

Airlines welcome efficiency and safety benefits of ADS-B, but some can't make the business case to equip fleets now.

# WAIT *and* SEE

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Uncertainty about U.S. airlines' willingness to voluntarily install new avionics eight years before the upgrade becomes mandatory surfaced repeatedly in a public discussion in mid-2011, dividing stakeholders who, nevertheless, share high aspirations for the U.S. Next Generation Air Transportation System (NextGen). During this government-industry meeting, several presenters credited the Federal Aviation Administration (FAA) with success in building a substantial portion of the ground infrastructure for automatic dependent

surveillance-broadcast (ADS-B). This satellite-based aircraft tracking system already has been authorized for air traffic control (ATC) to separate suitably equipped aircraft within current areas of ADS-B coverage, pending nationwide coverage in 2013 (Table 1).

The theme of the meeting — the RTCA 2011 Annual Symposium, held June 15–16 in Washington — was “Accelerating NextGen Through Public-Private Partnership.”

Encouraged by the FAA and some industry colleagues to join early adopters, several presenters from airlines

expressed support for NextGen — a massive migration of air traffic management from radar-based systems to satellite-based systems. But the same presenters were adamant that, for now, their capital investments will exclude ADS-B Out avionics, the *equipage* that provides the capability to continuously transmit aircraft position data to the ADS-B network in controlled airspace. The federal aviation regulation requiring the equipage will take effect on Jan. 1, 2020.

Other presentations explored efforts to accelerate airspace modernization, harmonize equipment and procedures,



and enhance safety. These efforts are being pursued in an international context demanding interoperability, synchronization of activity and readiness for implementation, specialists said.

Since September 2010, Dave Barger, chairman and chief executive officer of JetBlue Airways, has headed the FAA's NextGen Advisory Committee (NAC). He called NextGen implementation "truly tough" yet feasible for government and industry teams. The NAC, with RTCA support, has developed priorities and a roadmap for achieving four near-term and mid-term NextGen objectives: metroplex-level rollout, a phased concentration on 21 multi-city areas by 2016; creation of metrics for judging the effectiveness, cost-benefit and safety of implementation stages; development of incentives for aircraft equipage; and finalization of how satellite communication (sat comm) technology and procedures will replace voice with text display for routine messages between flight crews and ATC.

In early June, the NAC gave the FAA a list of NextGen mid-term operations that will depend on aircraft equipage. The committee also has advised the agency on integration of elements, preliminary system performance indicators, steps in NextGen rollout to metroplexes, and a plan for special activity airspace.

"NextGen is far more than science and technology ... more than equipage or metroplex prioritization," Barger said. "It is implementation ... how each of us operates. This is built on trust and on following through with commitments. ... Nothing will overcome challenges like simply implementing NextGen [and] delivering promised incremental improvements using equipment on aircraft today. ... The greatest [take-away lessons should be]: First, we don't have a choice. The status quo is not acceptable. Second, NextGen is an ongoing transformation; it won't happen as a 'big bang,' it will happen in steps."

No one has to look hard at U.S. airspace to realize that the airspace around New York "is imploding" in its limitations and disruptive spillover effects, or to grasp ADS-B as fundamental to the long-term solution, Barger added. "[ADS-B] technology is amazing, and has leveled

### FAA Progress in NextGen Airspace Access and Airport Surface Operations, 2010

Metroplex (Primary City)	Airspace Access Improvement	Airport Surface Operations Improvement
Anchorage, Alaska	OPD	
Atlanta, Georgia	OPD	DDU
Atlantic City, New Jersey	EVAL	
Boston, Massachusetts		N-CTL
Cape Canaveral, Florida	UAS	
Charlotte, North Carolina		DDU, RWY*
Chicago, Illinois		DDU
Dallas-Fort Worth, Texas		DDU
Denver, Colorado	3D-PAM	DDU
Detroit, Michigan		DDU
Kansas City, Missouri		DDU
Las Vegas, Nevada	OPD	
Los Angeles, California	OPD, ITA	DDU
Louisville, Kentucky	OPD	DDU
Memphis, Tennessee		SMDS-CDQM
Miami, Florida	OPD, ITA	
New York, New York	AS	DDU, RWY**, SMDS
Newark, New Jersey		DDU
North Texas	MS	
Oklahoma City, Oklahoma	CSPO	
Orlando, Florida		SMDS-CDQM
Philadelphia, Pennsylvania		DDU
Phoenix, Arizona		DDU
Portland, Oregon		RWY***
San Francisco, California	ITA	
Seattle, Washington	RTA	DDU
Washington, D.C.	MST	

