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United States Government Accountability Office  
Washington, DC 20548

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May 30, 2007

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

Subject: *Responses to Questions for the Record; Hearing on the Future of Air Traffic Control Modernization*

Dear Chairman Costello:

This letter responds to your May 10, 2007, request that we address questions submitted for the record related to the May 9, 2007, hearing entitled *The Future of Air Traffic Control Modernization*. Our answers to your questions are attached. Our responses are based on our previous work,<sup>1</sup> preliminary results of ongoing work, and our knowledge of the areas addressed by the questions. We prepared our responses during May 2007 in accordance with generally accepted government auditing standards. Because our responses are based on our previously issued products for which we sought and incorporated agency comments, as well as updates that we obtained through interviewing FAA officials and reviewing their documentation, we did not seek agency comments on our responses to these questions.

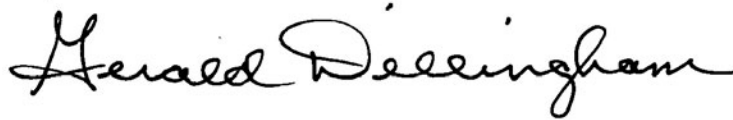
We are sending copies of this letter to the Administrator, Federal Aviation Administration, and the Director, Joint Planning and Development Office. We will make copies available to others on request. This letter is also available on GAO's Web site at [www.gao.gov](http://www.gao.gov).

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<sup>1</sup> GAO, *Next Generation Air Transportation System: Status of the Transition to the Future Air Traffic Control System*, [GAO-07-784T](#) (Washington, D.C.: May 9, 2007); *Joint Planning and Development Office: Progress and Key Issues in Planning the Transition to the Next Generation Air Transportation System*, [GAO-07-693T](#) (Washington, D.C.: Mar. 29, 2007); *Federal Aviation Administration: Key Issues in Ensuring the Efficient Development and Safe Operation of the Next Generation Air Transportation System*, [GAO-07-636T](#) (Washington, D.C.: Mar. 22, 2007); and *Next Generation Air Transportation System: Progress and Challenges Associated with the Transformation of the National Airspace System*, [GAO-07-25](#) (Washington, D.C.: Nov. 13, 2006).

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

Sincerely yours,

A handwritten signature in black ink that reads "Gerald Dillingham". The signature is written in a cursive style with a large, prominent initial "G".

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

Enclosure

***Responses to Post-Hearing Questions for the Record  
“The Future of Air Traffic Control Modernization”***  
**Subcommittee on Aviation  
Committee on Transportation and Infrastructure  
U.S. House of Representatives  
Hearing held on May 9, 2007**

**Questions for Dr. Gerald L. Dillingham, Director  
Physical Infrastructure Issues  
U.S. Government Accountability Office**

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**Questions for the Record Submitted by Chairman Jerry F. Costello**

- 1. Several stakeholders and other observers have suggested that JPDO is at a juncture wherein its current organizational structure and operating procedures should be revisited. The suggestions have ranged from the idea that JPDO should cease to exist as soon as it publishes its primary planning documents to the idea that it should become more autonomous, with more authority and budgetary control.**
  - a. How long should JPDO continue to exist, and if it should continue to exist, in what ways should its role and responsibilities with regard to NextGen change?**

JPDO was established to plan and coordinate the development of the next generation air transportation system (NextGen) and should exist for the duration of those tasks. The basic planning documents that JPDO is developing for NextGen are near completion, but further iterations of these planning documents will be needed as NextGen technologies are developed and implemented. With NextGen’s progression from the initial planning to the early implementation phase, JPDO’s role has evolved to include coordination and facilitation activities, as well as planning activities. GAO believes this is a reasonable evolution and a proper role for JPDO and is consistent with the language of JPDO's authorizing legislation.

