

OBSERVATIONS ON SHORT-TERM CAPACITY INITIATIVES

Federal Aviation Administration

Report Number: AV-2008-087

Date Issued: September 26, 2008



**U.S. Department of
Transportation**

Office of the Secretary
of Transportation

The Inspector General

Office of Inspector General
Washington, DC 20590

September 26, 2008

The Honorable James L. Oberstar
Chairman, Committee on Transportation
and Infrastructure
House of Representatives
Washington, DC 20515

The Honorable John Mica
Ranking Member, Committee on Transportation
and Infrastructure
House of Representatives
Washington, DC 20515

The Honorable Jerry F. Costello
Chairman, Subcommittee on Aviation
House of Representatives
Washington, DC 20515

The Honorable Thomas E. Petri
Ranking Member, Subcommittee on Aviation
House of Representatives
Washington, DC 20515

Dear Chairmen Oberstar and Costello and Ranking Members Mica and Petri:

As requested, we are providing our observations on the Federal Aviation Administration's (FAA) current efforts to increase capacity in the National Airspace System. Specifically, you requested that we provide our observations on the initiatives that will provide the most capacity benefits in the next 5 years, including updates on FAA's efforts to redesign airspace and implement performance-based navigation initiatives, i.e., Area Navigation (RNAV) and Required Navigation Performance (RNP). Consistent with your request, our objectives were to (1) identify the initiatives—both technological and procedural—that will provide the most capacity benefits in the next 5 years and (2) examine FAA's process for implementing and managing interrelationships among the various efforts. The results of our review are discussed below and further detailed in the enclosed briefing, which we provided to your staff on July 2, 2008.

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As we stated in our testimony before the Subcommittee on Aviation in April,¹ enhancing the capacity of the National Airspace System, particularly at already congested airports, and improving airline customer service are important issues facing the Nation. The summer of 2007 was part of the worst year on record for flight delays; cancellations; and long, on-board delays—the underlying causes of airline customer dissatisfaction. The Senate Joint Economic Committee estimates that last year’s flight delays alone cost the airlines, passengers, and the U.S. economy more than \$40 billion. Peak-year 2007 trends continued into early 2008. In the first 6 months of 2008, more than 1 in 4 flights (29 percent) were delayed or cancelled. Not until July did on-time performance show a substantial improvement compared to the same month last year.

Because delays in the New York region have a nationwide effect, the Secretary of Transportation formed the New York Aviation Rulemaking Committee (ARC) last September to explore ways to alleviate congestion and delays in the New York area. In addition, the Secretary directed FAA to negotiate with the airlines and established temporary flight caps at the John F. Kennedy and Newark/Liberty airports. The Secretary also proposed auctioning a limited number of take-off and landing opportunities (known as “slots”) at these two airports. This approach, however, is a very controversial issue among some stakeholders.

The Department, FAA, and various stakeholders have identified several initiatives to enhance capacity. The ARC identified 77 action items, including operational and infrastructure improvements, to mitigate delays in the New York metropolitan area. Of these action items, FAA states that 17 are complete, 30 are expected to be complete by the end of fiscal year (FY) 2008, and 40 by the end of FY 2009. The remaining items are either planned for the long term or undergoing analysis to establish feasibility and priorities. In this audit, we did not assess whether these initiatives targeted specifically for New York were effective in reducing delays.

Since we testified in April, the airlines have continued to face considerable financial uncertainty due to skyrocketing fuel costs and a softening economy. In response, airlines are reducing flight schedules and taking aircraft out of service. Nevertheless, FAA forecasts that the demand for air travel will grow. Even if airlines further reduce their schedules, FAA points out—and we agree—that the Agency and stakeholders must address the underlying causes of delays. We believe the current situation provides FAA with an important opportunity to better plan, prioritize, and manage capacity initiatives.

The long-term solution to increasing capacity and reducing delays depends largely on expanding capacity through the Next Generation Air Transportation System (NextGen), which is targeted for the 2025 timeframe. Although FAA is exploring

¹ OIG Testimony Number CC-2008-058, “Status Report on Actions Underway To Address Flight Delays and Improve Airline Customer Service,” April 9, 2008. OIG reports and testimonies are available on our website: www.oig.dot.gov.

ways to accelerate NextGen, much work remains to set realistic expectations for when capacity-enhancing initiatives can be delivered. Therefore, it will be important to keep several near-term, capacity-enhancing initiatives on track.

FAA Must Address Challenges With Several Initiatives Underway That Could Reduce Delays and Boost Capacity in the Near Term

While there is no “silver bullet” for addressing delays, we identified five FAA initiatives underway that can help reduce congestion and enhance capacity over the next 5 years.²

New Airport Infrastructure – According to FAA, building new runways provides the largest increases in capacity. Currently, there are nine key runway projects underway at seven Operational Evolution Partnership (OEP) airports. These projects are expected to be complete by 2012 and, according to FAA, will provide those airports with the potential to accommodate an additional 400,000 operations annually. These capacity benefits, however, cannot be realized without new air traffic control procedures and improved airspace redesign.

Challenges that could impede the progress of new runway projects include the years of planning required, extensive environmental reviews, coordination among numerous stakeholders, and legal issues. Another challenge is making corresponding improvements to an airport’s infrastructure (e.g., terminal gates and passenger waiting areas) to accommodate the increased traffic. Unfortunately, building a new runway is not an option for some airports, like LaGuardia.

Airspace Redesign – Airspace redesign efforts are critical to realizing the full benefits of runways and can enhance capacity without new infrastructure. Currently, FAA is pursuing seven airspace redesign projects nationwide, including a major effort to revamp airspace in the New York/New Jersey/Philadelphia area. Once implemented, FAA believes this effort could reduce delays by as much as 200,000 hours.

