



**Federal Aviation
Administration**

Next**GEN**

NextGen Works for America: Chief NextGen Officer Update to Congress

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The FAA with NextGen is taking the next quantum leap in air traffic control. Just over 100 years after the Wright brothers' first flight — a span that has seen airplanes guided by bonfires, flags, radios and radars — the agency is ushering in a new era of state-of-the-art, satellite-based technology that is making the world's safest aviation system even safer, delivering passengers to their destinations faster and with greater efficiency, while reducing aviation's impact on the environment.

Since I became Chief NextGen Officer in June 2013, the FAA has made clear and measurable progress toward completing the technological foundation that allows us to operate the NAS with greater efficiency and predictability and reduced environmental impact. We have strengthened our partnerships with key stakeholders, coming to an agreement on a set of near-term capabilities that both the FAA and industry will concentrate on over the next three years. And we have concrete evidence that demonstrates how NextGen works for aviation and for America as a whole.

Finishing the Foundation

We are on the cusp of finishing several key programs that underpin NextGen. In March 2014, we completed installation of the ground infrastructure for Automatic Dependent Surveillance – Broadcast (ADS-B), the new surveillance system that uses GPS signals to determine an aircraft's location. We will deliver traffic, weather and flight information directly to the cockpits of properly equipped aircraft across the country. These services have already proven to increase safety by enhancing a pilot's awareness of surrounding aircraft in flight, while also keeping them apprised of nearby weather activity and the availability of airspace and airport resources.

We are on track by the middle of 2015 to have all 20 en route centers operating with En Route Automation Modernization (ERAM), which will replace HOST, the computer system the FAA has been using to control traffic in high-altitude airspace since the 1970s. ERAM enables many new NextGen capabilities that could not be accommodated by HOST. By the end of 2016, we expect to have made substantial progress deploying Terminal Automation Modernization and Replacement (TAMR), a program that upgrades the automation platform used in FAA facilities that control low-altitude traffic approaching and departing from our nation's airports.

These accomplishments represent significant progress, and will generate benefits to the aviation community. They do not, however, represent a conclusion to NextGen.

Rather, these programs form the foundation for the next wave of capabilities. Going forward, ERAM and TAMR will be coupled with ADS-B and other NextGen programs still in development — such as Data Communications and a suite of traffic management and decision support tools — that will provide new ways to move aircraft safely and efficiently through the NAS.

Delivering Benefits Today

While NextGen changes are nearly invisible to the flying public, passengers today are, however, already enjoying the benefits of NextGen through shorter flights, better on-time performance and fewer missed connections. Air carriers are saving precious minutes and fuel and reducing aircraft exhaust emissions by taking advantage of more precise routing. General aviation pilots and other small aircraft operators are enjoying greater access to more airports across the country, particularly during poor weather. And air traffic controllers have access to new tools to help them make the critical decisions necessary to keep the world's busiest airspace system working as safely and efficiently as possible. NextGen is already working for America.

Automatic Dependent Surveillance–Broadcast

The initial benefits of ADS-B are being realized by pilots of properly equipped aircraft who are enjoying unprecedented levels of situational awareness through traffic and weather information being sent directly to the cockpit. This information alerts them to in-flight hazards and helps prevent accidents. The three types of ADS-B broadcast services now deployed are:

- **Traffic Information Service–Broadcast (TIS-B):** This air traffic advisory service provides the altitude, ground track, speed and distance of aircraft flying in radar contact with controllers and within a 15-nautical-mile (nm) radius, up to 3,500 feet above or below the receiving aircraft's position. A general aviation aircraft equipped with ADS-B In can also receive position data directly from other aircraft broadcasting on the same ADS-B Out frequency. In addition, TIS-B enables pilots to see aircraft equipped with transponders flying nearby even if those aircraft are not equipped with ADS-B Out.
- **Automatic Dependent Surveillance–Rebroadcast (ADS-R):** ADS-R takes position information received on the ground from universal access transceiver (UAT)-equipped aircraft and

rebroadcasts it on the 1090 MHz frequency. Likewise, ADS-R rebroadcasts 1090 MHz data to UAT users. In concert with TIS-B, ADS-R provides all ADS-B In-equipped aircraft with a comprehensive airspace and airport surface traffic picture. ADS-R delivers traffic data within a 15-nm radius 5,000 feet above or below relative to the receiving aircraft's position.

