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March 10, 2009

The Honorable Jerry Costello  
Chairman  
Subcommittee on Aviation  
Committee on Transportation and Infrastructure  
House of Representatives

Subject: *Responses to Questions for the Record: February 11, 2009, Hearing on the FAA Reauthorization Act of 2009*

Dear Mr. Chairman:

This letter responds to your request that we address questions submitted for the record related to the February 11, 2009, hearing entitled *FAA Reauthorization Act of 2009*. Our attached responses to these questions are based on updates to our previous work (see enc. 2) and our knowledge of the areas addressed by the questions.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 10 days after its issuance date. At that time, we will send copies of this report to the Acting Administrator, Federal Aviation Administration. We will make copies available to others on request. The report will also be available on GAO's Web site at [www.gao.gov](http://www.gao.gov).

If you have any questions or would like to discuss the responses, please contact me at (202) 512-2834 or [dillingham@gao.gov](mailto:dillingham@gao.gov).

Sincerely yours,

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

Enclosures

**February 11, 2009**  
**Subcommittee on Aviation**  
**Hearing on**  
**FAA Reauthorization Act of 2009**  
**Questions for the Record**

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

- 1. Dr. Dillingham, in your written testimony you state that the FAA will need to work with the stakeholders to explore a range of potential options available to provide incentives to purchase equipment and to suppliers to develop that equipment. You further state that these options could include some combination of mandated deadlines, operational credits, or equipment investment credits that financially support equipment implementation for a limited initial set of aircraft operators. Please define what you mean by “operational credits” or “equipment investment credits” and explain how they might be used.**

RESPONSE: The next generation air transportation system (NextGen) includes the policies, procedures, and equipment that will allow satellite-based navigation in the national airspace system. However, this system’s ability to meet forecasted traffic volumes also depends on aircraft being equipped to take advantage of NextGen capabilities. Purchase incentives could encourage carriers to equip their aircraft as soon as the Federal Aviation Administration (FAA) makes the procedures for operating in a NextGen environment available. Traditionally, FAA mandates the equipage of aircraft and provides several years for operators to comply. For a variety of reasons, some operators do not equip until the deadline for equipping is near. FAA has proposed an option to incentivize early equipage. It is referred to as “best-equipped, best-served.” Under this option, FAA would offer those aircraft operators who choose to equip their aircraft as soon as possible with various operational benefits, such as preferred airspace, routings, or runway access.

Another option, conceptualized by a Boeing air traffic management expert, is a type of “reverse auction” in which federal investment tax credits would be combined with operational benefits. Under this option, the carriers would bid for a level of investment credits in exchange for equipping a particular number of aircraft within a specified early time frame. The value of the investment credit would decrease as the auction proceeded. Those aircraft that were equipped would then operate under the best-equipped, best-served option. The Boeing expert has acknowledged that the total resources needed to pay for such tax credits would be quite large if the credits were extended to all carriers. However, he acknowledged that if the tax credit were extended only to a “critical mass” of carriers—for example, the first third of the carriers—the costs would be about \$750 million annually. He further stated that if the auction drove down the price by a third, the costs could be about \$500 million a year. But these costs would be over and above what FAA’s Air Traffic Organization (ATO) would already be spending on its own

equipment, facilities, and training. In any case, the proposal could only be implemented if Congress were to find some additional large source of funding for the tax credits.

**2. Dr. Dillingham, in your written testimony you state that the FAA has entered into agreements with private sector firms to conduct NextGen technology demonstration projects. Please provide the Subcommittee with a list of these projects.**

RESPONSE: FAA’s NextGen demonstration projects for fiscal year 2009 are listed in the following table. Some projects are in the early planning stages and the partners have not been selected yet; other projects continue from previous years.

<b>Project</b>	<b>Description</b>	<b>Location</b>	<b>Partners</b>
Surface Traffic Management	Provide situational awareness information to and data exchange among airport stakeholders using technology such as Airport Surface Detection Equipment-Model X (ASDE-X) to support new decision support tools.	Memphis, John F. Kennedy, and Orlando airports	Airport authorities, FedEx, and Northwest Airlines
Surface Conformance Monitoring	Begin to link the movement of aircraft on the surface between air traffic control and future cockpit moving map displays.	TBD	TBD
Arrival Management (Continuous Descent Arrivals, Tailored Arrivals)	Use integrated automation tools and data communication to provide a cleared trajectory path, which is transferred to the aircraft and flown by the flight management system.	Miami, Charlotte, Atlanta, Los Angeles, Charleston (SC), and San Francisco airports	NASA Ames, Boeing, Sensis, American Airlines, Delta Airlines, U.S. Air Force Mobility Command, Georgia Institute of Technology, MITRE Corporation, and foreign carriers
Three-dimensional Path Arrival Management (3D-PAM)	Will provide, at high-density airports, a means to achieve accurate, predictable, and fuel-efficient routes, which are designed to decrease controller and pilot workload, as well as decrease adverse environmental impacts (emissions and noise) while potentially enhancing airport throughput.	Denver	NASA Ames, Boeing
Ground Based Augmentation System (GBAS)	Initially define and test Area Navigation/ Required Navigation Performance (RNAV/RNP) approach routes into and out of Teterborough, and separate Teterborough traffic from Newark’s traffic. Operational demonstrations will be conducted using satellite navigation (SATNAV) technology in a complex environment to assist in identifying and implementing RNAV/RNP operations for performance-based navigation.	Newark and Teterborough airports	NY Port Authority and Continental Airlines
Oceanic Trajectory Based Operations (AIRE and ASPIRE)	Demonstrate potential benefits for oceanic trajectory optimization in terms of fuel savings and emissions reductions.	Atlantic and Pacific Oceans (beginning in fiscal year 2010) operational areas	Boeing; CSSI, Inc.; MITRE Corporation; American Airlines; foreign carriers and European partners

