implementation of operational capabilities that alleviate capacity constraints and system inefficiencies and deliver agreed-upon outcomes.

Question 2. What steps can the FAA take to better communicate with industry and other stakeholders to ensure that they fully understand the content and objectives associated with implementing NextGen?

Answer. FAA has begun to improve communications with stakeholders by issuing an implementation plan that strikes a better balance between providing technical information and responding to stakeholders' concerns that earlier iterations of plans were overly technical. In addition, FAA has developed detailed roadmaps that identify next steps and establish timelines for their completion. These documents differ from earlier NextGen planning documents, such as the concept of operations and enterprise architecture, which many stakeholders said were not very useful for their understanding and planning. However, some stakeholders told us they remain frustrated because the NextGen planning documents still lack any clear commitments from FAA.

Another step in the right direction is FAA's establishment of the NextGen Midterm Implementation Task Force to focus on "NowGen" development. This task force, which is to include representatives of all relevant stakeholder groups, is charged with identifying those technologies and capabilities that can be implemented in the relative near term and midterm and showing airlines how they can develop business cases for accelerating efforts to equip their aircraft to achieve those capabilities. FAA has also increased opportunities for representatives of its largest labor unions to participate in the planning of NextGen and has promised further outreach. For example, going forward, participation in the task force would allow these groups to have input at a key early stage of implementation. In addition, the resolution of labor issues has been identified as a top priority of the new FAA leadership. To move forward, both FAA and the unions must recognize the value of setting aside differences and working together to implement the vision of NextGen and realize its promised benefits. However, given longstanding difficulties related to this issue, we believe further monitoring by and consultation with Congress are warranted.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JOHN ENSIGN TO
DR. GERALD L. DILLINGHAM

Question 1. We have been talking about or planning NextGen modernization for about 7 years now and we are still working on the plans. What do we need to do so that 7 years from now we can be here talking about the substantial progress that we have made and the improvement in the safety, efficiency, and capacity of the National Airspace System?

Answer. To ensure that it moves from planning to progress, FAA must identify the operational capabilities that can be achieved with currently available technologies and procedures and develop the validations, certifications, rules, and other efforts needed to deploy those technologies and procedures in a timely manner. Known as "NowGen," this effort usually refers to capabilities FAA plans to implement between 2012 and 2018. Concurrently, FAA will need to ensure that pilots, controllers, and technicians receive the training necessary to implement the new capabilities. FAA's creation of the NextGen Midterm Implementation Task Force is a

key first step toward implementing NowGen. Charged with identifying critical near-term and midterm capabilities and developing a consensus among industry stakeholders, the task force plans to issue recommendations to FAA, that FAA must then follow through on to ensure that the identified capabilities can be deployed quickly, safely, and efficiently. To the extent that it measures outcomes achieved, such as increases in efficiency and capacity, rather than processes completed or actions taken, FAA will be able to demonstrate the results of its efforts to Congress and the public.

To deploy the new capabilities identified by the task force, airlines will need to equip their aircraft with the necessary avionics. However, as we have reported, airlines face a number of disincentives to early investment in new technologies. Therefore, FAA must develop specific strategies for airlines and other users of the national airspace system (NAS) to invest as early as possible in the necessary avionics equipment. FAA has outlined principles that will govern its efforts to accelerate equipage. These principles include providing operational benefits to early adopters of new technologies (the “best-equipped, best-served” concept) and possibly using financial incentives to minimize the business risk for airlines. However, FAA must now develop specific plans for realizing such operational benefits in the NAS, identify their potential magnitude, and specify how the financial incentives will be structured.

Question 2. Stakeholder involvement in NextGen is absolutely critical to its success. How well is FAA including stakeholders, including air traffic controllers, in NextGen decisions? Are there any obstacles to stakeholder cooperation that need to be addressed or eliminated?

Answer. FAA has recently made some progress in including air traffic controllers and technicians. For example, it has used active controllers as subject matter experts and allocated seats on the NextGen Management Board to representatives of both the controllers’ and the technicians’ unions. Controller union officials have likewise reported participating in several NextGen planning and decision-making groups. However, officials from both unions have continued to express concerns that their unions are not involved in selecting the subject matter experts that participate in NextGen activities and that their involvement in NextGen efforts remains limited. In our view, long-standing labor issues continue to prevent FAA from involving these key groups more extensively and limit these groups participation in NextGen activities. Recent direction from the Chairmen and Ranking Members of the Senate Commerce Science and Transportation Committee and its Aviation Subcommittee to the unions and FAA that they find a way to work together for the greater good could, if implemented, contribute to easing tensions between labor and management at FAA.