One example of this evolution is the role JPDO has begun to play in incorporating NextGen goals and activities into the Air Traffic Organization's (ATO) strategic plans. ATO has expanded and revamped its Operational Evolution Partnership (OEP) to become the Federal Aviation Administration’s (FAA) implementation plan for NextGen. The Review Board that oversees the OEP is cochaired by JPDO and ATO. Similar developments are expected to occur with other partner agencies as JPDO completes a memorandum of understanding with these agencies. If JPDO ceased to exist before NextGen was more fully developed, some alternative means of planning and coordinating NextGen's development would have to be established, which could delay NextGen's implementation.

JPDO’s role could further evolve to include more coordination and oversight activities. For example, JPDO could establish a program oversight capacity that would enable it to perform such functions as (1) harmonizing the enterprise architectures among the partner agencies; (2) coordinating the research, development, and systems-engineering and integration activities of the cooperating agencies and industry; (3) overseeing multi-agency projects; (4) overseeing, with FAA, the selection of products or outcomes of research and development that would be moved

to the next stage of a demonstration project through the Joint Resources Council (JRC);<sup>1</sup> (5) overseeing the fundamental research activities that support the long-term strategic investments of NextGen by managing a research portfolio among NASA, academia, federally funded research and development centers, and industry; and (6) maintaining a baseline modeling and simulation environment for testing and evaluating alternative concepts to satisfy NextGen enterprise architecture requirements.

Another example of the evolution of JPDO's role is the organizational shift from integrated product teams to working groups. This shift reflects the extension of JPDO's role beyond planning to the development of work products or "outcomes" that will contribute to the early development of NextGen and facilitate its implementation. As JPDO assumes more responsibility for facilitating NextGen's implementation, greater authority and resources would allow it to do more to coordinate the efforts of the partner agencies and work with the Office of Management and Budget as the principal NextGen point of contact. With adequate funding and authority, JPDO could acquire staff with the project management and systems engineering skills needed for JPDO to be an effective oversight and coordinating office.

**b. To what extent do you think that moving JPDO out of the Federal Aviation Administration's Air Traffic Organization will give it greater visibility and authority?**

Currently, JPDO is located within FAA and reports to both the FAA Administrator and the Chief Operating Officer of ATO. In GAO's view, JPDO should not be moved out of FAA. Since JPDO provides the vision for the future air traffic control (ATC) system and ATO is to be the principal implementer of that vision, the two organizations need to continue working closely together.

However, JPDO's dual reporting status hinders its ability to interact on an equal footing with ATO and the other partner agencies. On one hand, JPDO must counter the perception that it is a proxy for the ATO and, as such, is not able to act as an "honest broker." On the other hand, JPDO must continue to work with ATO and its partner agencies in a partnership in which ATO is the lead implementer of NextGen. Therefore, it is important for JPDO to have some independence from ATO. One change that could begin to address this issue would be to have the JPDO Director report directly to the FAA Administrator. This change may also lessen what some stakeholders now perceive as unnecessary bureaucracy and red tape associated with decision making and other JPDO and NextGen processes.

As a part of any change in the dual reporting status of JPDO's Director, consideration could be given to the possibility of creating the position of Associate Administrator of NextGen and elevating the JPDO Director to that post.

**c. What are the potential pluses and minuses of such a move?**

One plus or advantage of moving JPDO out of ATO is that it could raise JPDO's authority and visibility in interagency deliberations by putting JPDO on an equal footing with ATO and other FAA lines of business. For example, moving JPDO out of ATO might strengthen its linkages to the Department of Defense (DOD) and the Department of Homeland Security (DHS). In addition, JPDO may be able to work more effectively with other FAA lines of business, such as Airports, for which JPDO has planning responsibilities. For example, JPDO is responsible for

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<sup>1</sup> FAA's Joint Resources Council establishes and manages acquisition program baselines, which define cost, schedule, performance, and benefit parameters for programs over their full life cycle.

developing plans to increase airport capacity. A minus or disadvantage of moving JPDO out of ATO is that because much of the work related to implementing NextGen must occur under ATO, this work could be harder to accomplish.