ADS-B = automatic dependent surveillance-broadcast; AS = airspace redesign (John F. Kennedy International Airport); CSPO = closely spaced parallel operations (simulation); DDU = data distribution unit for ADS-B (installed); EVAL = research platform for NextGen integration and evaluation capability (initiated); ITA = initial tailored arrivals; MST = Metroplex study team (initiated); N-CTL = N-control, a gate-hold procedure to reduce fuel burn and emissions (demonstration); NextGen = Next Generation Air Transportation System; OPD = optimized profile descents; RTA = Required time of arrival (flight trial); RWY\* = Runway 18R/36L (extended); RWY\*\* = Runway 13R/31L and taxiway NY (reconstruction); RWY\*\*\* = Runway 10L/28R (extended); SMDS-CDQM = Surface management data sharing and collaborative departure queue management (demonstration); 3D-PAM = Three-dimensional path arrival (demonstrations); UAS = Unmanned aircraft system integration (demonstrations)

Source: U.S. Federal Aviation Administration (FAA), "FAA's NextGen Implementation Plan," March 2011

Table 1

the playing field," he said. "[At JetBlue we asked,] 'How do we start to drive the procedures and use [this] technology aboard aircraft?' NextGen already is driving our procedures and training.

... NextGen will not only raise the safety bar but [also accomplish goals in] environmental improvement, energy policy, the economy and employment.”

As a budget item, NextGen capital expenditures ought to be seen as a long-term investment for which airline executives do not require costs to be recouped within the first two or three years, some presenters suggested.

**FAA Perspectives**

FAA Administrator Randy Babbitt pointed to positive examples of government-industry partnership in ADS-B implementation. “RTCA’s Task Force 5 recommendations two years ago [ASW, 4/10, p. 30] helped us to shape the way we implement NextGen,” he said. “The NAC is part of our effort to change the FAA’s oversight structure to be more in keeping with current demands.” A pending internal change at the FAA, requiring approval by the U.S. Congress, is expected to separate responsibilities for NextGen from responsibilities for day-to-day system operations and regulatory oversight, he added.

“We can all agree that equipage is a critical building block,” Babbitt added. “We cannot fail to equip universally with all the components needed. ... These are tough economic times, and we need to balance our fiscal restraints with the need for equipage.”

Increases in jet fuel prices have influenced some airlines to look again at their business case for ADS-B equipage and other NextGen technology, and in flight line demonstrations, the savings and other benefits have been proven, he said.

“Southwest Airlines started using global navigation system [GPS]-based required navigation performance [RNP] approaches at a dozen airports this year,” Babbitt said. “They estimate they’ll save \$60 million a year in fuel once they can use these procedures systemwide.

“Alaska Airlines has been a leader in using RNP approach procedures at Juneau [Alaska] International Airport [also long a test site for ADS-B; ASW, 12/08, p. 42]. ... The airline estimates it would have canceled 729 flights last year into Juneau alone due to bad weather if it

were not for these approaches.”

The United States currently has more than 250 RNP approach procedures available for use by about 2,000 airline and business aviation aircraft. “Alaska Airlines is joining the FAA, the Port of Seattle and Boeing Commercial Airplanes to further develop [fuel-saving] RNP procedures at Seattle-Tacoma International Airport,” he said.

Delta Air Lines reported savings of 60 gallons (227 L) of fuel per flight by using continuous descent from cruise to the runway with engines idle. “We want to see this safety and efficiency systemwide,” Babbitt said, noting that the FAA has worked accordingly to reduce by 40 percent the time required to design and issue area navigation (RNAV) and RNP procedures.

