U.S. House of Representatives
Committee on Transportation and Infrastructure
Washington, DC 20515
October 5, 2011

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MEMORANDUM

TO: Members, Subcommittee on Aviation

FROM: The Honorable Thomas E. Petri, Chairman, Subcommittee on Aviation

SUBJECT: Hearing on a Comprehensive Review of FAA's NextGen Program: Costs, Benefits, Progress, and Management

Wednesday, October 5, 2011, 10:00 a.m. in room 2167 Rayburn House Office Building.

PURPOSE

The Subcommittee on Aviation will receive testimony from Federal government and industry witnesses regarding the costs, benefits, progress and management of the Federal Aviation Administration's (FAA) NextGen program. The discussion will focus on the FAA's progress in delivering measureable benefits to aviation users so far, as well as the agency's projections for future benefits to be gained from federal and industry investment.

BACKGROUND

The present-day national airspace system (NAS) consists of a network of en route[1] airways, much like an interstate highway grid in the skies. Airways are routes in space between

[1] The Federal Aviation Administration (FAA) uses three types of facilities to control traffic: *Airport towers* control airport surfaces and the airspace immediately surrounding airports; *Terminal Radar Approach Control Facilities (TRACONs)* sequence and separate aircraft in terminal airspace – i.e., as they approach and leave airports, beginning about five nautical miles and ending about 50 nautical miles from the airport and generally up to 10,000 to 14,000 feet above the ground; and *Air route traffic control centers* control aircraft in high-altitude en route

fixed points that include navigational radio beacons and waypoints defined by latitude and longitude coordinates and unique names. Because aircraft operating at high altitudes must follow these airways, they often cannot fly the most direct routing from their departure points to their destinations.

Surveillance and separation of aircraft is largely provided by an extensive network of radar sites and air traffic controllers who are directly responsible for ensuring adequate separation between aircraft receiving radar services. Maintaining this separation is achieved through extensive use of voice communications between controllers and pilots over open two-way radio frequencies, not so different from the technologies used in World War II.

Under the current system, controller workload, radio frequency voice-communication congestion, limitations of air traffic control (ATC) radar accuracy, and the coverage and accuracy of ground-based navigational signals impose practical limitations on the capacity and throughput of aircraft in the system, particularly in busy terminal areas near major airports and around choke-points where many flight paths converge.

Currently, the U.S. air transportation system transports about 730 million passengers a year and, combined with general aviation activity, results in about 70,000 flights over a 24-hour period. The FAA predicts that, by 2025, increases in passengers (up 53 percent to 1.1 billion per year) and general aviation activity will result in air traffic increasing to more than 85,000 flights every 24 hours.[2] It is widely acknowledged that the current U.S. air transportation system will not be able to meet these air traffic demands. In 2003, Congress passed H.R. 2115, Vision 100 – the Century of Aviation Reauthorization Act (Vision 100) (P.L. 108-176), which created the Joint Planning and Development Office (JPDO) within the FAA, and tasked it to plan for and coordinate with Federal and nonfederal stakeholders the transformation from the current air traffic control system to the NextGen system to meet anticipated traffic demands of 2025.

The NextGen plan consists of new concepts and capabilities for air traffic management and communications, navigations, and surveillance that involves: transitioning from a ground-based radar system to a more automated, aircraft-centered, satellite-based surveillance system; developing more direct and efficient routes through the airspace; improving aviation weather systems; developing data communications capabilities between aircraft and the ground to reduce controller and pilot workload per aircraft; and creating shared and distributed information technology architectures.

To date, the FAA has focused its effort to implement NextGen on deploying seven core infrastructure programs: Automatic Dependent Surveillance – Broadcast (ADS-B); System Wide Information Management (SWIM); NextGen Networked Enabled Weather (NNEW); Data Communications; NAS Voice Switch (NVS); En Route Automation Modernization (ERAM); and Collaborative Air Traffic Management Technologies (CATMT).[3]

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airspace – i.e., in transit and during approaches to some airports, generally controlling the airspace around and above terminal areas.

[2] FAA email to Bailey Edwards, Aviation Subcommittee Staff, 9-29-11.

[3] *ATC Modernization and NextGen: Near-Term Achievable Goals,* Before the H. Comm. on Transportation and Infrastructure, 111th Cong. vii-xx (2009).

