Navigating NextGen

Can the FAA pull off its $40 billion ATC makeover?

by John Sheridan

Ask any politician or media person what NextGen is and what it will do, and the chances are that the answers will include three common themes. First, you’ll hear that it uses satellites; second, it will be a boon to the traveling public; and third, it’s “on its way.” So far, so good. However, the devil is in the details, and NextGen has details in spades.

It’s not widely appreciated just how big a program NextGen actually is. It is truly enormous, causing a senior Boeing official to list it as one of the biggest single peacetime civil infrastructure endeavors ever undertaken by the U.S., and comparing it to the International Space Station, which actually is. It is truly enormous, climbing annually to $1.3 billion by FY 2014. Firm figures aren’t available beyond FY 2014, but it is expected to keep climbing. And that $40 billion, of course, doesn’t include operator compliance costs.

So can we afford NextGen? The simple answer seems to be that if the forecasts of twice, maybe three times, today’s traffic movements come to pass by 2025, then we can’t afford not to move to NextGen, since the present system would simply be unable to handle those increases.

Where does NextGen stand today, and how is it moving along? A review of some of the NextGen programs, and a few of the external factors that can shape them, may be helpful.

RNP, Rnav, ADS-B, Laas, Waas LPV, CDAs, GPS

These are all familiar programs that several operators are now using, selectively, to meet their individual needs. None has a blanket mandate applicable to all aircraft, although some procedures—RNP, for example—have fairly demanding user regulations. Other than the military’s GPS, all have been developed to make civil flight operations safer and more efficient, and all of them do that. What’s more, all of them have roles to play in NextGen.

But the fact that they’re here and usable doesn’t mean that we are in a NextGen environment. That’s still a long way away. NextGen’s timetable covers three phases: Near Term 2008-2012, Mid Term 2012-2018 and Far Term 2018-2025. Near Term might also be called a familiarization phase, with Mid Term a gradual transitional phase leading to completion. During the Far Term—always remembering that the mandate for ADS-B, which the FAA describes as “the backbone of NextGen,” is not expected to come due until 2020.

Yet even if the total civil air traffic fleet were fully equipped for all the myriad avionics applications that NextGen is planning to throw at us, we would be no further ahead than we are today. This is because the major ground systems that underpin both the implementation are either not ready for prime time or are still works in progress. And they are also high-ticket items, of interest to those who wonder how NextGen’s price tag can possibly reach $40 billion.

**Big Numbers**

NextGen architects (yes, that’s what they’re called) have designed NextGen on an integrated foundation of essential building blocks, which then collectively support a wide range of subsystems and applications, of which there are hundreds. It is understood that currently, the majority of the subsystems are defined and are under development, but most of the applications are still in the research stage. This recognizes that over NextGen’s time frame some newer technologies can be expected to offer additional benefits, perhaps even some that might previously have been thought unattainable. Also, 2025 is not regarded as the cutoff point for further development, but is an effort to put a thumbtack on the major building blocks and their costs could be useful to know.

Under a $1.7 billion contract, a network of more than 850 ADS-B ground stations is being installed nationwide, with completion planned in 2013. During this period, ADS-B services will be available to specific users, such as UPS (Ain, May, page 48) and helicopters in the Gulf of Mexico, but not offered publicly. One of many projects due to be clarified is that of controller separation of the equipped and non-equipped aircraft mix before the currently planned 2020 mandatory equipage date. AIN has been told that the installation program is progressing well, with no delays anticipated. Would that all the other major building-block programs were doing so well.

The $2.1 billion En Route Automation Modernization (Eram) program is designed to replace the current host computer system that essentially controls all traffic in the NAS. Host is a legacy system, reportedly employing obsolete computer language in places, and has virtually no upgrade potential. However, the DOT has said that the Eram solution, located for testing at the less busy Salt Lake City ARTCC, has been trouble prone. The DOT’s IG reported in April that Eram suffered from radar processor failures and problems in controller-to-controller handoffs, and that it also paired critical flight information with the wrong aircraft. The IG stated that the FAA was then spending about $14 million per month to resolve these problems. In approving additional contract, the IG observed that “those costs do not include enhancements for NextGen, which have not been established but are expected to cost several billion dollars.” Possibly, this is because the host system was planned, and its replacement’s design committed, long before NextGen was launched.

In terminal areas, controllers rely on two types of automation and display systems to handle Eram data: the standard terminal automation replacement system (Stars) and the common automated radar terminal system (Common Arts). Neither is able exclusively to handle NextGen demands and both require either upgrades or replacement. Common Arts might not be able to display ADS-B data that overfly the system is operating nationwide by 2013. The IG reported that cost estimates for either the upgrade or replacement options exceed $2 billion.