FAA has done a better job of coordinating airspace changes with Agency stakeholders and linking projects to its capital account³ since we reported on the airspace redesign program in 2005.⁴ We remain concerned, however, that FAA’s airspace redesign efforts still do not function as a “national” program since FAA facilities are now using their own resources to redesign airspace without coordinating with Headquarters. FAA is developing procedures to address this problem, but those have not been finalized. Further, since 2005, the airspace redesign program has experienced

² We did not assess planned NextGen demonstration projects or the potential benefits of proposed demand management techniques.

³ Prior to 2007, FAA’s airspace program was funded solely from the Operations account. By linking each project’s requirements to both the operations and capital budgets, the Agency was able to address procedural, environmental, technical, and staffing requirements to complete the implementation process.

⁴ OIG Report Number AV-2005-059, “Airspace Redesign Efforts Are Critical To Enhance Capacity but Need Major Improvements,” May 13, 2005.

significant funding reductions, from \$15.3 million to \$6.8 million—a 70-percent decrease. We are concerned that this could steer the program off track and note that FAA funded only three of seven planned airspace projects last year.

Performance-Based Navigation Initiatives – FAA is pursuing two initiatives that rely on aircraft avionics for improved route precision: RNAV and RNP. RNAV allows aircraft to fly any desired flight path without the limitations imposed by ground-based navigation systems. RNP adds an on-board performance monitoring and alerting capability for pilots and allows aircraft to fly more precise flight paths into and out of airports. This reduces fuel burn, boosts controller productivity, reduces noise emissions, and increases capacity.

As of June 5, 2008, FAA had published more than 400 RNAV/RNP routes and procedures and made this capability available at 98 airports. The Agency intends to publish at least 100 RNAV and 75 RNP procedures for the period FY 2008 through FY 2009, with priority given to new routes for airports in the congested New York, Chicago, and Dallas areas.

Challenges facing this initiative include close integration with airspace redesign as future RNAV/RNP routes shift away from localized operations toward “networking” routes between city pairs, such as Washington, D.C., and Chicago. It is also important to note that current RNAV/RNP routes are only available to specially equipped aircraft and trained aircrews, and air carriers must meet certain qualifications to fly these special airport approaches.⁵

To help speed the introduction of RNP, FAA is relying on non-government third parties to develop and implement new procedures. FAA has stated that it would like to delegate greater authority to third parties but is still defining these expanded roles and responsibilities. A considerable level of oversight will be required, and we will review this in greater detail later this year.

Air Traffic Management – This program, managed by FAA’s Command Center, provides the Agency with the ability to manage air traffic and reduce the impact of severe weather. The two major components of Air Traffic Management are the Traffic Flow Management (TFM) Program and the Collaborative Air Traffic Management Technologies Program. TFM includes a new tool, the Airspace Flow Program, to collaboratively plan and manage traffic demand for airspace congestion issues.

FAA is modernizing the overall TFM infrastructure for more than \$500 million but faces complex software development and integration issues. Another challenge is

⁵ In this case, we are referring to special instrument flight procedures that are known as RNP Special Aircraft and Aircrew Authorization Required (SAAAR). RNP SAAAR is the certification required by FAA to allow aircrew to use RNP avionics during RNP approaches. RNP SAAAR helps aircraft fly more precise approaches and departures, thereby increasing operational efficiency and reducing operating costs, noise, and emissions.

introducing better weather forecasting techniques into this system. We note that delays in implementing the new system could place the current system at risk of being unable to handle the increased demand.

Automated Controller Tools – The Traffic Management Advisor (TMA) tool allows air traffic controllers to better sequence aircraft to a runway and could therefore enhance the flow of traffic. FAA has deployed TMA to all 20 en route centers in the continental United States; 11 are fully operational, and the remaining systems are slated to be ready later this year. The transition to TMA will continue to be complex as new enhancements to this tool will require extensive software adaptation (site customization) and new controller training.

The Interrelated Nature of Short-Term Capacity Initiatives Will Require Management and Oversight at the National Level

Since 2001, FAA's blueprint for capacity has been the Operational Evolution Partnership (formerly known as the Operational Evolution Plan), which coordinates relationships among programs. In 2007, FAA refocused the OEP to help manage the implementation of NextGen. This plan was recently renamed the NextGen Implementation Plan.

The plan's initiatives that we examined are interdependent and span across the Air Traffic Organization's (ATO) three service units—Terminal, En Route, and Systems Operations—and therefore require much coordination. However, such coordination is often inhibited due to differences in the priorities and resources among these ATO units.

Until recently, there was no single office responsible for overseeing nationwide capacity initiatives. FAA has taken steps to reorganize the ATO and has established a Senior Vice President for NextGen Implementation and Operations Planning. Also, FAA is establishing a NextGen Integration and Implementation Office to oversee and coordinate near-term capacity and other NextGen initiatives. The recent focus on delays in the New York area raised questions about FAA's management of short-term capacity initiatives in the northeastern United States. To address these concerns, FAA appointed a single person to coordinate regional airspace issues and all projects and initiatives addressing congestion and delays in the New York area.

Several Key Issues Require Sustained Management Attention

In April, we highlighted several actions needed to help prevent a repeat of the summer 2007 air travel problems. In addition, there are several areas that require sustained management attention by FAA.

Managing Capacity Initiatives as Portfolios – To successfully implement short-term initiatives, FAA must manage these efforts in a highly integrated fashion. As we noted in the past, it is important to link NextGen Implementation Plan projects with

the operations and capital budgets. However, FAA lacks a long-term plan to sustain its procedural programs funded in the operations budget as it does for capital programs (e.g., new radar systems or controller displays) in the facilities and engineering budget.