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<b>Project</b>	<b>Description</b>	<b>Location</b>	<b>Partners</b>
International Flight Data Object (IFDO)	Conduct research, development, and laboratory proof of concept of IFDO exchange using collaborative flight planning capability for oceanic and en route air traffic services.	Daytona Beach airport	Lockheed Martin, Computer Sciences Corporation, Boeing, Harris, Adacel, and Nav Portugal
Four-Dimensional Flight Management System	One of a series of joint demonstration projects aimed at promoting global air traffic control leadership and collaboration with research and development activities in other countries.	TBD	TBD
Unmanned Aircraft Systems (UAS)	Examine potential for widespread integration of UASs into the future NextGen environment.	Kennedy Space Center	AAI Corporation, General Atomics, and GE
Network Enabled Operations Program	Develop and leverage network information technology to provide an agile, highly connective network for net-centric shared situational awareness.	TBD	TBD
Staffed NextGen Towers	Provide surface and tower services without the requirement for direct visual observation by air traffic control personnel from an airport tower cab.	TBD	TBD
Weather Integrated into Traffic Management Advisor and En Route Automation Modernization	Research, evaluate, and demonstrate NextGen concepts, procedures, technologies, and capabilities. Initial demonstration to show the incorporation of convective weather data into the Traffic Management Advisor tool to better maintain airport arrival rates.	Daytona Beach airport	Embry-Riddle Aeronautical University; Lockheed Martin; Computer Sciences Corporation; ENSCO, Inc.

Source: GAO analysis of FAA documents.

### **3. Dr. Dillingham, GAO recently took the FAA’s air traffic control modernization program off its “high risk” list. With regard to this distinction, please provide me with answers to the following questions:**

#### **a. Does GAO draw a distinction between the FAA’s ATC modernization program and the Next Generation Air Transportation System (NextGen) effort? If so, please explain the distinction?**

RESPONSE: Yes, GAO draws a distinction between air traffic control (ATC) modernization and NextGen. The ATC modernization program, which was placed on GAO’s High-Risk List in 1995, focused primarily on the acquisition of ATC systems. Key projects within that modernization program experienced cost overruns, schedule delays, and performance shortfalls that affected FAA’s ability to deliver systems as promised. GAO removed FAA’s ATC modernization program from the High-Risk List in January 2009<sup>1</sup> because of the agency’s progress in addressing most of the root causes of its past problems and its commitment to sustaining progress in the future.

NextGen is a total transformation of the air transportation system. NextGen represents a paradigm shift from air traffic control to air traffic management. It is a shift from ground-based radar control of aircraft to a satellite-based, aircraft-centric national airspace system. NextGen includes the acquisition of some new systems, but it also involves the

<sup>1</sup>GAO, High-Risk Series: An Update, [GAO-09-271](#) (Washington, D.C.: January 2009).

integration of “legacy systems” with those new systems, along with the development of policies and procedures that will enable a safe expansion of system capacity and efficiency to meet projected traffic demands by 2025. For example, the implementation of Automatic Dependence Surveillance-Broadcast (ADS-B) technology is designed to enable greater use of existing performance-based navigation techniques, which in turn would lead to a greater number of more efficient, more environmentally-friendly aircraft operations.

NextGen also differs from ATC modernization in its organizational structure. The implementation of NextGen extends beyond FAA’s ATO, which was almost solely responsible for ATC modernization, to other lines of business such as Airports, Safety, and Environment. Additionally, NextGen includes cooperative relations among FAA; the Departments of Transportation, Defense, Homeland Security, and Commerce; the National Aeronautics and Space Administration (NASA); and the White House Office of Science and Technology Policy. It also includes nonfederal aviation stakeholders, such as aircraft and avionics manufacturers, air carriers, airports, and aircraft operators.