- **Flight Information Service–Broadcast (FIS-B):** This service broadcasts graphical weather to the cockpit based on what ground-based weather radar is detecting. In addition, FIS-B broadcasts text-based advisories including Notice to Airmen messages and reports on everything from significant weather to thunderstorm activity. UAT-equipped general aviation aircraft can receive this information at altitudes up to 24,000 feet.

We initially demonstrated the value of these services in Alaska, where many residents rely on general aviation for travel and supplies. National Transportation Safety Board data show that the accident rate for ADS-B-equipped aircraft there is 30 percent lower than that of non-equipped aircraft, and more and more reports of accidents avoided are coming in as more pilots take advantage of this technology.

ADS-B has capabilities for commercial aviation as well. For example, in 2015 the agency will implement ADS-B-enabled In-Trail Procedures in oceanic airspace that will help airlines save fuel. Consider that a single oceanic flight can consume 300,000 pounds of fuel. When an aircraft deviates from an optimum altitude by as little as 1,000 feet, it can consume an additional 1 percent of fuel, according to research conducted by the Massachusetts Institute of Technology. Multiply that by 10 or more hours and it adds up.

Because there is no radar surveillance over the ocean, aircraft flying at the same altitude previously had to be separated by 10 minutes, or about 80-100 nautical miles. The old separation distance between flights made it difficult for aircraft to get cleared to change to more fuel-efficient altitudes as moving up or down puts the planes too close to one another.

But this is a better way. Pilots of properly equipped aircraft will have a display showing the location of other ADS-B-equipped aircraft nearby. After coordinating with controllers, the pilot will receive clearance to climb or descend safely through one or more flight levels even when other aircraft are as close as 15 nautical miles or no more than 2,000 feet above or below.

The FAA plans to deliver more ADS-B-based capabilities over the coming years. Ground-based Interval Management-Spacing capitalizes on ADS-B to streamline traffic flows into terminal airspace while Flight Interval Management-Spacing uses ADS-B Out to enable more precise spacing between aircraft. We expect to have these capabilities ready to use before the 2020 mandate to equip takes effect.

Performance Based Navigation

Performance Based Navigation (PBN) is a blanket term for more precise GPS-based navigation methods that allow optimal routing in all phases of flight. The FAA has been working with stakeholders for many years on PBN implementation, and today there are more PBN procedures and routes than there are conventional ones.

The agency is now employing a more systematic approach to PBN deployment through our Metroplex initiative. A metroplex is a geographic area with several airports and lots of air traffic that interact in the same airspace. The FAA is actively working to improve how air traffic flies into, out of and through 13 targeted metroplexes rather than dealing with airports one at a time.

The success of this approach can be seen in the Denver Metroplex project. This year Denver realized the culmination of a three-year effort during which the FAA worked with aircraft operators and nine area airports to create one of the most comprehensive operational networks of NextGen satellite-based arrivals and departures in the nation. This network enables more flexibility and better access to the airports, which the FAA estimates will save operators \$9.8 million annually by using 3.2 million fewer gallons of fuel. Overall, approximately 80 percent of all aircraft that fly in and out of Denver International are equipped to take advantage of the new procedures.

