

## **ADS-B: Frequently Asked Questions**

### **How does ADS-B fit with the vision for the Next-Generation Air Transportation System?**

With its combined increases in safety and efficiency, ADS-B is critical to the agency's Next-Generation Air Transportation System (NextGen) plan for meeting the nation's predicted tripling of demand in coming years.

### **Why replace radar with ADS-B?**

Although radar technology has advanced, it is essentially a product of the 1940s World War II technology. Radar occasionally has problems discriminating airplanes from migratory birds and rain "clutter." Secondary surveillance systems can determine what objects are because they interrogate transponders; however, both primary and secondary radars are very large structures that are expensive to deploy, need lots of maintenance, and require the agency to lease real estate to situate them.

ADS-B, on the other hand, receives data directly from transmitters rather than passively scanning for input like radars, so it does not have a problem with clutter. Unlike radar, ADS-B's accuracy doesn't degrade with distance. In addition, ADS-B updates in real time and locates aircraft with nearly 10 times more accuracy than radar.

ADS-B ground stations are inexpensive compared to radar and, with no moving parts, are easy to maintain. They are about the size of dorm refrigerators so they can be located just about anywhere – on buildings, on cell-phone towers, or even on oil rigs. This eliminates the need to lease expensive real estate and it also means that ADS-B ground stations can be deployed to regions that are too remote for radars. Remote areas that currently are not covered by radar can have precise surveillance coverage with ADS-B.

Because ADS-B is so much more accurate than radar and gives pilots greater situational awareness, less space is needed to safely separate aircraft. This will make more room in the national airspace and help meet the projected growth in air traffic. Current ground-based technology cannot meet the demand for increased capacity.

### **What is the next step?**

The FAA has \$165 million for fiscal years 2007 and 2008 to begin the initial implementation of ADS-B in the national airspace system. This includes continuing to support the ADS-B infrastructure already installed along the East Coast and integrating ADS-B surveillance into the FAA's current air traffic control systems. The contract to provide ADS-B services nationwide was awarded in August 2007 with ITT Corp, with a team that includes AT&T, Thales, WSI, SAIC, PriceWaterhouseCoopers, Aerospace Engineering, Sunhillo, Comsearch, MCS of Tampa, Pragmatics, Washington Consulting Group, Aviation Communications and Surveillance Systems (ACSS) and NCR Corporation. In addition, ITT has partnered with L-3 Avionics Systems and Sandia Aerospace.

### **Will there be a rule mandating avionics equipment needed for ADS-B?**

The agency expects to issue a notice of proposed rulemaking that would mandate the avionics necessary for implementing ADS-B across the national airspace system. This

proposed rule is targeted for release in September 2007. The FAA hopes to issue the final rule in late 2009. This rule will be structured much like today's transponder rule, so that ADS-B avionics will be required to operate in controlled airspace and the busy terminal airspace around major airports. Aircraft owners who don't plan to fly in the ADS-B-required airspace will not have to equip; however, those that do will benefit from cockpit displays of traffic, weather, and terrain maps that will help them fly more safely.

**How will the move from radars to ADS-B be coordinated?**

Under the contract, the FAA expects by 2010 to be able to "commission" ADS-B services for use in the national airspace system, and by 2013 to have coverage everywhere there is now radar coverage. The full evolution of ADS-B will take about 20 years, taken in manageable segments of equipment and ground-station installation, with about half of the legacy radars maintained throughout to provide a back-up in case of a GPS outage. Benefits in improved safety and efficiency will accrue with each step of the implementation.

**Will there be a back-up system for ADS-B?**

Yes, the FAA recognizes that a back-up system is needed in case of problems with the satellite system. In 2006, a team from the FAA, industry, and the military performed an analysis, taking into account such things as the operational capability needed during an outage, the length of time the back-up system would be expected to operate during an outage, and any overlap between the back-up and ADS-B that would result in a vulnerability. The agency adopted the team's recommendation to maintain about half the current network of secondary radars as a back-up system in case of a GPS outage.

**What steps did the FAA take to prepare for the ADS-B contract award?**

The FAA issued a Screening Information Request (SIR) in November 2006. The FAA evaluated vendors' proposed solutions for developing, installing, and making operational ADS-B services for a sample service volume from Philadelphia to New York. Teams headed by ITT Corp., Lockheed Martin, and Raytheon were found to have viable solutions.

The agency then issued a Request for Offer (RFO) in March 2007 that officially asked the three vendors to submit their proposals for providing ADS-B services. A team of subject-matter experts in technical, business, and cost areas evaluated and scored each proposal, based on strict evaluation criteria. Based on this extensive analysis, the FAA in August 2007 awarded the contract to the team headed by ITT, Corp because its proposal combined the best value and presented the least risk for a successful implementation.

**Why didn't the FAA select Lockheed Martin or Raytheon as the prime contractor?**

A team of subject-matter experts in technical, business, and cost areas from across the agency evaluated and scored each of the three proposals, based on strict evaluation criteria. While all three vendors were found to be viable, the agency selected the team headed by ITT because its proposal was the best value and presented the least risk for a successful implementation. The FAA will be conducting out-briefings with each of the three vendors to discuss the specifics of the agency's decision.

**Why would the FAA have a service contract versus traditional contract?**

Under the ADS-B contract, vendors will install and maintain the ground-station equipment, and the FAA will pay subscription charges to the vendor, just as the agency today buys telecommunications services from telecommunications companies. This is called a performance-based service acquisition.

This service-based acquisition is possible in part because ADS-B ground stations are about the size of dorm-room refrigerators and can be deployed nearly anywhere, unlike huge radars the government owns today. Today’s radars require approximately an acre of land each -- land the FAA must lease land indefinitely and perform the rigorous environmental due diligence required by law.