Estimated NextGen Benefits

The FAA has promised efficiency gains through NextGen by optimizing air traffic controller performance, consolidating obsolete facilities, enhanced safety improvements, and improved operational efficiency of the national airspace system. However, before airspace users are likely to invest in the expensive avionics from which the benefits are derived, they must have confidence in both the business case (ie: cost accounting of benefits) for NextGen as well as FAA's ability to manage the NextGen program so the agency can deliver the benefits in a timely manner (ie: within the needed return on investment window).

According to the FAA, there are significant, quantifiable benefits associated with the proper implementation of NextGen. FAA estimates show that by 2018, NextGen air traffic management improvements will reduce total delays, in flight and on the ground, about 35 percent, depending on fuel prices and traffic, compared with what would happen if no NextGen program was pursued. The delay reduction will provide $23 billion in cumulative benefits from 2010 through 2018 to aircraft operators, the traveling public and the FAA. With the airspace management improvements planned from 2010 forward, the FAA estimates that airspace users could save about 1.4 billion gallons of aviation fuel during this period, cutting carbon dioxide emissions by 14 million tons.[4] As new avionics are approved for installation in aircraft, the purchase and installation of the NextGen avionics will also drive job growth in the U.S. aviation sector. With as much as $41 billion in total costs to the U.S. economy annually, NextGen has a significant benefit to the broader economy in reduction of delay.[5]

A study released by Deloitte, LLP in May 2011 concurred that the timely implementation of airspace reforms as in the FAA's NextGen plan would produce significant benefits. The study estimates that completing planned NextGen efforts would yield an overall $281 billion net benefit to the U.S. economy.[6]

On January 26, 2010, FAA Administrator Randy Babbitt summed up his vision of NextGen benefits in the next ten years:

> Aviation is changing all around us, and the FAA is changing along with it. We have to open our minds to new and innovative ways of keeping our aviation system on the leading edge — whether it's technology, or creative funding mechanisms. We're getting high marks for safety, but we will not stop there.

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[4] http://www.faa.gov/nextgen/benefits/

[5] "Your Flight Has Been Delayed Again", A report by the Joint Economic Committee, United States Congress, May 2008.

[6] Tom Captain, Deloitte, LLP, *Transforming the Air Transportation System: A business case for program acceleration.* May 2011.

So let me share with you what my vision of a flight in 2020 would be like. Our clearance is delivered and accepted with Data Link. The radio will only be used for emergencies. We'll taxi out and takeoff without touching the brakes with no chance of a runway incursion. We'll fly the most efficient course for departure and enroute at our most efficient altitude. Complete high fidelity weather information will be will be available to the pilots and controllers for the full projected route and avoided using predictive weather tools. We will descend and reach our destination using a continuous descent approach. Our airports and airways will be funded with a transparent blend of lower taxes and fees not subject to variations of the economy and supplemented with savings in time, fuel and carbon emissions. We'll deplane through multiple jet bridges, move through the terminal on high speed vehicles and moving sidewalks, only to find out our bags didn't make it.[7]

Key NextGen programs

As mentioned above, there are seven key FAA programs critical to the delivery of NextGen benefits. Some of these programs have been underway for years, and the witnesses will discuss the FAA's progress in terms of program management as well as cost and delivery timelines. Below are brief descriptions of the key NextGen programs managed by FAA.

a. Automatic Dependent Surveillance-Broadcast (ADS-B)

Often characterized as the "backbone of NextGen," ADS-B is the satellite surveillance and tracking method that the FAA has chosen to replace radar. FAA claims that eventually ADS-B, for the first time in aviation history, will allow both controllers and pilots to simultaneously see nearby aircraft. ADS-B is meant to provide enhanced and shared situational awareness for controllers and pilots with far more enhanced precision information of air traffic location, aircraft type, heading, altitude, and speed. ADS-B is expected to enhance safety, capacity, and reduce fuel burn and emissions. While far more complex, ADS-B is a bit like having GPS in your car. Unfortunately, most aircraft are not yet equipped with ADS-B.