“With ADS-B, we have achieved new levels of safety and efficiency for air travel in the Gulf of Mexico, where there is no radar coverage,” he added. “Helicopters in the Gulf are ferrying as many as 10,000 workers a day out to thousands of oil rigs. Equipped aircraft are saving five to 10 minutes and 100 lb [45 kg] of fuel each flight. JetBlue equipped some of its aircraft with ADS-B to allow its Airbus A320s to fly more direct routes ... over water ... taking advantage of new RNAV routes from Boston and New York down to Florida and into the Caribbean that bypass the congestion. This is a trial period during which JetBlue will share flight data with us to see how and where they are saving time,



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JetBlue expects its early adoption of NextGen technologies to ‘raise the safety bar’ as well as save time, distance and fuel.

distance and fuel. We hope it will lead JetBlue to equip the balance of their fleet — and, meanwhile, to provide concrete data that we believe will inspire other carriers to equip their fleets.”

The collective insight of RTCA’s Task Force 5 and the FAA’s NAC to roll out NextGen metroplex by metroplex so far has worked as envisioned. “We’ve already completed assessments of the airspace around Dallas-Fort Worth and Washington, D.C., and made recommendations,” he said. “We’re finishing studies at Charlotte, North Carolina, and in Northern California. Next up will be Houston, Atlanta and Southern California.”

Not every airline will reap the same benefit from ADS-B and other NextGen technologies, said Carl Esposito, vice president, Honeywell Aerospace. Airlines therefore should recognize the importance of the ADS-B technology being available now, he said. Honeywell has been studying ways to minimize operator costs and time for related software upgrades during NextGen implementation.

### FAA Research and Development

This year, the FAA has been shifting some of its NextGen expenditures to better demonstrate to airlines how ADS-B can produce tangible short-term results. “We have invested in research and development to do risk reduction up front and to make a textbook case of how [ADS-B] works,” said Paul Fontaine, manager of the FAA Technology and Prototyping Group. One focus has been integrated arrival and departure management, he said.

For operations from top of descent to the surface environment, airlines and controllers gradually will see more airlines using ADS-B capabilities that increase their flexibility, such as a high-capacity

arrival management system that prepositions streams of aircraft.

“We have proved the constant descent angle/optimum profile descent,” Fontaine said. “That is where we will move in metroplex airspace.” Significant research and development of related capabilities, such as initial tailored arrivals at coastal airports, also is being completed in 2011. “Three-dimensional-path arrival management already in use in Denver will bring benefits to controllers of [the time-based metering function of the FAA’s traffic management adviser system and] RNP arrival routes,” he said.

At the surface, the FAA has followed through on the Task Force 5 recommendation to use ADS-B to increase situational awareness for both ATC and company ramp controllers “so everyone is able to see the same thing” on digital airport map displays.

Pressure to accelerate NextGen also has influenced the FAA to take corrective actions in the design process for instrument approach procedures. These eliminate rework and error-prone manual methods, and increase the robustness and integrity of automation in aeronautical charting, said John Hickey, deputy associate administrator for aviation safety. “We will be developing a singular, automated system from beginning to end, and everybody in the agency will [interact with charting] data in the same way.”

“It is pretty widely known inside the federal government [that cuts in operations funding] will be quite Draconian from fiscal years 2012, 2013 and the out years, and this will have a severe [impact] on our ability to carry out [NextGen]. At the fiscal year 2006 funding levels [proposed by some federal legislators], the FAA will have to make hard decisions [involving the

attrition] of a lot of people. This could be a serious problem.”

### Airlines Wait to Equip

Some FAA specialists see unresolved issues — despite more than three years of discussions — in fundamental assumptions by airlines versus the federal government as both have analyzed expectations in timing and paying for ADS-B equipage.

“We have a big challenge: We all view the business case differently,” said Kris Burnham, the FAA director, investment planning and analysis. “There is no one NextGen business case. ... Even within the FAA, we are dealing with hundreds of business cases. ... Our focus has been understanding [ADS-B’s] potential value and, in that context, refining program plans, increasing stakeholder involvement and reducing risk.”