Keeping Planned Airport Infrastructure and Airspace Projects on Track – FAA needs to ensure the navigation equipment, new procedures, and airspace modifications are in place when its nine runway projects are commissioned in 2012 so that the expected benefits can be achieved.

Maximizing Special Use Airspace – FAA needs to continue working with the Department of Defense to open special-use airspace, which is often inactive, to create additional lanes of traffic at specific chokepoints. Last year, joint efforts by the Departments of Transportation and Defense to open up special-use airspace along the east and west coasts before the winter holidays helped to reduce delays during these heavy traffic periods. Industry groups noted that “repeatable procedures” need to be developed to enhance coordination between military managers of special-use airspace on each coast and at FAA’s Command Center during periods of severe weather.

Addressing Controller Training Issues – We recently reported challenges FAA faces in training large numbers of developmental controllers to replace retirees.⁶ At the same time, FAA will be challenged to train controllers on capacity-enhancing efforts since several new initiatives involve introducing new capabilities. To gain maximum benefits from new technologies, it will be important for FAA to determine what can be accomplished over the next several years with controller training.

Addressing Controller Productivity and Excessive Spacing on Final Approach – In its December 2007 report, the New York ARC expressed concerns that excessive spacing between aircraft on final approach has contributed significantly to arrival delays at New York airports. FAA controllers and an internal study⁷ have noted that other factors, such as weather and poor coordination between FAA air traffic control facilities in the New York region, have also impacted spacing between aircraft. While FAA has developed a new tool to help monitor spacing and embarked upon educational efforts for controllers, clear and measurable performance expectations are still needed.

Updating Capacity Benchmarks – An important first step in addressing the delay problem in the 2000 timeframe was to develop a set of “capacity benchmarks” for the Nation’s top 30 airports. However, FAA has not published updated capacity benchmarks since 2004 and needs to do so as these are critical to understanding airline scheduling practices and expected relief from technology and new runways. At the very least, benchmarks can provide a common framework for understanding

⁶ OIG Report Number AV-2008-055, “Review of Air Traffic Controller Facility Training Program,” June 5, 2008.

⁷ Federal Aviation Administration New York Terminal Radar Control (TRACON) System Efficiency Assessment, February 4-8, 2008.

what maximum arrival and departure rates can physically be handled at the busiest airports, by time of day, under good and poor weather conditions. This information would be valuable to key decision makers and stakeholders.

In conclusion, there are several initiatives planned or underway that can provide some relief from delays and boost capacity over the next 3 to 5 years. Each initiative, however, faces challenges that must be fully addressed. FAA has recently taken several steps to better organize and manage capacity initiatives in both the short and long term and to help implement NextGen efforts. These include establishing a new Senior Vice President for NextGen Implementation and Operations Planning as well as a new office for NextGen integration. The details of these efforts are still evolving, however, and it is too soon to evaluate their effectiveness. Therefore, we are not making any recommendations at this time but will continue to monitor FAA's ongoing actions.

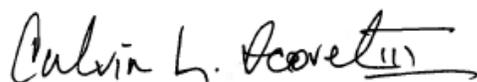
Objectives, Scope, and Methodology

We performed our review in accordance with Government Auditing Standards prescribed by the Comptroller General of the United States. The enclosed briefing further details our objectives, scope, and methodology and contains updated information to supplement our July briefing and April testimony.

We provided the Senior Vice President for NextGen Implementation and Operations Planning with a draft of our report and incorporated her comments where appropriate. The Senior Vice President generally agreed with our analysis and results.

If I can answer any questions regarding this review, please contact me at (202) 366-1959 or Theodore Alves, Deputy Inspector General, at (202) 366-6767.

Sincerely,

A handwritten signature in black ink that reads "Calvin L. Scovel III". The signature is written in a cursive style with a horizontal line underneath the name.

Calvin L. Scovel III
Inspector General

Enclosure

cc: Acting FAA Administrator

Review of FAA's Short-Term Capacity Initiatives



Briefing to the House
Subcommittee on Aviation
July 2, 2008



Objectives

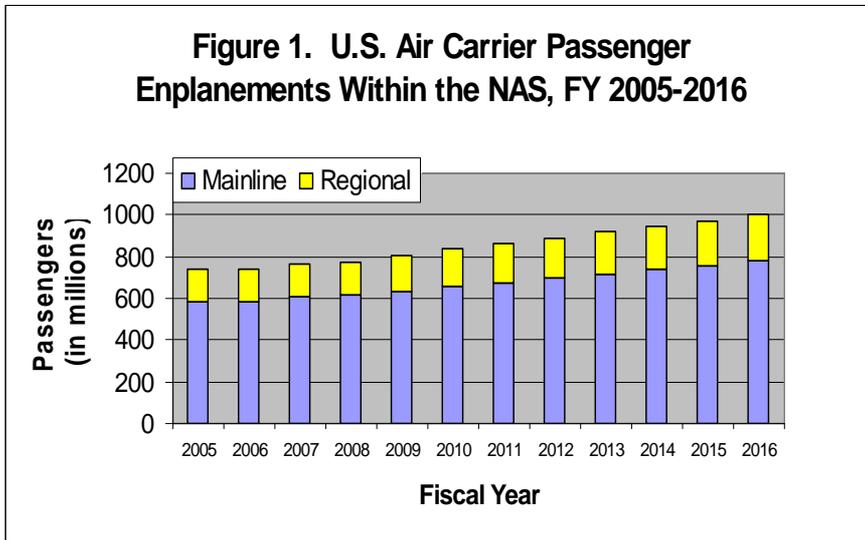
The Chairmen and Ranking Members of the House Transportation and Infrastructure Committee and its Aviation Subcommittee requested that the Office of Inspector General (OIG) review FAA's current efforts to increase capacity in the National Airspace System (NAS). Specifically, they requested that we provide our observations on the initiatives that will provide the most capacity benefits *in the next 5 years*, including updates of FAA's efforts to redesign airspace and implement performance-based navigation initiatives—Area Navigation (RNAV) and Required Navigation Performance (RNP).

