

BY LINDA WERFELMAN

# Ins and Outs of ADS-B

An avionics industry group warns of disruptions in the installation process.

A decision by the U.S. Federal Aviation Administration (FAA) is likely to complicate and delay implementation of the planned overhaul of the nation's airspace known as the Next Generation Air Transportation System (NextGen), the Aircraft Electronics Association (AEA) says.

The AEA, which represents the U.S. avionics industry, says an Aug. 30, 2010, FAA memo outlining the policy for approval of "ADS-B Out" systems — automatic dependent surveillance-broadcast avionics systems that transmit data, including aircraft identity, position and speed, from an aircraft to ground stations and to other aircraft that are equipped with ADS-B

## Report: FAA Faces Risks in Implementing ADS-B

The reluctance of aircraft owners to buy and install new avionics is among the greatest risks to the U.S. Federal Aviation Administration's (FAA's) implementation of its automatic dependent surveillance-broadcast (ADS-B) program, the U.S. Transportation Department's Office of Inspector General (OIG) says.

In a report released in mid-October, the OIG said that the FAA is progressing with its implementation of ADS-B, a satellite-based air traffic surveillance technology that is a key element of the Next Generation Air Transportation System (NextGen) — the planned overhaul of the U.S. national airspace system.

Nevertheless, the report identified risks in five areas that the OIG said would affect the cost, schedule and expected benefits of ADS-B. The reluctance to purchase new equipment is one of the two greatest risks, as is the agency's ability to "define requirements for the more advanced capabilities," the report said.

"Users have raised justifiable concerns about evolving requirements and uncertain equipage costs and benefits," the report said. "For example, based on FAA's analysis, the costs for users to equip with ADS-B avionics could range from \$2.5 billion to \$6.2 billion."

The report noted that the surveillance information that initially will be provided through ADS-B will replicate the information already provided by radar and therefore provide few new benefits to aircraft operators. In addition, the FAA has not yet specified how it will modify the existing systems that will

display ADS-B information to air traffic controllers, the report said.

"Until FAA effectively addresses these uncertainties associated with equipage and requirements for ADS-B's advanced capabilities, progress with ADS-B will be limited, and the potential for cost increases, delays and performance shortfalls will continue," the report said.

The report said that the OIG also had identified problems in other areas: "new requirements and controller/pilot procedures, frequency congestion with ADS-B broadcasts, integration with air traffic management systems and potential security vulnerabilities."

The OIG issued nine recommendations that it said were intended to reduce risks associated with ADS-B implementation, including speeding up efforts to establish requirements for the implementation of ADS-B In — in which properly equipped aircraft receive information transmitted from ground stations and other aircraft.

Other recommendations, intended to aid in oversight of the ADS-B contract, include a call to update the program's cost-benefit analysis.

The FAA agreed with seven of the recommendations and parts of the other two, and proposed what the OIG considered acceptable actions for all nine.

*This article is based on U.S. Department of Transportation Office of the Inspector General audit AV-2011-002, FAA Faces Significant Risks in Implementing the Automatic Dependent Surveillance-Broadcast Program and Realizing Benefits. Oct. 12, 2010.*

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In its August memo, the FAA said that ADS-B Out equipment must "only be installed when approved using the type certificate (TC), amended TC (ATC) or supplemental type certificate (STC) process. ... Installation of ADS-B systems may not be approved as a major alteration with 'approved data'; thus, field approvals are not appropriate."

The FAA said its instructions stemmed from its belief that TC, ATC or STC design approval would be "more appropriate to ensure consistent performance," and that, as the agency and the avionics industry become more experienced in this area, field approvals would be permitted.

However, in its letter to Babbitt, the AEA cautioned that the memo might have

equipment — creates "severe turbulence" in the procedures for installing ADS-B equipment.<sup>1</sup>

"Without your immediate intervention, this communication will stall early equipage, delay early implementation and, at the extreme, cause the failure of ADS-B altogether," the AEA said in an Oct. 4 letter to FAA Administrator Randy Babbitt.

An FAA spokeswoman said later in October that representatives of the agency had met with the AEA on the matter and were "working to resolve the issues."

the "unintended consequence" of hindering implementation of NextGen.

"The AEA supports the vetting of new products through the STC process, as required by [Advisory Circular] AC 20-165," the AEA said. "However, your memorandum goes beyond the reasonable approach of the AC and expresses a severe lack of trust of your employees, your designees and your TSOs [technical standard orders] and is simply not the best answer."

The approval process will push up the cost of installing an individual ADS-B system by at

least 200 percent and, in some cases, as much as 700 percent, the AEA said.

“The unintended consequence of this action is that, because of the high cost and slow certification times, the agency has effectively killed all new and novel technology advances in ADS-B and created a barrier that will provide a negative incentive to new entrants into the ADS-B marketplace,” the AEA said.

The organization added that, although the industry is pleased that the FAA intends to eventually ease installation requirements, “how do we encourage an early applicant to commit to an installation with a 700 percent premium that would likely take months to complete, instead of choosing to delay equipment until some later date, knowing it will reduce the owner’s initial investment from \$35,000 for a required STC installation to ... \$4,500 for a follow-on installation?”