**d. What are some potential alternative organizational structures or arrangements and operating procedures for JPDO?**

We think that besides moving JPDO out of ATO and changing JPDO's reporting status, a potential organizational alternative for JPDO could be elevating the JPDO Director's position by having the Director and the ATO Chief Operating Officer cochair the Joint Resources Council, the body within FAA that provides executive review and oversight of acquisitions. (Currently, the JRC is chaired by the Federal Acquisition Executive, a responsibility delegated by the Administrator to the Vice President of ATO-Administration.) Consideration could also be given to creating the position of Associate Administrator of NextGen for the JPDO Director. This would give greater authority, credibility, and visibility to this important position.

**e. What are your thoughts on the following suggestions?**

- 1) JPDO should be established as a program office with program management capabilities and tools to interact with other program offices such as the FAA program office, the program office that DOD has committed to create, and the joint weather office involving DOD, DOC, and FAA.**

Currently, we do not think JPDO has the technical resources, tools, or operational knowledge to function as a program office. Moreover, the partner agencies, led by ATO, have the operational knowledge to best implement NextGen systems. JPDO, however, could function purely as a coordinating body or executive council. For example, JPDO could be provided with the resources and authority to establish a program oversight capacity that would enable it to perform such functions as (1) harmonizing the enterprise architectures among the partner agencies; (2) coordinating the research, development, and systems-engineering and integration activities of the cooperating agencies and industry; (3) overseeing multi-agency projects; (4) overseeing, with FAA, the selection of products or outcomes of research and development that would be moved to the next stage of a demonstration project through the Joint Resources Council (JRC);<sup>2</sup> (5) overseeing the fundamental research activities that support the long-term strategic investments of NextGen by managing a research portfolio among NASA, academia, federally funded research and development centers, and industry; and (6) maintaining a baseline modeling and simulation environment for testing and evaluating alternative concepts to satisfy NextGen enterprise architecture requirements.

- 2) JPDO lacks the technical capacity to evaluate the R&D efforts of its government partners and private sector clients and should be provided with an increased capacity and technical resources to carry out this function.**

To oversee multi-agency programs and have the capacity to evaluate NextGen R&D efforts, JPDO must have the requisite human and technical resources, such as a sufficient number of personnel with expertise in areas related to NextGen technologies. JPDO does not currently have these

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<sup>2</sup> FAA's Joint Resources Council establishes and manages acquisition program baselines which define cost, schedule, performance, and benefit parameters for programs over the full lifecycle of the program.

<sup>4</sup> Congressional Budget Office, *Financing Investment in the Air Traffic Control System* (Washington, D.C.: Sept. 27, 2006)

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resources, but it could obtain them with funding over and above the level in the FAA reauthorization proposal. Such resources are needed for JPDO to monitor the implementation of NextGen.

**3) JPDO lacks a clear process to identify inconsistencies in partner agency budgeting. JPDO should become a partner in the budgeting process and there should be a budget resolution council to provide a forum for negotiation of budget priorities.**

JPDO is already a partner in the budgeting process. JPDO has been working with OMB to develop a process that would allow OMB to identify NextGen-related projects across the partner agencies and consider NextGen as a unified, cross-agency program. Under this process, JPDO and its partner agencies can jointly present OMB with business cases for the partner agencies' NextGen-related efforts, and these business cases can be used as inputs to funding decisions for NextGen research and acquisitions across the agencies.

We do not believe JPDO needs a forum to negotiate budget priorities. The Senior Policy Committee (SPC), headed by the Secretary of Transportation, includes senior-level officials from JPDO's partner agencies and was established, in part, to address NextGen budget issues. In JPDO's enabling legislation, SPC was explicitly made responsible for identifying NextGen resource needs and making recommendations to the members' respective agencies for the necessary funding.