Specifically, the Denver Metroplex project introduced a network of 51 satellite-based procedures designed to provide more direct routes, deconflict the airspace, save fuel and reduce emissions. This includes 21 arrivals with optimized profile descents, which allow aircraft to reduce thrust and glide down to the runway using less fuel and creating less noise. The project also introduced 16 departures procedures and two GPS approaches, which were published in January 2013. Twelve additional sophisticated approach procedures, known as Required Navigation Performance Authorization Required (RNP AR), went into operations in late June 2013. These RNP AR

procedures provide a more stable but curved approach, equaling a shorter flying distance. Flying these approaches requires specific aircraft instruments that contain the aircraft in a very narrow and precise corridor of airspace. The FAA has seen an approximate 35 percent decrease in the number of go-arounds caused by aircraft coming in too high or too fast. Aircraft on the new arrival procedures are more stabilized on their final approach as they usually arrive on a more predictable course and speed.

United Airlines was the lead carrier working with the FAA on this project. All of United's aircraft are equipped to fly satellite-based procedures and the airline estimates saving 100-200 pounds of fuel on each arrival. With an average of 120 flights per day, that equates to an estimated annual reduction of 4.35-8.7 million pounds of fuel and 13.8-27.6 million pounds of carbon dioxide emissions. That figure could triple when an arrival procedure connects to an RNP procedure and eliminates about 10 miles of flying for aircraft equipped to fly the more sophisticated routes.

In addition to the Metroplex projects, the FAA continues to implement PBN at other airports across the country, including Wide Area Augmentation System Localizer Performance with Vertical guidance procedures that increase access to airports in lower visibility conditions and are especially helpful to general aviation pilots.

System Wide Information Management

System Wide Information Management (SWIM) is the digital data delivery backbone of NextGen, ensuring the right people have the right information at the right time. Since 2010, NAS users — particularly airline operations centers — have been accessing weather and other flight planning information via SWIM, enabling airline dispatchers and traffic managers to collaborate on the routing and rerouting of traffic based on real-time information. Users benefit by having access to a single, comprehensive data feed that contains management initiatives, airport runway configurations and which airports are in deicing.

In August 2013, Miami Terminal Radar Approach Control (TRACON) became the first facility to begin distributing data from the towers included in its coverage area to an airline via the SWIM Terminal Data Distribution System (STDDS). STDDS takes raw surface data and converts it into easily accessible information. The system sends surface information from airport towers to the corresponding TRACON, which makes the information available via SWIM messaging services. Airlines and airports can use this information to streamline surface

operations and increase efficiency. Ultimately, 136 airports will provide surface information via STDDS at 39 TRACONs to users via SWIM services.

The FAA is planning to unveil several new SWIM capabilities next year, including Flow Information Publication, which provides subscribers with access to traffic flow information.

NextGen Ahead

A complex, long-term undertaking such as NextGen requires a constant dialogue with our stakeholders to ensure we are on track. We recognize that while meeting programmatic milestones is one measure of success, ultimately industry cares most about the operational improvements enabled by these programs, and the tangible benefits they provide. Having laid the foundation with ADS-B, ERAM and TAMR, we are now focused on deploying new capabilities over the next three years.

The FAA works closely with stakeholders each and every day through Metroplex working groups, concept validation projects, and equipage incentive partnerships. Last year we asked industry, through the NextGen Advisory Committee, to identify their top priorities among all of our planned capabilities. The resulting list falls into four categories: PBN, multiple runway operations, surface operations, and data communications. Because some capabilities require operators to make changes to their aircraft and flight operations centers, as well as to provide additional pilot training, we are working to develop a master implementation plan for this set of capabilities that will include commitments from both FAA and the industry.

It is important to remember that NextGen does not end after this near-term work is completed. The foundation we've laid will support additional capabilities that we plan to deploy through the end of the decade. It is also important to remember that delivering NextGen to the traveling public is not a foregone conclusion. Some of the foundational capabilities we described above have already been delayed due to the disruption of the sequester. For others, we have had to delay implementation schedules as projected funding has not materialized.

Next year will be pivotal for the next stage of NextGen, as we make investment decisions for a series of future programs. These decisions are dependent on stable funding. With the continuing support of Congress and our stakeholders, we will deliver NextGen and its benefits to aviation, the economy, and the American people.