Development of low-cost ADS-B installations for general aviation will not begin until the STC requirement has been eliminated, the AEA said.

The AEA complaint to Babbitt followed the FAA’s go-ahead for nationwide ADS-B ground station deployment and air traffic control surveillance.

The AEA said the FAA’s policy — which specifically addressed the installation of equipment governed by TSO C166b — resulted in the unintended interruption of installations of Mode S transponders, which are manufactured according to standards set forth in TSO C166 — not TSO C166b.

“We already have received reports from our members that FAA regional certification offices are implementing this policy on ADS-B-equipped Mode S transponders,” the AEA said.

The AEA’s complaint came days after the FAA said that it had given “the green light for full-scale, nationwide deployment” of ADS-B — an action that the FAA said will allow air traffic controllers to use ADS-B technology for aircraft separation.<sup>2</sup> In areas that have ADS-B coverage, the controllers’ screens will display aircraft being tracked by radar and those whose positions are broadcast by on-board ADS-B equipment.

The FAA said the ADS-B system “tracks aircraft with greater accuracy, integrity and reliability than the current radar-based system. ADS-B targets on controller screens update more frequently than radar, and show information including aircraft type, call sign, heading, altitude and speed.”

The go-ahead for full-scale ADS-B deployment followed use of ADS-B on a smaller scale in four areas — Alaska; the Gulf of Mexico; Louisville, Kentucky; and Philadelphia — chosen for their “target-rich environments for operational testing” or because they “presented different challenges reflecting the complexity of the nation’s airspace.

“This approach ensured that ADS-B was tested in the most extreme environments, allowing the agency to uncover and resolve any anomalies before the commissioning.”

For example, the FAA said that the ADS-B operation in the Gulf of Mexico — a partnership involving the agency, the Helicopter Association International and the owners and operators of platforms and helicopter companies — was implemented because the lack of radar coverage in the area “severely restricts capacity due to the separation procedures needed to maintain safety.”<sup>3</sup>

The FAA has tested prototype ADS-B installations in several areas, including the Gulf of Mexico, depicted on the screen below.





According to FAA plans, all areas of the United States that currently are covered by radar will, by 2013, be covered by ADS-B. Plans call for a ground network of 800 ADS-B stations; of these, 300 already have been installed.

By 2020, FAA plans call for all aircraft operating in controlled airspace in the United States to be equipped with ADS-B Out avionics to broadcast their positions. In addition, aircraft that also are equipped with ADS-B In avionics designed to receive data broadcasts will be capable of receiving weather and traffic information, and pilots of those aircraft will be able to view cockpit displays that depict their position in relation to other aircraft, bad weather and terrain.

### NextGen Components

ADS-B is a key component of NextGen, designed to modernize U.S. airspace by moving away from a radar-based air traffic control system in favor of a satellite-based system and, in the process, improving safety and efficiency.

Those other components include airport surface detection equipment—model X (ASDE-X), which uses radar and other surface surveillance sources, to automatically transmit the most accurate information to air traffic control tower monitors. The FAA has said that the most significant improvement over current radar systems will be the use of global positioning system (GPS) information to depict the locations of aircraft and surface vehicles. At the end of May, the FAA said that ASDE-X was fully operational at more than two dozen U.S. airports.

Other procedures include:

- Tailored arrivals, which provide for air traffic controllers to review a flight path when an aircraft is about 200 nm (370 km) from the destination airport and adjust it to avoid bad weather, restricted airspace and other potential problems.
- Optimized profile descents, which enable smooth continuous-descent approaches rather than stepped-down approaches required by current procedures. These descents “maximize satellite-based approaches

called area navigation (RNAV) and required navigation performance (RNP),” to allow aircraft to land more quickly and efficiently.

- Data communications (Data Comm), formerly known as controller/pilot data link, which will replace more error-prone voice communications between pilots and controllers.
- Systemwide information management (SWIM), which will enable communications between all FAA systems incorporated into NextGen, as well as airlines, military and security officials.
- NextGen Network Enabled Weather (NNEW), which will improve the quality of weather information available to flight crews, especially information about thunderstorms, icing and other severe weather conditions. NNEW is intended to help air traffic managers and others better manage traffic flow during periods of bad weather.

The FAA also is working with European air navigation service providers, the Single European Sky Air Traffic Management Research (SESAR) program, aircraft manufacturers and airlines to test oceanic trajectory based operations (TBOs), designed to help identify the most efficient routes and altitudes for trans-Atlantic flights. ➤

### Notes

1. ADS-B In systems receive information transmitted from ground stations and other aircraft that are equipped with ADS-B.
2. FAA. *FAA Gives Green Light to ADS-B Rollout*. Sept. 24, 2010.
3. FAA. *Fact Sheet — Next Generation Air Transportation System*. May 27, 2010.

### Further Reading From FSF Publications

- Rosenkrans, Wayne. “NextGen Safely.” *AeroSafety World* Volume 5 (April 2010): 30–34.
- Rosenkrans, Wayne. “Repurposing Avionics.” *AeroSafety World* Volume 3 (December 2008): 42–45.
- Rosenkrans, Wayne. “ADS-B On Board.” *AeroSafety World* Volume 2 (November 2007): 44–47.

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