**b. Does GAO deem NextGen to be a “high risk” effort? If not, why not?**

RESPONSE: While NextGen is a high-risk effort because of its dollar cost and complexity, it is not currently on GAO’s High-Risk List. NextGen has only recently begun to move from the planning stage to implementation. As we noted in our 2009 High-Risk update, we plan to closely monitor FAA’s efforts to implement NextGen as the program continues to mature. At the request of this Subcommittee, we will be monitoring NextGen’s implementation and regularly updating the Subcommittee. Therefore, NextGen will be receiving the scrutiny that any high-risk program would receive and will be evaluated against criteria set out in our guidance document *Determining Performance and Accountability Challenges and High Risks*.<sup>2</sup>

**4. GAO has previously reported that FAA briefed the industry on preliminary near-term costs for NextGen in April 2006 and this preliminary estimate provided approximately \$1 billion more through 2012 than FAA’s most recent 5 year capital investment plan (CIP) for FAA facilities and equipment. If Congress were to provide the level of funding outlined in the FAA’s preliminary estimate, approximately \$1 billion more through 2012 than the most recent CIP, would it help to accelerate the development and deployment of NextGen?**

RESPONSE: Yes, if Congress provided FAA with additional funding, that funding could be applied to a variety of projects and initiatives that would help to accelerate the development and deployment of NextGen. We discuss the specific research, development, and deployment that could be undertaken should Congress provide additional funding in my response to a question below.

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<sup>2</sup>GAO, *Determining Performance and Accountability Challenges and High Risks*, [GAO-01-159SP](#) (Washington, D.C.: November 2000).

**5. Would additional Facilities and Equipment funding help to bridge the so-called NASA gap? In other words, could it be used for the type of intermediate development and demonstration projects that NASA would no longer fund?**

RESPONSE: In the past, NASA conducted a significant portion of aeronautics research and development but the funding for those efforts declined when NASA's aeronautical research portfolio was restructured to focus more on fundamental research. Meanwhile, budget requests for FAA's NextGen-related research and development have increased in recent years to address the gap that resulted from both the previous administration's cuts to NASA's aeronautics research funding and the expanded requirements of NextGen. Nonetheless, our work has identified areas that would benefit from additional research and development, such as the environmental impact of aviation, human factors, and other areas that are discussed further in my response to the question below. Additional research and development in such areas is critical for the timely implementation of NextGen and could benefit from additional funding, should Congress decide to provide it.

**6. Would you cite additional research, development and deployment that could be done with funding over and above FAA's capital investment plan funding levels?**

RESPONSE: While we have not evaluated the full merits of providing additional funding, additional research, development, and deployment could be undertaken or accelerated in several areas with funding over and above the level provided in FAA's 2009 through 2013 CIP. Through our work, we found two closely related areas that are critical and time-sensitive for the implementation of NextGen and could be candidates for increased funding—avionics development and aircraft equipage. Additional support in these areas could accelerate the transition to satellite-based navigation, which requires the commercial fleet to be equipped with advanced avionics. This transition would allow FAA to pursue the elimination of costly ground-based navigation aids; the transition to data link; and the standardization of future aircraft capabilities such as flight management systems, traffic collision avoidance systems, and modular avionics.

The development and deployment of NextGen will require a series of incremental changes that must be demonstrated and tested to help ensure that they do not degrade the safety of current systems. Developing the evidence for regulatory bodies and for the public that these incremental changes are safe will be time-consuming, costly, and difficult. For example, additional development funding could help with the testing of a system in which pilots and air traffic controllers share in decisions about the aircraft's flight path. Such a system would increase the level of safety assurance for en route and terminal automation and support the acquisition of air-to-ground data communications to support trajectory negotiation.

Our research has shown that human factors is another area that could benefit from additional funding. As we have previously reported, one of the principal changes under NextGen will be a transformation from air traffic control to air traffic management. This

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will mean new roles for all participants in the system, including air traffic controllers and pilots. Additional funding could accelerate human factors research and training initiatives that are central to the success of NextGen, such as initiatives defining the relative responsibilities of aircraft personnel and ground controllers, and modernizing controller training through the use of advanced simulation and intelligent tutoring tools.

According to FAA officials we interviewed, research and development for advanced concepts and applications could also be strengthened and accelerated in the area of airborne applications. This research could include spacing and merging approaches, including optimizing the spacing of aircraft that are in flight, allowing for closely spaced parallel approaches and reduced separation standards, and addressing wake turbulence. Additional funding could allow for limited field trials to refine operational and system requirements, and work could be done to integrate unmanned aerial systems into the national airspace system. Establishing supporting processes for rulemaking and software certification could also accelerate the removal of potential bottlenecks to implementing NextGen.

**Related GAO Products**

*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.

*Next Generation Air Transportation System: Status of Key Issues Associated with the Transition to NextGen.* [GAO-08-1154T](#). 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.

*Responses to Questions for the Record; Hearing on JPDO and the Next Generation Air Transportation System: Status and Issues.* [GAO-07-918R](#). Washington, D.C.: May 29, 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.

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