In comparison, Ed Lohr, director of fleet strategy, Delta Air Lines, was among airline representatives who said that closing the business case for aircraft equipage in the near term is very difficult. “The investment needs to fit either our need for competitive advantage or our need to remedy a [competitive] disadvantage,” Lohr said. “Until [NextGen technology] does that, we cannot invest.”

Similarly, Bob Johnson, managing director of flight operations, American Airlines, said that the company supports NextGen as a force for moving the nation in the right direction, yet faces some near-term realities about equipage. “It is important to American that once [NextGen] generates efficiencies, and competitors have an advantage, we make sure that as NextGen evolves, we do as well,” he said.

“We are involved in equipping [aircraft with ADS-B in the new coverage area] in South Florida,” Johnson said. “We have a large investment already in

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The FAA demonstrates ADS-B with a Garmin Apollo MX20 multifunction display at its technical center in Atlantic City, New Jersey.

fleets and in training pilots in [technologies] that can be applied now. ... We are not interested in the future ADS-B [capabilities] until the FAA is further along on current technology. ... We will not equip [with ADS-B now] and then go exploring for benefits of NextGen [if] the benefit is 10 years out. We wield a pretty sharp pencil, and we are looking for tangible benefits in any investment we make first in navigation capability, then in data comm capability.”

Steve Fulton, chief technical officer, GE Aviation, noted that airlines’ reluctance to equip airplanes with ADS-B could blunt other aviation advancements. “We invest to have the latest and best technology in engines [to achieve] a 15 percent improvement in specific fuel consumption,” Fulton said. “[Airlines already] have flight management systems that can navigate in four dimensions. It is a real loss when engine efficiency [gains are] lost because of inefficiency in the ATC system.”

Neil Planzer, vice president, air traffic management, Boeing, said that in light of expected federal budget cutting,

“Using RNP, there are clear capacity improvements, and we do not have to have everything done [at once]. There are lots of [technological] capabilities that would provide significant benefit now. But what we have done is churn the same things, study and study them, and do seminars around the world.” If this pace continues, he said half-jokingly, his grandchildren likely will find themselves on an RTCA NextGen implementation committee, and “the nation still will not be able to have one more airplane landing at La Guardia Airport.”

### Global ADS-B Perspective

Worldwide interoperability of ADS-B equipage and commonality among ATC procedures will be “absolutely critical to safety,” said Rob Eagles, director, safety, operations and infrastructure at the International Air Transport Association (IATA).

Bo Redeborn, principal director air traffic management, Eurocontrol, told the symposium that the United States and European countries still have a “golden opportunity to harmonize”

ADS-B applications within NextGen and Single European Sky Air Traffic Management Research (SESAR). So far, however, they “have not been successful in achieving harmonization in all areas” and they now “want to reduce the amount of resources [expended] to achieve this,” he said.

Despite interaction between U.S. specialists and their counterparts in other world regions, some harmonization gaps remain in the use of ADS-B, especially with SESAR, JetBlue’s Barger agreed, speaking for the NAC. “In the short term, SESAR is properly funded,” Redeborn noted. “The [European] issue now is related to incentives [for operators to proceed with ADS-B equipage] ... the need for them to allocate \$4.2 billion in 2014–2044. We have had a few examples in military aviation and general aviation where [ADS-B] benefits have been obvious. But we also see that when money is so tight, that also jeopardizes the solidarity [of states].”

Marc Hamy, vice president, SESAR and NextGen programs, Airbus, said that the company is fully committed to these transformations on both sides of the North Atlantic as “the only way to deal with traffic growth.” This commitment includes quickly exploiting every ADS-B capability.

“First, we need interoperability, and we are working very well with Boeing,” Hamy said. “Second, we need to have coordination and to be ambitious. Airbus is looking for a real transformation of air traffic management — solutions that have a long-term vision. Operators will not accept the need to refit every year.” The solution, however, is not to wait for perfect harmonization because doing nothing is unacceptable and significant benefits would derive from the acceleration of SESAR and NextGen, he added. ➤