The FAA Telecommunications Infrastructure (FTI) is a $3.5 billion contract to modernize communications among FAA facilities. But its problems caused the DOT IG to question “whether the system can be relied on for NextGen initiatives and whether the FAA is adequately overseeing the contractor.” At issue here was a system failure in November last year that delayed more than 800 flights nationwide and took five hours to diagnose, correct and restore service. It turned out that, unbeknownst to the FAA, the contractor had disabled its failure alerts while performing work on the system. Perhaps dryly, the IG noted that the FAA had approved the same contractor to continue modernizing the FTI network.

Currently, the top spot on the NextGen contract pyramid is a program called Systems Engineering 2020 (SE2020) that will dole out support contracts to different bidders this year.

What’s a support contract? It’s simply a means of providing FAA staff with, er, support: technical, operational, financial, administrative, you name it. The object is to provide qualified people to agency sectors that face relatively brief but intense peaks of activity during key phases of a program. The current project has a ceiling of $7 billion for the total number of contracts awarded. Interestingly, that’s a little over twice the price United is paying to buy Continental. True, $7 billion for temporary help may seem like heavy stuff, but this is Washington.
One observer said that if ADS-B is the backbone of NextGen, and Eram is to be its central nervous system, then Swim will be its heart, continuously circulating information throughout the aviation system. Swim is unquestionably the leading imperative of NextGen—which can’t work for anything if it—an overhead view of Swim’s contract value are available, it’s no coincidence that all the industry giants are intent on getting a piece of the action, with some powerhouse alliances already being formed. Such alliances are also being formed in Europe, where Swim is also a key element of Sesar, Europe’s NextGen equivalent. Eventually, mutually compatible Swim complexes will cover worldwide aviation activities.

Those, then, are NextGen’s major building blocks. It’s safe to predict that their introduction will not always be smooth, technical problems will arise, and their eventual costs and operational readiness dates will likely slip. In fact, the DOT’s IG stated in April that “A recent NextGen portfolio analysis…already shows that some NextGen automated air and ground capabilities originally planned for 2025 may not be implemented until 2035 or later….” Space does not allow discussion of the many subsystems that the major NextGen building blocks will support. But pilots will certainly look forward to one of them, NextGen would not save the airlines money. He added that installing NextGen avionics would cost US Airlines nearly $1 billion, and as long as the airline had to pay for it, they would rather not have it. American Airlines CEO Gerald Arpey has expressed similar views, stating that American’s top executives anticipated that its fixed costs with satellite-based navigation upgrades would run from the tens to the hundreds of millions of dollars. Generally, airline officials maintain that the government should cover the airlines’ costs of compliance with its air traffic infrastructure, since it is in the national interest to maintain such a system. On the other hand, Southwest Airlines in April began RNP operations after installing equipment in nearly 400 of its Boeing 737s. Southwest claims that its $175 million investment will be repaid by cutting just one minute of flying time off each flight.

Here, US Airways and American are looking at one side of an issue (having to comply with arbitrary mandates) and Southwest is looking at the other (being able to select equipment that simply meets the needs of the operator). It’s the difference between rigid mandates, such as those expected for ADS-B, and the more flexible best equipped, best served (BEBS) concept. Yet it’s a growingly contentious issues that has to be resolved.

**called the 4D Weather Cube. 4D refers to latitude, longitude, altitude and time validity.**

As we all know, weather forecasts are variable entities, and it is not unusual for the forecasts to come from separate sources covering the same area, altitudes and time periods to differ, sometimes significantly. The Weather Cube concept collects and analyzes all available sources, both public and private, and derives the most reliable result, which then becomes the common published forecast. In operation, a pilot during cruise could call up a 4D cube for FL350 over a 600-mile-square area for the next two hours and, before entering the terminal area, select 2,000 feet over 40 miles for the next 30 minutes. The 4D Weather Cube is expected to be fully developed by 2013. That’s certainly a date to look forward to.

**Summary**

Many years ago, when NextGen was still called the Next Generation Air Transportation System (NextGen), a speaker at an Nats conference put up a memorable slide illustrating the future transition. On the left half of the screen a weather-beaten propeller-driven airliner was heading upwards toward a large cloud in the center of the screen while a gleaming jetliner was emerging from the cloud on the right half. Above the prop airplane was the word Today, and above the jet was the word Tomorrow. The cloud bore three words: A Miracle Happens. **Maybe we should all believe in miracles.**