- 2. Much has been written and spoken about the role of and contributions of the various partner agencies to JPDO. Some observers have commented that the degree of participation by the partner agencies seemed to be on a continuum from a significant amount of participation to seemingly not very much at all. FAA and NASA are consistently indicated as the most involved participants.**

- a. In your opinion, to what extent are the partner agencies participating in the vision and work of JPDO?**

The partner agencies' participation in the vision and work of JPDO has varied to date and will continue to evolve over time. Interagency partnerships are difficult because it takes time to forge working relationships and establish accountability. While FAA and NASA have been the most involved in the planning and coordination of NextGen, the other agencies are also participating. The Department of Defense, for example, is transferring to NextGen the technology it has developed for sharing information across networks, is establishing a program office to coordinate all of its NextGen activities, and is collaborating with FAA and the Department of Commerce to develop and implement NextGen's weather forecasting capability. The Department of Homeland Security is participating by contributing "in-kind" services in the form of personnel and research.

- b. How could the roles of the partner agencies be changed to enhance their participation or positively affect the development of NextGen?**

We believe that the partner agencies' participation in NextGen could be enhanced by incorporating NextGen goals and activities in the agencies' key planning documents and research agendas. For example, JPDO is working with FAA to refocus one of FAA's key planning documents—its Operational Evolution Partnership (OEP)—on the implementation of NextGen. Formerly a plan for airport capacity, OEP has been expanded and revamped to become a comprehensive description of how FAA will implement NextGen. We believe that similar efforts by the other partner agencies could increase both their accountability to JPDO and JPDO's authority over them. In addition, JPDO has been working with OMB to develop a process for identifying NextGen-related research in the partner agencies' budgets (see 1e. (3)).

- c. What do you think about the idea of having each partner agency designate a senior-level official as the responsible individual for all NextGen-related programs in the agency?**

Designating a senior-level official within each partner agency as responsible for all of that agency's NextGen-related programs could be an effective way of helping to ensure that all the partner agencies are interacting on an equal footing and providing the needed leadership and commitment.

- d. Some observers have noted that there seems to be a lack of accountability and authority in the current JPDO structure, especially with regard to partner agencies. Would you agree or disagree with this assertion? If you agree with the assertion, how could this problem be addressed?**

We would agree that, as a planning and coordinating organization, JPDO lacks authority over the key human and technological resources of its partner agencies. Consequently, institutionalizing its process for collaborating with its partner agencies will be critical to JPDO's ability to leverage its partner agencies' resources and facilitate the implementation of NextGen. Institutionalizing

the collaborative process means that, as administrations and staffing within JPDO change over the years, those coming into JPDO will clearly understand what is expected of them and what time and resource commitments are entailed. JPDO, however, has not yet established some practices that are important to institutionalizing its collaborative process. For example, JPDO does not yet have formal long-term agreements among its partner agencies on their roles and responsibilities in creating NextGen. According to JPDO officials, a memorandum of understanding (MOU), signed by the Secretary or another high-ranking official from each partner agency, will define the partner agencies' roles and responsibilities. To date, this MOU has been signed by the Departments of Transportation and Commerce and NASA, but remains unsigned by the Departments of Defense and Homeland Security. (See 2e.)

**e. What kind of changes to the authority and resources now provided to JPDO would you suggest to enhance its effectiveness in coordinating the partner agencies?**

Besides institutionalizing the collaborative process between JPDO and its partner agencies, elevating the position of JPDO within the NextGen implementation process could enhance its effectiveness in coordinating the partner agencies. In addition, JPDO could be provided with the resources and authority to establish a program oversight capacity that would enable it to perform such functions as (1) harmonizing the enterprise architectures among the partner agencies; (2) coordinating the research, development, and systems-engineering and integration activities of the cooperating agencies and industry; (3) overseeing multi-agency projects; (4) overseeing, with FAA, the selection of products or outcomes of research and development that would be moved to the next stage of a demonstration project through the Joint Resources Council (JRC); (5) overseeing the fundamental research activities that support the long-term strategic investments of NextGen by managing a research portfolio among NASA, academia, federally funded research and development centers, and industry; and (6) maintaining a baseline modeling and simulation environment for testing and evaluating alternative concepts to satisfy NextGen enterprise architecture requirements.