There are two key components to ADS-B implementation. One is the FAA's deployment of ground infrastructure for controllers. The Agency awarded this contract to ITT Corporation in August 2007 and expects to complete this task by 2013. While radar simply collects radar information from ground-based radar stations, ADS-B technology relies on avionics in the aircraft to broadcast information to ADS-B ground stations. This is a change from the passive surveillance where radars send out a signal that bounces off of the aircraft skin and is collected again by the radar station to an active surveillance system where aircraft actually broadcast more

[7] "Focus and Vision: Moving Forward", J. Randolph Babbitt, Washington, D.C. January 26, 2010

precise and extensive information from the aircraft. This active surveillance is heavily avionics-dependent. So the second part of ADS-B implementation is avionics equipage in order to transmit ADS-B data to controllers and to other aircraft. Given the financial challenges facing aircraft owners, many have suggested that the FAA develop operational and financial incentives that will accelerate aircraft equipage.

b. En Route Automation Modernization (ERAM)

The computer system used at the FAA's high altitude en route centers processes flight radar data, provides communications, and generates display data to air traffic controllers. The current system, called the "Host", is being replaced by ERAM, a key automation platform, built with NextGen in mind, that will enhance air traffic controller productivity.

According to the FAA, ERAM hardware has been installed by Lockheed Martin at 20 en route centers. Software testing is currently underway at key sites, including Salt Lake City, Seattle and Minneapolis. Salt Lake City and Seattle were chosen as the first two sites to test ERAM communication and data transmissions between facilities.

c. Data Communications (DataComm)

In the current operational environment, communications between pilots and air traffic controllers is largely voice communications over two-way radio. Pilots are required to read back air traffic controllers' instructions to confirm that they have properly understood the instructions. In addition, frequency congestion can also interfere with pilots' efforts to contact controllers, or vice versa. At times, even with the "read back" and "acknowledge" requirements, errors are made that can jeopardize aviation safety. In addition, voice communications are time consuming and limit an air traffic controller's productivity.

FAA's answer to these challenges is the DataComm program. According to the FAA, DataComm will improve safety and efficiency by replacing voice communications with text-message instructions which for controllers would be generated by the air traffic control automation platforms. NextGen communications between controllers and flight crews will be handled by Data Comm transmissions, relieving radio frequency for more complex maneuvers and allowing complicated instructions to be provided electronically.

According to the FAA, deployment of DataComm could happen in the 2015-2018 timeframe, but it is unclear as to the exact cost and deployment schedule the FAA will pursue because the program has not been formally baselined. DataComm was originally supposed to be deployed in the 2014 timeframe.

d. System Wide Information Management (SWIM)

For years, the FAA has managed the national airspace system using a patchwork of different legacy systems that were not necessarily designed to share data with each other. Since NextGen relies on the interoperability of NextGen systems to more efficiently operate the NAS, as well as make information available to users, the FAA embarked on creating a common data platform for FAA systems, called SWIM.

According to the FAA, SWIM is an information platform that will allow all of the FAA systems in NextGen to "speak" to one another – as well as to the systems used by other parts of the aviation community, including the airlines, the military and the Department of Homeland Security. SWIM is an essential part of NextGen, since the safe and efficient use of airspace depends on how well the different parts of the airspace system communicate with one another.

SWIM's cost and timeline is broken into two Segments, Segment 1 and Segment 2. Segment 1 was rebaselined in 2009 with a $100 million program cost increase and a 2 year delay (to 2015). Segment 2 has not yet been formally baselined.[8]

e. NAS Voice Switch (NVS)

The NAS Voice Switch (NVS) is a forward-looking program to replace national airspace system (NAS) voice switches more than 20 years old with a new technology switching system capable of supporting future requirements for NextGen. The current inventory has 17 different NAS voice switches, each with different training and logistics requirements and tech refresh approaches. Many of these switches are experiencing increasing obsolescence and failures and are in need of replacement. They are not capable of supporting flexible reallocation of access to communications resources, and lack security needed for a network-based communications infrastructure, which is a key concept in modernization of the NAS. The NVS program will provide a key transitional element in the air traffic control voice communications infrastructure as it moves toward realizing the NextGen vision, Operational Evolution Partnership (OEP) goals, and a more operationally efficient and economic NAS.

Improvements provided by NVS will benefit the FAA and the airspace user. Fewer switch baselines in the NAS will significantly simplify and cut costs of training, logistics, and support. As NextGen infrastructure is put into place, the benefits of networked communications that NVS supports are planned to manifest in numerous ways. Flexible access to communications assets will support dynamic response to contingencies of weather, equipment or facility outages and other events that demand load balancing or sharing, dynamic airspace reconfiguration, or business continuity planning operations. These operations lead, in turn, to better balance of air traffic controller workloads and more efficient use of the airspace.

