ADS-B Update
A Datalink for Everyone

BY JULIE K. BOATMAN

Imagine climbing into your single-engine airplane, starting up, then turning on the avionics master. As the boxes begin warming up, a stream of information pours onto a screen the size of a CD jewel box. You enter your flight plan and zoom out the display on the map page to see weather along the route. A green dot marks your destination and you smile — you're good to go, the ceiling and visibility indicate good VFR conditions.

While sitting in the runup area, you notice a traffic icon that circles your departure airport, and you look out to see that target in real-time — another airplane in the traffic pattern. You still keep your eyes outside the cockpit, but you do so with more knowledge than before. You know what the radar picture looks like from 10 minutes ago, so what you see in the clouds above is put into context, and you can recognize a possible trend more rapidly. You already have located one target in the pattern, so you can focus your search for others that might not show up.

What's even better? You paid a reasonable price for the multifunction display, a receiver and antennas, but the FAA provides the traffic and weather information. And other airplanes operating in the system send out additional traffic data as well — so you get more information than a controller could give you, even if he had the airtime to do so. You both operate with a higher common knowledge than possible with radar alone.

If this sounds like a dream,

Continued on page 56...

Four-screen install on a King Air 300

ADS-B

Continued from page 54

then welcome to reality with ADS-B. Already in use in several areas around the United States, ADS-B (automatic dependent surveillance–broadcast) promises to revolutionize how pilots obtain traffic, weather and other communications in the near future.

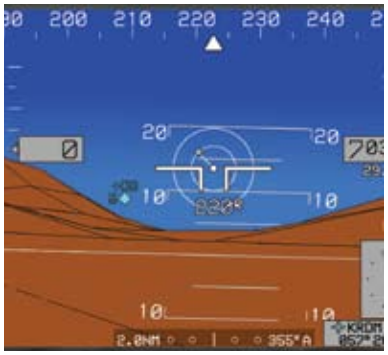
The Technology

Automatic dependent surveillance–broadcast technology delivers traffic and weather information via ground transmitters on a dedicated frequency and via aircraft equipped with the appropriate transceiver and display hardware. Participating aircraft transmit their GPS-derived location (along with other data) once each second, and this transmission goes to other ADS-B-equipped aircraft as well as to the ground station.

In addition, ground transmitters broadcast FAA secondary surveillance radar (SSR) targets to help participating aircraft locate those aircraft that aren't ADS-B-equipped.

The ADS-B system relies upon having a highly accurate WAAS-capable GPS onboard the airplane. WAAS (wide area augmentation system) superpowers the regular GPS signal and provides a more accurate aircraft location than does regular GPS position geometry. The ADS-B system takes the aircraft's GPS-based position, digitizes it and combines it with other data, including the aircraft type, its groundspeed, a flight number (if available), and whether the aircraft is climbing, turning or descending.

The ground stations broadcast weather information on the same frequency. The pilot can choose to display these text and



graphical weather products on the same display used to show traffic. Currently, this information includes METARs, TAFs and Nexrad radar graphics.

Specifically, the ground-station-delivered traffic portion of ADS-B is called TIS-B (traffic information system–broadcast), while the weather portion is delivered via FIS-B (flight information system–broadcast). In the future, additional safety-of-flight information will be delivered via FIS-B.

The Equipment

The average general aviation airplane requires several pieces of hardware to make use of ADS-B — but you might already have a couple of them onboard.

What might those be? Well, a GPS navigator and its associated antenna, for one, and an altitude-encoding altimeter. You also might have a compliant multi-function display, such as the Garmin AT MX20.

ADS-B materials refer to these MFDs as "cockpit displays of traffic information," or CDTIs. After the next round of upgrades are made to the MX20, Garmin intends to bring ADS-B functionality to the GNS 430 and 530, and G1000 integrated flight deck.

In addition to an MFD, you'll need a universal access transceiver (UAT), such as the Garmin GDL 90, and UAT antennas for the top and bottom of the fuselage. Similar to having dual-com or traffic-system antennas, this type of installation maximizes transmission and reception. In addition, the GDL 90 has its own GPS antenna. Sound like the beginning of your own flying porcupine? As antenna technology advances, combination GPS and com antennas should cut down on the clutter.

While Garmin has ADS-B equipment on the market now, other manufacturers are showing interest in producing ADS-B components, particularly as future FAA sponsorship of the program solidifies. Among the possibilities are ADS-B data delivered to handheld devices, including personal digital assistants, which could significantly reduce costs for pilots.

On the ground side of the equation, Sensis Corp. served as the primary contractor for ADS-B ground transceivers deployed into Alaska (the ground network of 78 stations was completed in March 2005) and continues to produce this equipment.

In the lower 48 states, 28 ground-based transceivers were operational as of July 2005. These are located along the East Coast and in Florida, Arizona, Ohio and North Dakota. There's also a station up and running in Oshkosh, Wis.

The range of reception varies depending on the aircraft's altitude, with the maximum radius of coverage (150 nm) available at altitudes above roughly 5,000 feet agl.

The Advantages

ADS-B offers a list of advantages to pilots as its implementation spreads — both over traditional radar-based traffic information

and current weather information delivered through ground-based stations. Among these are:

• The same real-time traffic information provided to pilots as well as to controllers, along with a target's heading, speed and relative altitude.

• An effective range of the system (a radius of 100 to 150 nautical miles from a ground station or another participating aircraft) that allows both pilots and controllers to see potential conflicts further ahead than is possible with current radar technology.

• Proven digital communications technology used by ADS-B that allows for multiple data streams over a single channel and can be implemented rapidly at a relatively low cost.

• The availability of weather and other flight information to pilots for only the cost of basic equipment — no subscription required.

• The availability of traffic information and automatic position reporting to air traffic control in areas without radar coverage.

More Uses for ADS-B

In addition to its clear-cut advantages in the air, ADS-B also has applications for use on the ground. Because ADS-B-equipped airplanes transmit position information regardless of altitude (and that position reporting doesn't rely on a given radar installation "seeing" the aircraft), this position information is frequently — if not always — available all the way to the ground.

One important on-the-ground application of ADS-B is for runway incursion alerts. Controllers can use it to monitor traffic on taxiways and runways, especially those areas of an airport that might be difficult for the controller to see because of obstructions or during periods of reduced visibility. ADS-B also can be installed in ground vehicles to maximize safety for ground operations at busy airports.

More uses for FIS-B will develop as the system matures. Additional flight data planned for delivery in the future could include notams, temporary flight restrictions (TFRs) and a wider variety of weather products, such as hazardous weather information.

The Deployment

In five geographical areas in the United States, pilots can take advantage of ADS-B right now. The equipment is on the market, and the initial ground-station networks have been operational since early 2005.

The FAA plans a major expansion of ADS-B ground stations in fiscal years 2007 and 2008, expanding ADS-B coverage well into areas not yet served.

The FAA has committed to the development and implementation of ADS-B. As part of its long-range plans, the agency would like to see ADS-B positioned to replace radar within the next two decades. In fact, at some point, ADS-B equipment may be required for aircraft wanting to access certain portions of the National Airspace System.

The result will save the FAA a great deal of money — though the burden to aircraft owners and operators is clear and will require careful planning on the part of the FAA, manufacturers and aircraft owners and pilots.

For more information about ADS-B, visit www.adsb.gov. ■