JPDO's efforts to reorganize itself internally may also increase its authority and enhance the participation of its partner agencies. We see this as a positive development that extends JPDO's role beyond planning to focus more on the development of work products or "outcomes" that will contribute to the early development of NextGen and facilitate its implementation. As JPDO assumes more responsibility for facilitating NextGen's implementation, greater authority and resources would allow it to do more to coordinate the efforts of the partner agencies and work with the Office of Management and Budget as the principal NextGen point of contact. We believe that with adequate authority and funding, JPDO could acquire staff with the project management and systems engineering skills needed for JPDO to be an effective oversight and coordinating office for NextGen.



3. **JPDO has been described as having a government staff of fewer than a dozen full-time government employees to coordinate a long-term initiative involving tens of billions of dollars investment. Some observers say that JPDO will only be credible in its joint role when funded by all principal partners. Only FAA and NASA currently fund JPDO and its funding has not grown since inception despite its maturing requirements.**

- a. **What are your thoughts on the following suggestions related to funding JPDO?**

- 1) **JPDO operations should be funded equally with money from FAA, NASA, DOD, DHS, and DOC until such time as a memorandum of understanding can be established to determine an alternative proportional scheme.**

We believe the partner agencies' funding of JPDO operations could be based on the roles and resources of the the partner agencies or the partner agencies could continue to contribute cash, expertise, and other resources as needed and available. For example, DOD plans to provide \$5 million for a demonstration of information sharing across networks this year (FAA and DHS are also providing \$5 million each for this demonstration). The other partner agencies provide a variety of "in-kind" services through personnel assigned to JPDO and research. Nonetheless, it is most important to ensure that JPDO's funding needs are fully met.

- 2) **FY09 funding from DOD, DHS, and DOC should match the ongoing commitment from FAA and NASA of at least \$18M per entity for a total of \$90M in FY09.**

Contributions of some amount by the partner agencies could encourage those agencies to have JPDO undertake work that is valuable to them as well as to JPDO. While some stakeholders have said that requiring \$18 million per agency, the amount currently contributed by FAA and NASA, would not be likely to have a significant impact on the R&D budgets of DOD, DHS, and DOC, we believe it is most important that the agencies contribute some amount to JPDO relative to their roles and responsibilities for making NextGen a reality.

- b. **Some stakeholders and other observers have opined that it is essential that JPDO be independent of ATO to be successful in objectively facilitating the implementation of NextGen with its other governmental partners.**

In GAO's view, making JPDO independent of ATO could help to reduce or eliminate any perceptions on the part of JPDO's other governmental partners that JPDO might be too closely aligned with FAA to serve as an objective, independent facilitator of a multiagency partnership. Independence could also raise JPDO's authority and visibility in interagency deliberations by putting it on an equal footing with ATO and other FAA divisions. Furthermore, we believe loosening JPDO's ties to ATO could strengthen its linkages to DOD and DHS and enable it to work more effectively with other FAA divisions, such as Airports, for which JPDO has planning responsibilities. For example, JPDO is responsible for developing plans to increase airport capacity. Moving JPDO out of ATO could, however, make it harder for JPDO to obtain ATO's collaboration on efforts related to the implementation of NextGen.

**c. What are some alternative governance structures that could be used by JPDO?**

Besides moving JPDO out of ATO and thereby eliminating its dual reporting status (to both the FAA Administrator and the ATO Chief Operating Officer), the operation of the Joint Resources Council, the body within FAA that provides executive review and oversight of acquisitions, could be changed so that the council would be chaired jointly by the Chief Operating Officer and the JPDO Director. (Currently, the JRC is chaired by the Federal Acquisition Executive, a responsibility delegated by the Administrator to the Vice President of ATO-Acquisition & Business Services.) Additionally, consideration could be given to creating the position of Associate Administrator of NextGen to put the JPDO Director on a more equal organizational footing with the ATO Chief Operating Officer.