It is unclear as to the status of this program due to lack of clear baselines and program schedule from the FAA.

[8] FAA Brief to Subcommittee Staff, SWIM and Weather, June 8, 2011.

f. NextGen Network Enabled Weather (NNEW)

According to FAA statistics, weather accounts for 70 percent of all delays in the national airspace system. The FAA's NextGen Network Enabled Weather (NNEW) program is intended to improve aircraft operations over the nation's skies by reducing the impact of weather. According to the FAA, NNEW will provide better weather forecasts, particularly for severe conditions such as thunder storms and icing. This will allow FAA air traffic managers and those who use the system to better manage traffic flow in bad weather.

It is unclear as to the status of this program due to lack of clear baselines and program schedule from the FAA.

g. Collaborative Air Traffic Management Technologies (CATMT)

According to the FAA, Collaborative Air Traffic Management Technologies (CATMT) is a NextGen transformational program that provides enhancements to the existing Traffic Flow Management System (TFMS). This program is meant to develop an assortment of tools to best manage air traffic flows throughout the National Airspace System, taking into account big weather systems, automated delay and ground-stop delay programs at airports, improved route planning tools, and shared information about Special Use Airspace Restrictions. More efficient air traffic management is key to delivery of NextGen benefits—after all, the shorter the flight, the less fuel burn and carbon emissions.

The FAA plans to spend roughly $174 million through 2015 on this solution set.

RTCA Task Force

While NextGen has been planned over a long horizon, with a target date of 2025, many stakeholders have come to the conclusion that more can and must be done now to address inefficiencies and delay in the system. This could be done by more fully taking advantage of existing technologies, procedures, and capabilities rather than waiting for deployment of new systems and equipping aircraft with new technology. Due to the airline industry's economic distress, there has been more urgency to improve the efficiency and effectiveness of the air traffic control system in the near-term (2-3 years) to mid-term (by 2018) without damaging the long-term (2025) NextGen goals. In addition, industry stakeholders have urged the FAA to provide more detail on commitments needed to deliver quantifiable operational benefits in the mid-term that would help the industry justify and plan for the investments it needs to make in aircraft equipage.

On January 16, 2009, Hank Krakowski, then the Chief Operating Officer (COO) of the FAA Air Traffic Organization (ATO), and Margaret "Peggy" Gilligan, FAA Associate Administrator for Aviation Safety (AVS), sent a letter to RTCA, Inc. (RTCA).[9] The letter

[9] RTCA is a private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance, and air traffic management system issues. RTCA functions as a Federal

request that RTCA establish a government-industry NextGen Mid-Term Implementation Task Force (RTCA Task Force) to forge an aviation community consensus on NextGen operational improvements to be implemented between now and 2018. The goal was to maximize NextGen benefits in the near-term, and develop a business case for industry investment. On September 9, 2009, the RTCA Task Force issued its final report.

The RTCA Task Force consisted of approximately 335 individuals from 141 different organizations. Aviation industry stakeholder participants included users from the four major operating communities (airlines, business aviation, general aviation and the military), manufacturers, suppliers, vendors, and the analytic resources of MITRE-Center for Advanced Aviation System Development (MITRE).[10]

The RTCA Task Force report recommended a prioritized list of desired operational capabilities (and corresponding technologies, procedures, pilot and controller training, policies, etc. needed to achieve those capabilities) to be fully deployed by 2018. In addition, the RTCA Task Force sought to maximize the benefits of existing aircraft equipage.

The RTCA Task Force recommended a total of 29 operational capabilities in seven key areas: 1) Surface Operations (i.e., safer, more efficient movement of aircraft on the airport surface), 2) Runway Access (i.e., improving the utilization and capacity of airport runways), 3) Metroplex (i.e., deconflicting airspace and traffic flows among adjacent airports in major metropolitan areas), 4) Cruise (i.e., high altitude/en route airspace); 5) Access to the NAS (i.e., access to low altitude airspace and smaller airports – primarily for General Aviation operators); 6) Data Communications Applications (i.e., implementing controller-pilot data/text communications); and 7) Integrated Air Traffic Management (including pre-flight FAA/system operator flight planning collaboration).