Going forward, participation in the NextGen Midterm Implementation Task Force, which is designed to build stakeholder consensus, would allow these groups to have input at a key early stage of implementation. In addition, the resolution of labor issues has been identified as a top priority of the new FAA leadership. To move forward, both FAA and the unions must recognize the value of setting aside differences and working together to implement the vision of NextGen and realize its promised benefits. However, given the long-standing difficulties related to this issue, we believe further monitoring by and consultation with Congress are warranted.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK BEGICH TO
JOE KOLSHAK

Question 1. If the necessary infrastructure were in place, how soon could the airline industry equip commercial aircraft with NextGen Avionics?

Answer. Through leadership and investment by the Federal Government, ADS-B and other proven air traffic technologies, such as RNP/RNAV, GBAS and Electronic Flight Bags, could be deployed, and the resulting benefits to the traveling public, the environment and the Nation’s economy could be delivered in the next 3–4 years.

Question 2. In your opinion, would the airline industry support the creation of a single program office to facilitate the implementation of NextGen?

Answer. Yes. Because of its complexity, scope, and national importance, we believe NextGen demands a single program office to provide necessary leadership and ensure success.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. JOHN ENSIGN TO
JOE KOLSHAK

Question. ADS-B is a cornerstone technology for NextGen. While FAA plans to mandate “ADS-B Out,” the majority of airspace user benefits and costs are associated with “ADS-B In” and cockpit displays. From your company’s perspective, what needs to be done to facilitate the quick deployment of these technologies?

Answer. Current plans call for deployment of ground-based infrastructure by 2013 and mandatory aircraft equipage by 2020. This plan delays the benefits of air traffic modernization, including better customer service, reduced greenhouse gas emissions and overall economic improvement, for far too long. Through leadership and investment by the Federal Government, ADS-B and other proven air traffic technologies should be accelerated, and the resulting benefits to the traveling public, the environment and the Nation’s economy could be delivered in the next 3–4 years. The U.S. Government should finance and provide incentives for ADS-B avionics equipage across air transport, general aviation, government and DoD aircraft to accelerate deployment and assure maximum return on investment for taxpayers and system users. There are various ways to make equipage more affordable, including general fund stimulus, incentives, leasing, and other creative financing techniques. In addition, procedure improvements such as “best-equipped, best served” and reduced separation standards will help to deliver benefits sooner and improve the business case for accelerated equipage.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARK BEGICH TO
DALE WRIGHT

Question 1. From NATCA’s position, how many more Air Traffic Controller positions are needed to adequately support our Nation’s airspace?

Answer. In 1998, the FAA and NATCA jointly authorized a staffing standard derived from scientific formula which took into account time and motion studies, sector complexity and workload, number of operations on the 90th percentile day, and relevant non-operational activities (*i.e.*, training, leave). As part of its Controller Workforce Plan, the FAA abandoned these scientifically-based allocations and established staffing ranges for each air traffic control facility, which it modified slightly in 2008. These ranges represented a reduction in controller staffing of between 20 and 25 percent across the system.

Rather than basing its staffing goals on an accurate and precise scientific assessment of each facility’s requirements for safe operation, the FAA has designed these ranges in order to deliberately mislead stakeholders about the staffing crisis currently facing the air traffic control system in this country. They were designed in order to meet specific budget goals, with regional directors identifying the number of air traffic control positions it could fund at each facility and remain within its fixed budgets.¹ NATCA has reason to believe that the FAA’s official staffing ranges were engineered by the Air Traffic Organization (ATO) Finance office, rather than the ATO Safety Office based on a memo written by the workforce staffing manager, Jodi McCarthy.²

The FAA attempted to justify this budget-based staffing standard by presenting a pseudo-scientific justification for its staffing numbers in its controller workforce plan. The FAA’s reasoning is based on an average of the following:

1. Scientific Data—The FAA does not specify which study this refers to, who conducted it, or whether the study was conducted by an unbiased third party. It has thus far refused to provide NATCA with the details of the study parameters or the results.
2. Current staffing at peer facilities—As the entire system is suffering the same staffing shortage, peer facilities will be equally understaffed. Therefore using these as a basis of comparison yields a dangerously low standard.
3. Past staffing lows—The FAA misleadingly refers to this comparison as the past year of “highest productivity.” However, it goes on to define productivity as the highest number of operations per controller—or the year when the fewest controllers were relied upon to control the largest amount of traffic—without taking into account error rates, delays, or effect on the work force. By using this

¹ Letter from FAA Regional Administrator Christopher R. Blum, Central Region, to Congressman Dennis Moore. February 22, 2006.