Consistent with the request, our objectives were to (1) identify the initiatives—both technological and procedural—that will provide the most capacity benefits in the next 5 years and (2) examine FAA's process for implementing capacity initiatives and managing interrelationships among the various efforts. We provided our preliminary results at the Subcommittee's April 9, 2008, hearing on congestion and delays.

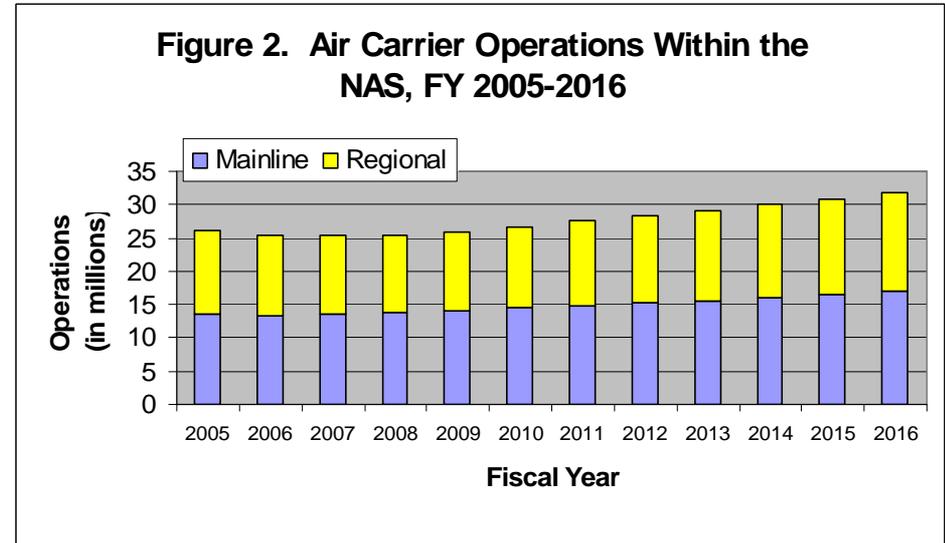


Background

- During fiscal year (FY) 2007, U.S. airlines handled over 700 million passengers, and this number is forecast to grow to over 1 billion by 2016 (see figure 1). Also, during FY 2007, U.S. domestic air carriers and commuter airlines performed over 25 million flight operations (take-offs and landings)—forecast to grow to 30 million operations by 2014 (see figure 2).



Source: FAA Aerospace Forecast, Fiscal Years 2008-2025



Source: FAA Aerospace Forecast, Fiscal Years 2008-2025



Background (continued)

- In 2007, increased demand caused several key airports (e.g., LaGuardia, John F. Kennedy, and Newark) to operate near or at full capacity, resulting in increased congestion and unprecedented delays.
- Operational performance of the NAS continued a downward trend in 2007 with one in four flights arriving late. This level of delay is worse than 2000 when aviation gridlock dominated the aviation agenda. Problems at the New York airports reached intolerable levels and affected the entire NAS.
- On-time performance in summer 2007 deteriorated over the already dismal levels of 2006, even though the number of flights essentially remained the same.

Table 1. Increases in Flight Delays and Cancellations (Summer 2006 and Summer 2007)			
Notable Statistics	Summer 2006	Summer 2007	Percent Change
Scheduled Flights	1,986,654	2,014,279	+1%
Percent Delayed	26%	29%	+12%
Airports With Delays > 30 Minutes	9	26	+189%
Length of Arrival Delays	56 Minutes	60 Minutes	+6%
Cancelled Flights	37,396	47,911	+28%
Percent Cancelled	1.9%	2.4%	+26%

Source: FAA



Background (continued)

- Near-term initiatives are critical because much work remains to define and clarify NextGen benefits and timetables for capacity enhancing benefits. FAA is exploring ways to accelerate NextGen and what can be done in the near and mid term.
- As we testified in April, the airlines face considerable financial uncertainty due to skyrocketing fuel costs and a softening economy. The airlines continue to reduce schedules and take aircraft out of service. This situation provides FAA with opportunities to better plan and manage short- and long-term capacity initiatives.



Results

Objective 1: Identify the initiatives—both technological and procedural—that will provide the most capacity benefits within the next 5 years.

- There is no “silver bullet” for reducing delays. However, there are a number of initiatives that can enhance capacity. We identified five FAA capacity initiatives that are expected to provide the most capacity benefits over the next 5 years.
 1. Runways
 2. Airspace Redesign
 3. RNAV and RNP
 4. Air Traffic Management
 5. Controller Tools (e.g., Traffic Management Advisor)
- For each initiative, we identified issues or concerns that have the potential to affect implementation and limit expected benefits.



Objective 1 Results: Runways

- Constructing new runways and runway extensions is the most effective method of increasing capacity.
- **Status of New Runways**
Since FY 2000, 13 new runways have opened at the 35 Partnership airports (formerly called OEP airports), thereby providing them with the potential to accommodate 1.6 million more annual operations. Currently, seven OEP airports have nine airfield construction projects that are expected to be commissioned through 2012 (see table 2 on slide 8).