Moreover, in addition to identifying operational capabilities and specific operators willing to commit to those capabilities, the RTCA Task Force attempted to define when and where each capability should be implemented.[11]

Regarding *where* capabilities should be implemented, it is important to note that the Task Force report represents a sort of localized, "airport centric" approach to early NextGen improvements – delivering measurable efficiency improvements through targeted deployment of capabilities at the key airports and large metropolitan areas, the bottlenecks where problems are most acute and most likely to ripple through the NAS before implementing NextGen solutions across the entire NAS.

Advisory Committee and includes roughly 335 government, industry, and academic organizations from the United States and around the world. Members represent all facets of the aviation community, including government organizations, airlines, airspace users and airport associations, labor unions, aviation service and equipment suppliers.

[10] MITRE is a non-profit organization and the CAASD was established in 1990 within MITRE. MITRE-CAASD is sponsored by the FAA as a Federally Funded Research and Development Center (FFRDC). A FFRDC meets certain special long-term research or development needs that cannot be met as effectively by existing in-house or contractor resources.

[11] RTCA, *NextGen Mid-Term Implementation Task Force Report,* (Sep. 9, 2009).

Additionally, the RTCA Task Force report memorialized the commitment on the part of users that if the FAA implements the elements of a recommended operational capability for which it is responsible, the operators who requested that capability would commit to making all necessary investments (e.g., training and equipage) in coordination with a rational and definable plan to be able to fly and achieve the benefits of such capability.

a. Streamlining Operational Procedure Approval

One of the key RTCA Task Force recommendations was to accelerate the FAA's approval of operational procedures. Operational approval is a process the FAA uses to authorize an operator to conduct operations using a specific aircraft and associated equipment in a specific operating environment. FAA's certification process ensures, among other things, the safety of aircraft equipment entering the NAS. For example, an operator must obtain operational approval, from FAA's Flight Standards Service, to use Required Navigation Performance (advanced satellite landing) procedures.

The RTCA Task Force recommended streamlining the environmental and operational approval and certification processes. It pointed out that failure to streamline these processes will likely have far-reaching implications and negatively impact FAA and industry progress toward NextGen implementation.

According to the Government Accountability Office (GAO), stakeholders, including airlines, general aviation groups, and avionics manufacturers, have said that these processes take too long and impose costs on industry that discourage them from making the investment in NextGen aircraft equipment. For example, stakeholders have expressed concern over the time FAA takes to certify Required Navigation Performance routes. The longer it takes to get more efficient procedures certified, the weaker the business case for operators to equip with costly NextGen avionics.[12]

b. Performance Metrics

Another key challenge for the FAA is the establishment of performance metrics that accurately measure the extent to which NextGen benefits are achieved. Some stakeholders have expressed concern that the performance metrics currently used by FAA do not, in some cases, measure the achievement of value provided to FAA or the industry. One stakeholder has suggested that FAA adopt "outcome" based metrics that would measure whether FAA's actions yielded beneficial outcomes to both FAA and the industry.

The RTCA Task Force report identified the establishment of performance metrics as an important part of following up and tracking its recommendations. Included in H.R. 658, "FAA Air Transportation Modernization and Safety Improvement Act," is a requirement for the FAA to

[12] Government Accountability Office Audit GAO-11-14, "Aviation Safety: Certification and Approval Proceses are Generally Viewed as Working well, but Better Evaluative Information Needed to Improve Efficiency," October 7, 2010.

collect data on output metrics for NextGen to measure the performance of FAA's efforts to deliver NextGen benefits. Examples of outcome-based metrics would include:

- Safety – Yearly improvement in accident rates;
- Capacity – Change in allowable/schedulable runway operations per hour at major airports;
- Capacity – Number of new runways enabled in high density regions;
- Fuel, Environment and Airspace Efficiency – Reduction in scheduled block time between major city pairs; and
- Air Navigation Service Provider (ANSP) Efficiency – FAA Unit Cost per Operation.

Witnesses:

Panel I:

The Honorable Michael P. Huerta
Deputy Administrator
Federal Aviation Administration

Captain Lee Moak
President
Air Line Pilots Association International

Mr. Edward M. Bolen
President and CEO
National Business Aviation Association

Mr. Tom Captain
Vice Chairman, Principal
U.S. Aerospace and Defense Sector Leader
Deloitte LLP

Panel II:

The Honorable Calvin L. Scovel, III
Inspector General
U.S. Department of Transportation

Dr. Gerald L. Dillingham
Director, Physical Infrastructure Division
Government Accountability Office

Mr. Thomas L. Hendricks
Vice President for Operations and Safety
Air Transport Association