

Automatic Dependent Surveillance-Broadcast (ADS-B)



The Issue

Automatic Dependent Surveillance-Broadcast (ADS-B) is a datalink technology that uses satellite-based navigation and positioning information to transmit aircraft location and altitude to air traffic controllers and other nearby aircraft. The Federal Aviation Administration (FAA) plans to use ADS-B as the replacement to air traffic control radar over the next 10 to 15 years. This means that aircraft owners will likely be required to equip with ADS-B receivers to fly wherever a transponder with Mode C is mandated today.

The Importance to Our Members

In the past few years, ADS-B has proven a viable replacement for ATC radar. Using robust datalink technologies, affordable improvements to the National Airspace System will also result in benefits to pilots, too.

- ADS-B provides real-time, fast update traffic information to pilots who have on-board traffic displays. For most pilots, graphic depiction of traffic is currently unavailable. With each aircraft's ADS-B system receiving position reports from other aircraft in the vicinity, pilots will be able to determine not only the position of conflicting traffic, but will clearly see the traffic's direction, speed, and relative altitude.
- General aviation pilots can use the ADS-B datalink to receive flight information services such as graphical weather radar and textual flight advisories. In the past, these services have been unavailable or too expensive for widespread use in general aviation.

Implementing ADS-B nationwide impacts almost all general aviation aircraft, and owners should plan to invest in ADS-B avionics over the next decade. It is extremely critical that the FAA implement ADS-B correctly to ensure the proper benefits for general aviation. For example, numerous manufacturers must offer affordable products, and sufficient time is required for aircraft equipage. In terms of the necessary infrastructure, the FAA needs to provide free graphic information including weather and temporary flight restriction (TFR) data nationwide within the next two years.

Background

In the early 1990s, AOPA aggressively opposed an FAA proposal to mandate Mode S transponders, citing the lack of benefits to pilots. AOPA and other industry experts proposed an alternative solution: Combine the benefits of datalink and the Global Positioning System (GPS) to broadcast an aircraft's position to controllers and other nearby aircraft. AOPA also recommended adding graphic weather data to ADS-B so that one datalink meets the needs of general aviation.

In 2000, the Alaskan research project called Capstone began using an ADS-B datalink called the universal access transceiver (UAT) for live trials with 200 general aviation aircraft. On January 1, 2001, the FAA began using ADS-B to "radar vector" aircraft in Alaska. At the same time, ADS-B-equipped aircraft also received graphic weather data, enabling pilots to improve their ability to safely operate.

In 2000, AOPA installed UAT ADS-B systems and multifunction displays in the aircraft flown by staff. The ADS-B systems have been well received and have been continuously operational ever since. An ADS-B ground-based transceiver (GBT) was also installed at AOPA's headquarters. It provides traffic and weather

uplink to ADS-B aircraft within a 75-mile radius (at 6,000 feet).

Over the past five years, AOPA has demonstrated the general aviation benefits of a UAT-based ADS-B system. Demonstration flights have been conducted for numerous universities, state aviation officials, FAA management, and even foreign delegations

Today, worldwide radio frequency spectrum and the necessary standards are available for UAT ADS-B. In addition, Embry-Riddle Aeronautical University has equipped its entire fleet with ADS-B datalink and multifunction displays.

AOPA's Position

AOPA generally supports an FAA strategy to transition from radar to ADS-B over the next 10 to 15 years. However, this support is contingent on several factors:

The ADS-B datalink for general aviation must be the UAT datalink, which is capable of providing both graphical weather and traffic data.

A nationwide ground-based transceiver (GBT) infrastructure should be in place, and free graphic weather data must be provided eight to 10 years before any equipage mandate becomes effective.

The FAA must meet all infrastructure milestone schedules — including the depiction of ADS-B aircraft on every air traffic control radar screen — before mandating ADS-B.

The cost of the ADS-B datalink system must be at or below today's price of a Mode C transponder. Once the ADS-B mandate becomes effective, aircraft should not be required to be equipped with a Mode C transponder.

How ADS-B Works

Using GPS as the source of aircraft position, and on-board altimetry as the source of aircraft altitude, ADS-B broadcasts an aircraft's position once per second. Other aircraft and GBTs receive the information. The ground-based transceivers forward the ADS-B data to air traffic control, who then use the ADS-B data to provide separation services in a similar fashion to traditional radar. With a once-per-second update rate, the ADS-B reports provide the controllers with faster updates than traditional radar that can take as long as 12 seconds.