**d. What are the advantages and disadvantages of any such governance structures, including potential unintended consequences?**

As discussed, moving JPDO out of ATO and elevating the position of the JPDO Director could increase JPDO's independence, raise its authority and visibility in interagency deliberations, strengthen its linkages to DHS and DOD, and enable it to work more effectively with other FAA divisions. Such changes could, however, make it harder for JPDO to collaborate with ATO.

**e. You testified that the Senior Policy Committee (SPC) meets only sporadically and has not been actively engaged in providing cross-agency leadership. What do you think would be the effect of a mandated schedule for SPC meetings, i.e., quarterly or semi-annually?**

To date, the SPC has not met regularly. During the time JPDO has been functioning—just over 3 years—the SPC has met four times and has not convened as a formal body since November 2005. Although JPDO's enabling legislation calls for the SPC to advise the Secretary of Transportation, provide policy guidance for NextGen, and provide ongoing policy review for the transformation of the air transportation system, the legislation does not require a meeting schedule for the SPC. To the extent that the SPC cannot voluntarily meet on a regular schedule, then we think requiring regular meetings could be beneficial.

**f. The JPDO Board has no legislative basis, as it was not created by Vision 100. A junior and senior level board (i.e., SPC) for governance is unprecedented in industry. Why not dissolve the JPDO Board?**

The JPDO Board acts as an action arm of the SPC members whose wide-ranging responsibilities limit their continuing and comprehensive involvement in NextGen. We believe a designated senior person from each agency who has access to and can act with the authority of the SPC member from that agency is needed to carry out necessary actions.

**g. What are your thoughts on the following governance related ideas?**

**1) JPDO should report directly to the Office of the Secretary of Transportation.**

In GAO's view, JPDO should not report to the Secretary of Transportation because placing JPDO in the Secretary's office would remove it too far from the implementation and operations of NextGen.

- 2) **The JPDO Director should report to the FAA Administrator exclusively, rather than also to the ATO Chief Operating Officer (COO), as is currently the case and proposed in FAA’s reauthorization.**

As discussed, this change could increase JPDO’s independence and authority and strengthen JPDO’s linkages to some other agencies and divisions, but it could also hamper interactions with ATO.

- 3) **FAA funding of JPDO should be direct from FAA Financial Services, as is the case for other independent internal FAA entities, e.g., Airports and Commercial Space Transportation, rather than through ATO.**

Yes, this change would be consistent with moving JPDO out of ATO and could help to raise the visibility and legitimacy of JPDO. If JPDO becomes organizationally independent of ATO, then its FAA funding should come directly from FAA Financial Services, as does the funding for FAA’s Airports and Commercial Space Transportation divisions.

- 4) **FAA should create the position of “Associate Administrator for Next Generation Systems” that is co-equal internally with positions of the same title for Commercial Space Transportation, Airports, and Aviation Safety.**

FAA should consider creating the position of Associate Administrator of NextGen and elevating the JPDO Director to that post. We think that this would give greater credibility, authority, and visibility to this important position.

- 5) **If such a position were created what do you think would be the effect of the JPDO Director filling that position or reporting to it?**

The JPDO Director could fill that position. Another reporting level could increase red tape and bureaucracy.

- 6) **The Director of JPDO or Associate Administrator for Next Generation Systems should be a voting member of the FAA Joint Resources Council and participate in making capital investment decisions.**

In GAO’s view, the JPDO Director should be a member of the Joint Resources Council (JRC), the body within FAA that makes capital investment decisions and provides executive review and oversight of acquisitions. The FAA reauthorization proposal calls for the JPDO Director to be a voting member of the JRC, as is the Chief Operating Officer of ATO. This change would help ensure that NextGen plans are consistent with current operations.