Objective 1 Results: Runways (continued)

Table 2. Current Airfield Construction Projects		
Airfield Construction Projects	Est. Completion	Cost Estimate
Philadelphia	March 2009	\$65 million
Seattle-Tacoma	November 2008	\$1.1 billion
Washington-Dulles	November 2008	\$356 million
Chicago O'Hare*	2012*	\$1.9 billion
Charlotte	February 2010	\$300 million
Dallas Ft. Worth	December 2008	\$79 million
Boston	November 2009	\$55 million

* Chicago O'Hare has three runway projects underway. Two of the three will be completed by November 2008.
Source: FAA



Objective 1 Results: Runways (continued)

- **Challenges to New Runway Initiatives**

- Not all runway projects will increase capacity. At some airports, such as Los Angeles International, a new runway will only replace an existing runway.
- Runway capacity benefits cannot be realized without airspace and procedural changes. In fact, FAA states that 40 to 60 percent of projected capacity would be lost without corresponding airspace changes.
- Some airports, such as LaGuardia and Las Vegas, need additional capacity but do not have the space to add new runways. Other airports may benefit by minimizing runway crossings through new taxiway designs.
- To accommodate the additional traffic generated by new runways, airports need to plan and build additional gates and passenger receiving areas. A good example of this is Atlanta Hartsfield-Jackson Airport, which is building new gates.



Objective 1 Results: Airspace Redesign

- Airspace redesign is an important but often overlooked capacity enhancing initiative. History shows that airspace redesign efforts, even without new infrastructure, can enhance the flow of air traffic.
- **Status of Airspace Redesign Initiatives**
 - In May 2005, we reported that the management and oversight of airspace projects were fragmented between FAA Headquarters and various local facilities. Further, we found that FAA's overall process for controlling costs, mitigating risks, and coordinating efforts was not effective. Specifically, FAA did not have reliable project cost estimates and did not prioritize airspace redesign projects according to Agency national goals. FAA also did not effectively coordinate projects or link them to the Agency's budget process.
 - In response to our report, FAA made several changes to the airspace program, including focusing efforts on high-priority projects with national significance and assigning trained project managers to each new project.
 - For FY 2007, FAA approved seven airspace redesign projects as national programs. However, only three projects received full funding due to funding shortfalls (New York/New Jersey/Philadelphia Metropolitan Airspace Redesign, Chicago Airspace, and Houston Area Air Traffic System).
 - Since 2004, the number of, and funding for, airspace projects has steadily declined (see table 3 on slide 11).



Objective 1 Results: Airspace Redesign (continued)

Table 3. Current Projects and Funding Profile			
Fiscal Year	Number of Projects	Operations Budget	Capital Budget
2004	42	\$21.0 million	None
2005	42	\$15.3 million	None
2006	20	\$8.5 million	None
2007	7	\$6.8 million	\$1.1 million
2008 (Proposed)	9	\$10.7 million	\$5.0 million
2009 (Estimate)	8	\$8.2 million	\$3.0 million

Source: FAA



Objective 1 Results: Airspace Redesign (continued)

- **Challenges to Airspace Redesign Initiatives**

- FAA identified seven projects as national priorities for FY 2007 but was only able to fully fund three projects. In fact, one of the seven national projects (Southern California) was put on “hold” indefinitely because there was no guarantee of sustained funding for the environmental phase.
- FAA’s airspace redesign effort is not functioning as a national program. There is little central coordination at the FAA Headquarters level, and some FAA facilities are using their own resources to redesign airspace without coordinating with Headquarters. As a result, some projects are not being measured against national priorities and may not conform to the needs of the rest of the NAS.
- Airspace redesign initiatives are cross-cutting efforts that require close coordination among the Air Traffic Organization (ATO) units. It is important for FAA to (1) finalize procedures for working across ATO lines of business to implement airspace redesign initiatives and (2) determine what can reasonably be accomplished with airspace redesign efforts in the near term.



Objective 1 Results: RNAV and RNP

- RNAV consists of procedures that allow aircraft to fly on any desired flight path without the limitations imposed by ground-based navigation aids. RNP takes advantage of an airplane's on-board navigation avionics capability to fly a more precise flight path into an airport.

- **Status of FAA's Initiatives To Move Forward With RNAV /RNP**
 - As of June 2008, FAA had published over 400 RNAV/RNP procedures. In 2007, FAA published 69 RNAV routes and 41 RNP procedures. To accomplish this, FAA focused on what could be done without extensive environmental review, which is normally a factor when new routes are involved. For FY 2008, FAA intends to publish at least 50 RNAV procedures and 25 RNP procedures. For FY 2009, it plans to publish 50 RNAV and 50 RNP procedures.

 - To help speed the introduction of RNP procedures, FAA signed agreements with two private vendors (Naverus and Jeppesen) to develop and implement public RNP Special Aircraft and Aircrew Authorization Required procedures. FAA has proposed giving greater authority for developing and implementing new procedures to third parties. It will be important to clearly define roles and responsibilities for that process.



Objective 1 Results: RNAV and RNP (continued)

- **Challenges To Implementing RNAV/RNP**

- Current RNAV and RNP routes are largely overlays of existing routes and do not require extensive environmental reviews. However, new routes that will take full advantage of RNAV/RNP capabilities may require more extensive environmental reviews, which could take up to 8 years.
- Thus far, FAA has developed RNAV/RNP procedures primarily for local operations. However, significant benefits may be realized by “networking” RNAV/RNP routes between city pairs. This will require that FAA closely integrate RNAV/RNP procedures with airspace redesign efforts. Considerable simulation and modeling will also be required.
- FAA modernization efforts will impact the implementation of RNAV/RNP procedures. For example, moratoriums on new procedures at sites where En Route Automation Modernization (ERAM) systems are being installed will limit FAA’s ability to implement new procedures at critical times between 2009 and 2012. If ERAM installation is delayed, implementation of RNAV/RNP procedures may also be delayed.