The ADS-B system on board the aircraft transmits data very quickly. Therefore, the majority of the time the datalink is receiving traffic reports from other aircraft or from ground-based transceivers that are transmitting Mode C traffic data into the air (see description of UAT avionics below). Separately, the datalink also supports the transmission of weather data from the ground-based transceivers to the cockpit. The weather data can be displayed on board the aircraft when it is equipped with the appropriate display.

ADS-B Avionics

The AOPA-preferred UAT datalink is capable of providing pilots with three separate but related services:

ADS-B. The UAT transmits the aircraft's ADS-B information once per second. When not transmitting, the UAT is listening for other aircraft to report their ADS-B information.

TIS-B (Traffic Information Services-Broadcast). TIS-B is the source of non-ADS-B traffic data that is transmitted into the sky from the GBTs. The GBTs obtain radar data that depicts the Mode C transponder reports from airborne aircraft. Each GBT transmits all transponder-equipped traffic data below 18,000 feet msl. In large metropolitan areas, multiple radar systems (both en route and terminal) will provide the TIS-B data for the GBT to uplink.

Note: TIS-B as described above is completely different than Mode S TIS.

FIS-B (Flight Information Services). FIS-B data includes graphic Nexrad weather radar and textual METAR/TAF data. In the future, FIS-B services may include graphic TFR data. At this time, the only manufacturer of UAT avionics is Garmin, which manufactures the Garmin GDL 90. It can be purchased through a Garmin dealer.

A second ADS-B datalink is the 1090 Mode S Extended Squitter. The 1090 ADS-B datalink will be used by the airlines (which already have Mode S systems they can upgrade).

According to a 2000 ADS-B Technical Link Assessment Team organized by the FAA and Eurocontrol, the 1090 link has reduced bandwidth when compared to the UAT and is only capable of supporting text FIS-B products.

Lastly, the 1090 Extended Squitter does not offer a privacy feature (like a 1200 squawk on a Mode C transponder).

A general aviation version of the 1090 Extended Squitter ADS-B system is manufactured by Bendix/King (Honeywell), which is targeting the system for general aviation aircraft owners in Australia and other countries around the world.

The Benefits of ADS-B

The benefits of ADS-B are numerous and vary with the user. For general aviation, the benefits of a UAT-based ADS-B system includes free access to graphic weather and traffic data, plus the strong potential for increased radar coverage as compared to today's radar.

The benefits of ADS-B to the FAA includes the tremendous cost savings of replacing multi-million-dollar radar systems with ground-based transceivers that cost less than \$200,000 to purchase. However AOPA is quick to point out that the FAA's cost savings should be used to assist aircraft owners with the equipage of the necessary avionics on board aircraft.

Next Steps For ADS-B

AOPA continues to advocate an ADS-B implementation strategy that maximizes the benefits to general aviation and ensures that any mandates are implemented properly. The next steps for the FAA include:

- Conduct an in-depth analysis and make a final decision to pursue ADS-B in lieu of radar or other surveillance technologies.
- Obtain the necessary funding from Congress for a nationwide network of ADS-B GBTs.
- Begin providing nationwide FIS-B and TIS-B over the GBT network.
- Finalize the type and performance of the ADS-B avionics that general aviation aircraft owners would be expected to purchase if a mandate is levied.

Status

The ADS-B datalinks are mature, the system proven, and the benefits well known. In September 2005, the FAA decided to begin a transition from radar to ADS-B. A cost/benefit analysis is under way, and the final FAA deployment decision is expected within the next six months, and the proliferation of ADS-B ground stations nationwide may begin as early as December 2006.

In conjunction with this final stage of planning, AOPA continues to represent the interests of our members by communicating the best alternatives to ensure the transition to ADS-B is beneficial and affordable for the largest group of aviation users in the world.

In the meantime, the FAA is deploying a GBT infrastructure to support ADS-B services along the East Coast, Arizona, North Dakota, and Alaska. Pilots equipped with ADS-B receive real-time weather, traffic, and non-control aeronautical information such as notices to airmen (notams).

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Federal Aviation Administration's ADS-B website www.adsb.gov