4. **You have testified that FAA’s funding system based on the current ticket and fuel taxes is sufficient to fund the NextGen. However, the Administrator suggests that if the current funding structure were able to support NextGen, it would be a much longer process and has argued for a user fee based system.**
  - a. **What would be the effect, if any on the NextGen budget if Congress does not enact the Administration’s proposed aviation financing reform package (ticket taxes; aviation fuel taxes) as part of a new authorization, but instead leaves the current ticket and fuel taxes in place?**

The current FAA funding structure can provide sufficient funding for NextGen—with some caveats. Congress has used the current funding structure—excise taxes plus a General Fund contribution—to fund FAA for many years. As the number of air travelers has grown, so have excise tax revenues. Even though revenues fell during the early years of this decade as the demand for air travel fell, they began to rise again in fiscal year 2004, and FAA estimates that if the current taxes remain in effect at their current rates, revenues will continue to increase. According to projections prepared by the Congressional Budget Office (CBO),<sup>4</sup> revenues obtained from the existing funding structure are projected to increase substantially. Assuming the General Fund provides about 19 percent of FAA’s budget, CBO estimates that through 2016 the Trust Fund can support about \$19 billion in additional spending over the baseline FAA spending levels CBO has calculated for FAA (the 2006 funding level, growing with inflation) provided that most of the spending occurs after 2010. How far this money will go to fund modernization is subject to a number of uncertainties—including the future cost of NextGen investments, the volume of air traffic, the future cost of operating the national airspace system (NAS), and the levels of future appropriations for the Airport Improvement program, all of which influence funding for FAA.

However, if the desired level of funding exceeded what was likely to be available from the Trust Fund at current tax rates, Congress could make further changes within the current structure that would provide FAA with additional revenue. Congress could raise more revenue from airspace system users for NextGen or for other purposes by raising the rates on one or more of the current excise taxes. Congress could also provide more General Fund revenues for FAA, although the nation’s fiscal imbalance may make a larger contribution from this source difficult.

- b. **If additional financial resources, in the range of \$200 million annually for the next five years over the President’s current budget request, were made available to JPDO, what would or should be its priorities aimed at expediting NextGen capabilities into the NAS?**

In GAO’s view, JPDO could expedite the development of NextGen capabilities with accelerated funding over and above the President’s current budget request. There are several areas in which additional research and development and deployment could be undertaken or accelerated with funding over and above the President’s current budget request. Two closely related areas that could be candidates for increased funding are avionics development and aircraft equipage. Additional support in these areas could accelerate the transition to satellite-based navigation, which requires the commercial fleet to be equipped with advanced avionics. This transition would allow FAA to pursue the elimination of costly ground-based navigation aids; the transition to data link; and the standardization of future aircraft capabilities such as flight management systems, traffic collision avoidance systems, and modular avionics. The successful development and deployment of NextGen will require a series of incremental changes that must be tested to

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

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

Another area that could benefit from additional funding is human factors research. As you know, one of the principal changes under NextGen will be a transformation from air traffic control to air traffic management. This will mean new roles for all participants in the system, including air traffic controllers and pilots. Additional funding could accelerate human factors research and training initiatives that are central to the success of NextGen, such as initiatives defining the relative responsibilities of aircraft personnel and ground controllers, and modernizing controller training through the use of advanced simulation and intelligent tutoring tools.

5. **Traditionally, NASA has developed promising technologies to a high maturity level enabling FAA to incorporate them into its air traffic control system without too much additional development. Now that NASA is confining its development work to a basic level of technical maturity, JPDO/FAA must find ways to have the necessary R&D work conducted by other organizations. This R&D includes work needed for planning as well that needed for validation and demonstrations.**

- a. **To what extent do FAA and the other federal partners have the resources and capability to meet the R&D needs in these two areas?**

The National Aeronautics and Space Administration (NASA) formerly conducted the type of intermediate research and development (R&D) and demonstration projects that will be needed for the NextGen program, but the funding for these efforts was discontinued when NASA's aeronautical research portfolio was restructured to focus more on fundamental research. Although FAA has not fully determined the impact of the NASA restructuring on the R&D needs for NextGen, We agree with some key stakeholders that additional R&D funds will be needed and are critical for the timely development of NextGen. FAA recognizes that this is a critical issue and has already taken some action to address it. For example, in the President's fiscal year 2008 budget request for FAA, funds have been included for developmental and transition research, in the Facilities and Equipment (F&E) Activity 1 account. In light of the NASA restructuring, FAA has also undertaken a study to assess the nature and scope of its NextGen R&D needs. According to JPDO officials, this study will be completed in August 2007. FAA officials say the results of this study will be used as a basis for determining how any "gap" identified can be addressed with government or private sector resources.