² Untitled memo from Jodi S. McCarthy, ATO–T Finance, Manager, Workforce Staffing. Received February 28, 2007 on the topic of the Staffing ranges featured in the 2007 Controller Workforce Plan.

definition of productivity the FAA is selecting a dangerously low staffing number as a standard again.

4. Managers' advice—The FAA misleadingly refers to this as “service unit input.” This input did not include input from NATCA and came entirely from within FAA management ranks who are under pressure to conceal the extent of the staffing shortage and assure Congress and the flying public that all is under control. Therefore this too is likely to yield a dangerously low and inaccurate estimate of needed staffing.

NATCA recognizes that circumstances have changed since 1998. There have been some technological advances, changes in traffic flow, increases or decreases in service at particular airports or facilities, and changes in facility alignments and boundaries. There is also an increased training burden on the workforce as a result of the current staffing crisis. All of these affect the staffing needs of the both the system as a whole and individual facilities. As a result we are not comfortable giving concrete estimate for the number of additional controllers needed to safely and efficiently support the National Airspace System (NAS). Rather we would like to see a new scientific study, conducted by an independent 3rd party, preferably the National Academy of Sciences, in an open and transparent manner that would again be able to provide a scientific basis for the systems air traffic controller staffing needs. The FAA and NATCA would then be able to utilize this scientific study to work together to develop a staffing standard that is designed to meet the needs of the NAS.

Question 2. Does NATCA support the creation of a single program office to facilitate the implementation of NextGen?

Answer. NATCA does support the creation of a single program office that would facilitate the development and implementation of NextGen. It is important that NextGen be developed in a way that comprehensively considers and addresses the impact changes would have on the system as a whole. The piecemeal approach that the FAA has used for realignment initiatives and airspace redesign has yielded problematic results that have compromised the safety of the system and the efficacy of the projects. A single program office would be better positioned to ensure a holistic approach to this major modernization undertaking.

Furthermore, a single program office would enable accountability for NextGen. This office must have the authority to do what is necessary to ensure that NextGen initiatives remain within budget and on time, without compromising safety or effectiveness of the projects.

Lastly, this office must serve as the point of contact for stakeholders. Stakeholders in general, and NATCA in particular must be given the opportunity to meaningfully collaborate on NextGen from development through implementation. NATCA's members are frontline workers who are able to provide vital insight to help the team identify and address human-interface issues and other concerns. Doing so on the front-end rather than during implementation will save the agency time, taxpayer money and resources while avoiding potential damage to the integrity of the air traffic control system. Because NATCA's members have an intimate understanding of frontline air traffic control, they are uniquely qualified to provide insight into the needs of the system, the utility of the FAA's proposed technology, and the usability of the products included under the NextGen umbrella. It is therefore important that stakeholders collaborate directly with this single NextGen program office, in order to minimize the chance of miscommunication.

RESPONSE TO WRITTEN QUESTION SUBMITTED BY HON. MARK BEGICH TO
T. K. KALLENBACH

Question. Do manufacturers have enough information on NextGen avionics equipment standards to produce the necessary equipment and instrumentation necessary for the aviation industry?

Answer. As I mentioned in my testimony, there are a number of NextGen capabilities ready for implementation today including Required Navigation Performance (RNP), GPS Ground-Based Augmentation System (GBAS), Automatic Dependent Surveillance—Broadcast (ADS-B) “OUT”,¹ and Continuous Descent Arrivals (CDA). For these capabilities, manufacturers have sufficient information on standards, and in most cases, already have solutions developed and ready to be deployed. These ca-

¹ADS-B “OUT” is the capability to broadcast position and identification information off of the aircraft for use by the ground ATC system or other aircraft.

pabilities go a long way toward improving the performance of our air transportation system in the near and mid-term.

However, more capabilities are needed to stay ahead of air traffic demand and fully implement the NextGen system. Follow-on capabilities, including ADS-B “IN”² and associated applications, data link communications, and full 4-dimensional flight plans, require additional definition before manufacturers are able to develop solutions. It is important that this definition work be accelerated, in parallel with the deployment of the already developed NextGen capabilities (above). With parallel deployment and standard development efforts, we can ensure the next wave of follow-on capabilities is ready to go when needed, and that they will efficiently support on-going air transportation system growth.



²ADS-B “IN” is the capability to receive position and identification information from other aircraft or surface vehicles for use by the flight crew on the aircraft.