Objective 1 Results: RNAV and RNP (continued)

- **Challenges To Implementing RNAV/RNP (continued)**

- Controllers must manage a “*mixed equipage environment*” in which they manage both RNAV/RNP and non-RNAV/RNP aircraft within the same airspace. This may limit the benefits from RNAV/RNP operations.
- FAA will need to develop new criteria for complex RNP procedures, and operators will need to work with FAA for RNP approvals and authorizations (including pilot training and company requirements).
- Initially, controller training has been minimal because the controllers are already familiar with the routes. As FAA advances toward RNAV/RNP routes that are significantly different from existing routes (e.g., network routes), extensive controller training will be required.
- FAA will need to standardize *phraseology* for controllers and pilots to build upon RNAV/RNP procedures and potential capabilities to enhance capacity.
- Airspace users may have to invest in more modern navigation equipment to take advantage of the benefits from RNAV/RNP procedures.



Objective 1 Results: Air Traffic Management

- **Air Traffic Management** is a combination of Air Traffic Control and the **Traffic Flow Management (TFM)** program. TFM, managed by FAA's Command Center, is the Nation's focal point for capturing and disseminating air traffic information across the aviation community. TFM is comprised of two major components: the TFM-Modernization (TFM-M) Program and the Collaborative Air Traffic Management Technologies (CATMT) Program. TFM includes a new tool, the **Airspace Flow Program (AFP)**, to collaboratively plan and manage traffic demand for airspace congestion issues. AFP, which also operates from FAA's Command Center, enables both the Agency and the airlines to reduce the impact of severe weather.
- **Status of Air Traffic Management Initiatives**
 - Improvements to TFM include the capability for improved planning and execution of routes by 2010. This will help the FAA and user communities react more quickly and efficiently to severe weather situations. FAA inaugurated the AFP in June 2006 in the northeastern United States and expanded it to the rest of the country in the spring of 2007.
 - During the 2006 convective weather season, FAA implemented the AFP program in the northeast on 19 severe weather days. As a result, FAA did not solely rely on widespread use of ground delay programs in the northeast corridor as in the past, which would have needlessly delayed thousands of flights.



Objective 1 Results: Air Traffic Management (continued)

- **Challenges to Air Traffic Management Initiatives**

- Although FAA has been deploying new software releases every 6 months, the age of the TFM system prevents further upgrades. The service life for the currently fielded TFM hardware and software expires in December 2009.
- FAA faces complex software development and integration issues, particularly in the development of the TFM-Modernization (TFM-M) system. While FAA has scheduled TFM-M to begin its operational phase in September 2008, the Agency has yet to determine when the system will become fully operational (estimated completion of deployment by FY 2010-2013). *Delays in implementing the new system could place the current system at risk of not being able to handle the increased demand.*
- It will be important for FAA to determine how best to (1) integrate weather forecast products into Air Traffic Management decision support capabilities and (2) improve common situational awareness related to weather forecasts and collaborative decision making with airspace users.



Objective 1 Results: Controller Tools

- **Traffic Management Advisor (TMA)** is a controller tool that could enhance the flow of air traffic. TMA is a software tool that applies the technique of “time-based metering” rather than miles-in-trail to manage traffic. TMA helps controllers (who manage high-altitude traffic) by predicting the time an aircraft will cross a navigation fix, sequencing them for arrival, and identifying conflicts with the predicted flight profiles of other aircraft.
- **Status of the TMA Initiative**
 - TMA is installed at all 20 en route centers in the continental United States. Eleven of these are currently fully operational, and 9 are expected to be fully operational by the end of FY 2008.
 - FAA is adding an adjacent center metering feature to TMA. This enables metering and spacing to be coordinated between adjacent en route centers. This will extend TMA beyond a single center and provide regional metering to airports.



Objective 1 Results: Controller Tools (continued)

- **Challenges To Using TMA To Enhance Capacity**

- The use of TMA represents a significant change in how controllers manage traffic. Effective training will be required for traffic management personnel and controllers to gain confidence in the automated functions of TMA.
- To realize additional benefits, FAA needs to evolve TMA into managing traffic beyond the proposed adjacent center metering concept (also known as “regional center TMA”). To gain maximum benefits, traffic will need to be metered and spaced from the point of origin to the destination, called “multi-center TMA.” This will require some additional development and greater coordination between FAA facilities and the FAA Command Center.



Objective 2 Results

Objective 2: Examine FAA's process for implementing capacity initiatives and managing interrelationships among the various efforts.

- **Implementing Capacity Initiatives**

- Various short-term capacity projects are interdependent. For example, FAA needs to adjust airspace to get the most benefits from RNAV/RNP procedures.
- Since 2001, FAA's blueprint for capacity initiatives has been the *Operational Evolution Partnership* (formerly called the *Operational Evolution Plan or OEP*). The OEP is FAA's mechanism for managing the interrelationships among programs. Overall, FAA's efforts to guide capacity initiatives have been successful. FAA recently refocused the OEP to help manage and implement NextGen initiatives and renamed it the *NextGen Implementation Plan*.
- FAA's short-term capacity initiatives cut across the ATO's three lines of business (i.e., Terminal, En Route, and Systems Operations) and will require greater coordination. Such coordination is inhibited, however, as a result of differences in priorities and availability of resources among these three ATO units.