- b. **What actions should JPDO take to help ensure that the demonstrations, certifications, and transition R&D needed to validate new technologies be conducted in a timely manner so that NextGen will not be delayed?**

The time required to prototype, validate, and certify a technology can present a significant risk to the timely and cost-effective implementation of NextGen. We have studied the lead times required to prototype, validate, and certify new technologies. Neither JPDO nor FAA currently has sufficient resources to prototype, validate, and certify new technologies, and neither agency can currently develop the technologies internally without causing significant delays in the implementation of NextGen. In addition, stakeholders have expressed concern over the time it takes to develop rules for new equipment and the problems caused when equipment is fielded before rules are finalized. Any activities that will be required to implement new policies, demonstrate new capabilities, set parameters for the certification of new systems, and develop technologies will take time. Just as important, the time required to prototype, validate, and certify a new technology must be balanced against the need to ensure the reliability of the technology and the safety of the flying public.

If JPDO had sufficient resources, it could prototype, validate, and certify new technologies in a timely manner. We believe another option would be for JPDO to identify other organizations with the capacity to accomplish these tasks and provide them with the resources to take on these tasks. In addition, JPDO could work with FAA's Aviation Safety organization to establish the metrics needed to assess compliance with the standards to which these systems must conform.

- c. **It takes considerable time to prototype, validate, and certify new technologies required for NextGen, in addition to time required for**

**rulemakings. How much of a risk do these processes pose to timely development of NextGen?**

We cannot quantify how much of risk exists, but we think that a significant risk does exist for the timely development of NextGen because demonstrations and transition R&D are necessary to develop certification standards for new technologies.

JPDO does not currently have the resources to prototype, validate, and certify new technologies. Moreover, several of the stakeholders with whom we spoke believed that even if JPDO were to obtain the needed resources, it could require as much as 5 years to establish the infrastructure needed to prototype, validate, and certify new technologies. Any activities that will be required to implement new policies, demonstrate new capabilities, set parameters for certifying new systems, and develop technologies will take time. Just as important, the time required to prototype, validate, and certify new technologies must be balanced against the need to ensure the reliability and safety of the technology.

**d. What do you think of the following suggestions related to research and development?**

- 1) **Establish JPDO as the modeler for the NextGen business case, with a formal charter and supporting resources made available to allow the creation of a National Virtual Test Bed to link government, academic, and industry simulation models in a nonpartisan and transparent fashion to assess technical options and quantify cost and benefits of the evolving implementation approach for NextGen.**

Yes, this role seems to be consistent with JPDO's authorizing legislation. As JPDO becomes more involved in facilitation, it must test, validate, and assess technical options and quantify their costs and benefits so that decision makers can evaluate the options for inclusion in the NAS.

- 2) **In order for FAA/JPDO to be able to conduct all but the most long-term, fundamental research supporting NextGen development, some or all of NASA's aeronautics research capabilities should be transferred to FAA/JPDO, specifically Langley Research Center and portions of Ames Research Center.**

In GAO's view, some or all of NASA's aeronautical research capabilities that are located at Langley Research Center and portions of Ames Research Center could be transferred to FAA or JPDO. However, another alternative to consider might be to make more use of the resources available at the FAA Technical Center in Atlantic City, New Jersey, and the FAA Aeronautical Center in Oklahoma City, Oklahoma. This decision will be informed by the results of a JPDO study that is currently underway to assess the nature and scope of NextGen's R&D needs. According to JPDO officials, this study will be completed in August 2007.

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