

NextGen

Traffic? Weather? Navigation?

NextGen is shorthand for the FAA's Next Generation Air Transportation System, a long-term, ongoing, wide-ranging transformation of the National Airspace System (NAS). Everyone who is responsible for moving aircraft through space and time needs to know that this is much more than just an upgrade. It's an evolution in the way we fly. NextGen will transform the NAS from a ground-based air traffic control system to a satellite and performance-based air traffic management system.

The latter term, management, implies a more proactive approach to the flow of air traffic, made possible by a sophisticated framework of new technologies, processes, and infrastructure. The goal is to address growth, improve safety, increase user access to the NAS, and, at the same time, reduce environmental impacts. The overall concept is built upon relying more extensively on the satellite-based Global Positioning System (GPS) as the primary means for determining aircraft position and less on ATC radar.

Advances in digital communications and networking will allow all players in the NAS— air traffic controllers, pilots, dispatchers, weather forecasters, and others—to have instant access to the information they need to do their jobs. As the NextGen infrastructure continues to mature, avionics choices are likely to expand to include a broad selection of panel-mounted systems as well as handheld devices that run all sorts of applications. The possibilities are wide open.

When fully implemented, NextGen will safely allow more aircraft to fly more closely together on more direct routes while reducing delays, carbon footprints, and noise. Pilots can expect to have access to richer and faster in-flight traffic and weather data. Here's a snapshot of where we

are today and what we can expect in the months and years to come.

Timeline for Implementation

If money is what makes airplanes fly, then NextGen is a giant engine with an equally massive appetite for cash. On February 1, 2010, U.S. Transportation Secretary Ray LaHood announced that President Obama's \$79 billion budget for the U.S. Department of Transportation includes \$1.1 billion for NextGen air traffic control technologies, an increase of \$275 million, or 32 percent, over the previous year's budget.

"There is much to be done and the timeline for completion is drawing near," LaHood said.

The clock is ticking, indeed. As of this publication's deadline, the final rule defining the operational requirements for Automatic Dependent Surveillance-Broadcast (ADS-B) within the NAS was set to be published in the *Federal Register* in April/May 2010, officially opening the door for the aviation industry to bring ADS-B products and services to the market. While NextGen includes a diverse cast of characters, the star of the show is ADS-B. The ADS-B orchestra of ground stations, satellites, and cockpit avionics is offering pilots new ways to maintain situational awareness. (See story on page 11.) Though ADS-B has existed in some form for more than decade, the NextGen version of ADS-B is slated to be available throughout the NAS by 2013—fewer than three years from now, with mandatory equipage and compliance by 2020.

"NextGen benefits will be maximized when the majority of operators are properly equipped," said Leslie Smith, Manager, FAA Flight Technologies and Procedures Division. "While these avionics will also support capabilities implemented beyond 2018, additional equipage may be necessary to take advantage of capabilities introduced beyond the mid-term."

NextGen *for the Masses*

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Enabling Technologies

NextGen isn't so much a comprehensive overhaul of our national airspace system as it is an information technology project of grand proportions, with teams of software engineers working to build the network of systems that will keep everything humming. With that in mind, the FAA has identified six "enabling technologies" of NextGen, with ADS-B positioned at the top of the list. The other five are the subsystems that allow ADS-B and all of the other NextGen technologies to function.

System-Wide Information Management (SWIM) is the information technology standards base that will help to make sure that every NextGen application is compliant within the NAS. The goal of SWIM is to improve operational decision making by allowing easier data exchange between systems. The program's first segment will focus on applications related to flight and flow management, aeronautical information management, and weather data dissemination.

The **Data Communications (Data Comm)** subsystem defines the increasing importance of digital communications between air traffic controllers and aircraft, in addition to traditional analog (radio) voice communications with pilots, which are workload intensive and prone to errors in both delivery and receipt. ("Potomac, was that approach clearance for Seven Papa Whiskey or Two Papa Whiskey?")

Initially, data communications will be a supplemental means for two-way exchange between controllers and flight crews for air traffic control clearances, instructions, advisories, flight crew requests, and reports. As the system matures, the majority of air-to-ground exchanges will be handled by data communications for appropriately equipped users.

NextGen Network Enabled Weather (NNEW) will serve as the infrastructure core for aviation weather support services, providing access

to a NAS-wide common weather picture. NNEW will identify, adapt, and use standards for system-wide weather data formatting and access. The FAA is calling this collaboratively built, but centrally accessed, data source the "4-D Weather Data Cube," where aviation weather information from multiple agency sources will be developed and stored. The Cube will provide a single national—and eventually global—picture of the atmosphere, updated as needed in real-time and distributed to authorized users and systems. The National Weather Service will have primary responsibility for operational management of the Cube, while the FAA will define requirements and coordinate and implement changes to FAA infrastructure that support it.

National Airspace System Voice Switch (NVS) is a program to replace current voice switches, some of which are more than 20 years old. With the current voice architecture, linkages do not support sharing of airspace within and across facility

NextGen includes a diverse cast, with ADS-B as the star of the show.

A GA cockpit equipped with ADS-B avionics





A cockpit display showing ADS-B and non-ADS-B traffic

the cockpit, which if used properly can enhance situational awareness and safety. But since so much of this is, as they say, a coming attraction, the best we can do right now is educate ourselves about what's coming, and be ready to play ball when the first pitch is thrown. ✈️

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boundaries, reconfiguration capability of controller position to radio frequency and volume of airspace is inflexible, and reconfigurations are laborious and time consuming.

Performance-Based Navigation (PBN)

includes both area navigation (RNAV) and required navigation performance (RNP). RNAV enables aircraft to fly on any desired flight path within the coverage of ground- or space-based navigation aids. The concept is not new—VOR/DME and LORAN were types of RNAV systems—but the NextGen application of it is new, with the emphasis on GPS as the position source. RNP takes RNAV and adds an onboard performance monitoring and alerting capability. A defining characteristic of RNP operations is the ability of the aircraft navigation system to monitor the navigation performance it achieves and inform the crew if the requirement is not met during an operation. For more information on PBN, see the article on page 15 of this issue.

What NextGen Means for General Aviation

The NextGen component that is likely to have the most immediate impact on general aviation is ADS-B. Pilots will have access to improved traffic and weather information in

For More Information

Here are some helpful Web sites on NextGen:

<http://www.faa.gov/about/initiatives/nextgen/>

http://www.faa.gov/about/initiatives/nextgen/media/NGIP_3-2010.pdf

<http://www.dot.gov/affairs/2010/dot2010a.htm>

http://www.faa.gov/news/fact_sheets/news_story.cfm?newsid=8145

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