Objective 2 Results (continued)

- **FAA's Management of Interrelated Efforts**

- Until recently, there was no single FAA office in charge of overseeing capacity initiatives. FAA has established a NextGen Integration and Implementation Office to oversee and coordinate capacity initiatives.
- The recent focus to address short-term issues in and around New York airspace raised questions about FAA's management of short-term capacity initiatives in the northeastern United States. To address these concerns, FAA put a single person in charge of New York area efforts to coordinate initiatives.

- **We identified several areas that require FAA's attention.**

- **Managing Capacity Initiatives as Portfolios** – To successfully implement short-term capacity initiatives, FAA must manage initiatives as portfolios—or in a highly integrated fashion. This would help link short-term capacity requirements and initiatives to the capital and operations accounts.
- **Keeping Planned Airport Infrastructure and Airspace Projects on Track** – Nine key runway projects are currently underway at seven airports (including projects at Washington Dulles and Chicago O'Hare) and are planned to be commissioned by 2012. FAA needs to make sure the navigation equipment, new procedures, and airspace modifications are in place when these projects are commissioned so that expected benefits can be achieved.



Objective 2 Results (continued)

- **Maximizing Special Use Airspace (SUA)** – More effective management and better scheduling of SUA is needed to make maximum use of airspace. As demonstrated by the Departments of Transportation and Defense decision to use military airspace over the holidays last year, use of such airspace can enhance the flow of air traffic. The goal is for improved schedule information to be made available to FAA and airspace users. There may be opportunities to make better use of SUA when planned military operators and training missions have been cancelled.
- **Addressing Controller Training** – FAA faces challenges in training large numbers of developmental controllers to replace retirees while concurrently training controllers to learn new short-term initiatives. Several of these short-term capacity measures, such as TMA and RNAV/RNP, involve automating previously manual and decision-making processes. To gain maximum benefits from this new technology, traffic flow managers and controllers will need to be trained in how to use these new tools and processes. Currently, FAA only provides limited training for TMA and little training for RNAV/RNP. FAA needs to determine what reasonably can be accomplished in the short term with respect to controller training.



Objective 2 Results (continued)

- **Examining Controller Productivity and Excessive Spacing on Final Approach** – In its December 2007 report, the New York Aviation Rulemaking Committee reported that the spacing between aircraft on their final approach had been steadily increasing beyond that needed for safety and contributed significantly to arrival delays at John F. Kennedy, LaGuardia, and Newark Liberty airports. Air Traffic Organization officials commented that concerns about excessive spacing extend beyond New York facilities. We discussed the issue with the controllers union, and they pointed out that other factors, such as weather conditions, also impacted spacing between aircraft. An internal FAA study found that problems were also traceable to poor coordination among FAA facilities. FAA has developed a tool to help monitor spacing and embarked upon educational efforts for controllers in both the en route and terminal lines of business. FAA needs to complete efforts to establish clear and measurable performance expectations.
- **Updating Capacity Benchmarks** – An important first step in addressing the delay problem in the 2000 timeframe was to develop a set of “capacity benchmarks” for the Nation’s top 30 airports. However, FAA has not published updated capacity benchmarks since 2004.



Scope and Methodology

- We conducted this audit between May 2, 2007, and June 30, 2008. During the audit, we met with and obtained documentation from officials representing:
 - FAA Headquarters (Airspace Management Program, RNAV/RNP Group, Office of Performance Analysis, Airports Division, Weather Group)
 - FAA Air Traffic Control System Command Center
 - FAA Western, Central, and Eastern Service Centers
 - FAA Northeast U.S. Region
 - FAA facilities in Los Angeles, CA; Seattle, WA; Anchorage and Juneau, AK; Las Vegas, NV; Dallas and Ft. Worth, TX; Long Island, NY; and Atlanta, GA.
 - Local airport authorities in Dallas, TX; New York, NY; and Atlanta, GA.
 - Southwest Airlines and Alaska Airlines
 - Naverus, Inc.

- We reviewed:
 - FAA policies and procedures for coordinating, designing, and implementing RNAV/RNP procedures.
 - Terms of the Other Transaction Agreement for third party design and implementation of RNP procedures.
 - FAA regulations relating to airspace usage and aircraft sequencing and spacing.
 - FAA plans for installing and implementing short-term capacity automation initiatives.
 - FAA plans and procedures for implementing short-term capacity procedural initiatives.

The following pages contain textual versions of the graphs and charts included in this document. These pages were not in the original document but have been added here to accommodate assistive technology.

**Observations on Short-Term Capacity Initiatives
Section 508 Compliant Presentation**

Figure 1. U.S. Air Carrier Passenger Enplanements Within the National Airspace System, Fiscal Year 2005 to Fiscal Year 2016

Fiscal Year 2005	587 million mainline (air carrier) and 150 million regional (air taxi/commuter) air carrier passenger enplanements
Fiscal Year 2006	584 million mainline (air carrier) and 156 million regional (air taxi/commuter) air carrier passenger enplanements
Fiscal Year 2007	606 million mainline (air carrier) and 159 million regional (air taxi/commuter) air carrier passenger enplanements
Fiscal Year 2008 (projected)	614 million mainline (air carrier) and 162 million regional (air taxi/commuter) air carrier passenger enplanements
Fiscal Year 2009 (projected)	634 million. mainline (air carrier) and 171 million regional (air taxi/commuter) air carrier passenger enplanements
Fiscal Year 2010 (projected)	658 million mainline (air carrier) and 178 million regional (air taxi/commuter) air carrier passenger enplanements
Fiscal Year 2011 (projected)	677 million mainline (air carrier) and 185 million regional (air taxi/commuter) air carrier passenger enplanements
Fiscal Year 2012 (projected)	698 million mainline (air carrier) and 191 million regional (air taxi/commuter) air carrier passenger enplanements
Fiscal Year 2013 (projected)	719 million mainline (air carrier) and 198 million regional (air taxi/commuter) air carrier passenger enplanements
Fiscal Year 2014 (projected)	738 million. mainline (air carrier) and 205 million regional (air taxi/commuter) air carrier passenger enplanements
Fiscal Year 2015 (projected)	760 million mainline (air carrier) and 213 million regional (air taxi/commuter) air carrier passenger enplanements
Fiscal Year 2016 (projected)	781 million mainline (air carrier) and 221 million regional (air taxi/commuter) air carrier passenger enplanements

Source: FAA Aerospace Forecast, Fiscal Years 2008-2025

Figure 2. Air Carrier Operations Within the National Airspace System, Fiscal Year 2005 to Fiscal Year 2016

Fiscal Year 2005	13.5 million mainline (air carrier) and 12.6 million regional (air taxi/commuter) air carrier operations within the National Airspace System
Fiscal Year 2006	13.3 million mainline (air carrier) and 12 million regional (air taxi/commuter) air carrier operations within the National Airspace System
Fiscal Year 2007	13.6 million mainline (air carrier) and 11.7 million regional (air taxi/commuter) air carrier operations within the National Airspace System
Fiscal Year 2008 (projected)	13.8 million mainline (air carrier) and 11.5 million regional (air taxi/commuter) air carrier operations within the National Airspace System
Fiscal Year 2009 (projected)	14.1 million mainline (air carrier) and 11.8 million regional (air taxi/commuter) air carrier operations within the National Airspace System
Fiscal Year 2010 (projected)	14.5 million mainline (air carrier) and 12.2 million regional (air taxi/commuter) air carrier operations within the National Airspace System
Fiscal Year 2011 (projected)	14.9 million mainline (air carrier) and 12.6 million regional (air taxi/commuter) air carrier operations within the National Airspace System
Fiscal Year 2012 (projected)	15.2 million mainline (air carrier) and 13.1 million regional (air taxi/commuter) air carrier operations within the National Airspace System
Fiscal Year 2013 (projected)	15.6 million mainline (air carrier) and 13.5 million regional (air taxi/commuter) air carrier operations within the National Airspace System
Fiscal Year 2014 (projected)	16 million mainline (air carrier) and 14 million regional (air taxi/commuter) air carrier operations within the National Airspace System
Fiscal Year 2015 (projected)	16.4 million mainline (air carrier) and 14.5 million regional (air taxi/commuter) air carrier operations within the National Airspace System
Fiscal Year 2016 (projected)	16.9 million mainline (air carrier) and 14.9 million regional (air taxi/commuter) air carrier operations within the National Airspace System

Source: FAA Aerospace Forecast, Fiscal Years 2008-2025

Table 1. Increases in Flight Delays and Cancellations (Summer 2006 and Summer 2007)

- In the summer of 2006, there were 1,986,654 scheduled flights. In the summer of 2007, there were 2,014,279. This represents a 1 percent change.
- In the summer of 2006, flight delays represented 26 percent of all scheduled flights. In the summer of 2007, flight delays represented 29 percent of all scheduled flights. This represents a 12 percent change.
- In the summer of 2006, there were 9 airports with delays of 30 minutes or more. In the summer of 2007, there were 26 airports. This represents a 189 percent change.
- In the summer of 2006, the average length of arrival delays was 56 minutes. In the summer of 2007, the average was 60 minutes. This represents a 6 percent change.
- In the summer of 2006, there were 37,396 cancelled flights. In the summer of 2007, there were 47,911. This represents a 28 percent change.
- In the summer of 2006, the percentage of cancelled flights was 1.9 percent of all scheduled flights. In the summer of 2007, the percentage of cancelled flights was 2.4 percent of all scheduled flights. This represents a 26 percent change.

Source: FAA

Table 2. Current Airfield Construction Projects

Philadelphia airfield construction project	Estimated completion date: March 2009	Estimated Cost: \$65 million
Seattle-Tacoma airfield construction project	Estimated completion date: November 2008	Estimated Cost: \$1.1 billion
Washington-Dulles airfield construction project	Estimated completion date: November 2008	Estimated Cost: \$356 million
Chicago O'Hare airfield construction project	Estimated completion date: 2012	Estimated Cost: \$1.9 billion
Charlotte airfield construction project	Estimated completion date: February 2010	Estimated Cost: \$300 million
Dallas Fort Worth airfield construction project	Estimated completion date: December 2008	Estimated Cost: \$79 million
Boston airfield construction project	Estimated completion date: November 2009	Estimated Cost: \$55 million

Note: Chicago O'Hare has three runway projects underway. Two of the three will be completed by November 2008.

Source: FAA

Table 3. Current Airspace Redesign Projects and Funding Profile

In fiscal year 2004, there were 42 airspace projects. Funding for these from the Operations Budget was \$21 million, and \$0 from the Capital Budget.

In fiscal year 2005, there were 42 airspace projects. Funding for these from the Operations Budget was \$15.3 million, and \$0 from the Capital Budget.

In fiscal year 2006, there were 20 airspace projects. Funding for these from the Operations Budget was \$8.5 million, and \$0 from the Capital Budget.

In fiscal year 2007, there were 7 airspace projects. Funding for these from the Operations Budget was \$6.8 million, and \$1.1 million from the Capital Budget.

In fiscal year 2008, there are 9 proposed airspace projects. Proposed funding for these from the Operations Budget is \$10.7 million, and \$5.0 million from the Capital Budget.

In fiscal year 2009, there are 8 estimated airspace projects. Estimated funding for these from the Operations Budget is \$8.2 million, and \$3.0 million from the Capital Budget.

Source: FAA