From the government’s point-of-view, a performance-based service acquisition maximizes the competition and substantially reduces the costs accrued by leasing land and owning, maintaining, and upgrading equipment throughout the system’s lifecycle. It also allows vendors to use facilities and equipment they already own – such as cell phone towers and support buildings, fiber-optic networks, and operations centers – so they can piggy-back off existing assets. As a result, actual hardware investments will be relatively small since much of the infrastructure is already in place and being used for other purposes. This speeds the deployment and reduces costs. Finally, by purchasing services instead of equipment, the FAA can easily and quickly adapt to local increases or decreases in air traffic volume that change the level of services required.

Once the ADS-B infrastructure is in place, vendors will likely use the system’s capabilities to offer even more services to pilots and airlines.

Below is a table that shows the difference in the cost of a traditional contract and a service contract:

<b>Through 2025</b>	<b>Traditional</b>	<b>Service Contract</b>
Seg 1	\$497,646.1	\$1,060,253.9
Seg 2	\$1,659,973.6	\$753,110.1
<b>Total Costs (\$K)</b>	<b>\$2,157,619.7</b>	<b>\$1,813,363.9</b>

**When will ADS-B be commissioned?**

The FAA will hold a Critical Design Review of the system in January 2008.

In November 2008, the agency expects to commission (the FAA calls this an In-Service Decision) both of the ADS-B broadcast services. The broadcast services are known in the aviation community as ADS-B “In,” because ground stations will transmit data in to aircraft equipped with ADS-B avionics. ADS-B ground stations will transmit information from the national weather service and flight information, such as temporary flight restrictions. The ground stations will also add radar-based targets for non-ADS-B-equipped aircraft to the mix of ADS-B targets and send that information out for traffic displays. Aircraft equipped to receive the data receive these broadcasts of traffic, weather and flight information.

The decision to commission both the surveillance and the broadcast services is expected in September 2010. The surveillance portion is called ADS-B “Out” because it depends on location and heading data transmitted out of the aircraft transponder. ADS-B Out requires the development of cockpit displays and modifications to FAA’s air traffic control systems so that controllers and pilots will see displays with both ADS-B and radar-based targets.

**How will ADS-B change the role of air traffic controllers?**

With ADS-B, some of the responsibility for keeping safe distances between aircraft will eventually shift from air traffic controllers to pilots. This will be possible because pilots will have displays in their cockpits pinpointing all the air traffic around them, along with local weather and terrain displays. The displays will not only show other aircraft in the sky, but they will also show the path and speed at which those planes are flying and whether they are climbing, descending, or turning. Air traffic controllers will have more time to manage the flow of traffic when they are freed from the need to closely control each flight.

**How much will it cost the commercial aviation industry to equip?**

The cost to equip a commercial aircraft with ADS-B “Out” capability ranges from \$32,000 to \$174,640, depending on the age of the aircraft and its existing avionics. Since much of this equipment is based on existing technology, the unit costs are not expected to decrease over time. The additional cost to equip with ADS-B “In,” over and above ADS-B “Out” with a Class III Electronic Flight Bag to support the initial advisory applications ranges from \$162,250 to \$217,000. ADS-B “In” incremental costs can range from \$210,750 to as much as \$670,000 to equip for future, more advanced aircraft applications.

**How much will it cost general aviation to equip?**

The cost to equip a general aviation aircraft ranges from \$7,644 to \$10,920 for ADS-B “Out” and from \$10,444 to \$29,770 for ADS-B “Out” and ADS-B “In” depending on aircraft type. It is expected that most general aviation operators will desire the ADS-B “In” services. However, the unit costs for general aviation are expected to drop 30 percent after the introduction of the final rule mandating ADS-B avionics equipage. The final rule is targeted for fall of 2009.

**How long will it take for both general aviation and commercial aviation to equip?**

Our estimate is that it will take about 10 years for both general aviation and commercial aircraft to equip.

**What is the estimated cost of the ADS-B ground infrastructure?**

The total estimated cost of the ADS-B nationwide infrastructure is about \$1.8 billion through 2025 for the service provider.

**Where will ADS-B ground stations be deployed initially?**

During the first three years, from 2007 to 2010, ADS-B will be deployed in the Gulf of Mexico; Louisville, KY; Philadelphia, PA; Ontario, CA; and Southeast Alaska. Once these sites are established, the FAA will be able to test the new system to make sure it meets all safety and operational requirements and, if it passes, determine that ADS-B is safe for operational use in the national airspace system. This “commissioning” is targeted for 2010.

Following the success of testing at the key sites, the FAA has the opportunity to exercise the contract option for deploying ADS-B services nationwide. Under this option, from 2010 to 2013, ADS-B would be deployed throughout the national airspace system

in order to have coverage everywhere there is current radar coverage. If all goes as planned, in only six years, the United States will have moved from ground-based radars to a much more accurate satellite-based system for the air traffic control, with major safety and efficiency improvements for both general and commercial aviation.

#### **What will the ADS-B look like in the cockpit?**

Pilots will be able to customize ADS-B cockpit displays that show local weather, terrain, traffic. Even airport ground vehicles can have transponders installed so they too will appear on the cockpit displays, superimposed on runway maps. All of these cockpit displays will be accurate and complete, even at night or in low-visibility weather conditions.

Click on the following link to see photographs of actual ADS-B cockpit displays: [http://www.faa.gov/about/office\\_org/headquarters\\_offices/ato/service\\_units/enroute/surveillance\\_broadcast/graphics/](http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/enroute/surveillance_broadcast/graphics/)

#### **What other services might be offered in the future?**

To add even more safety and efficiency to the system, the FAA can exercise further options to work with ITT, Corp in the out-years of the contract in developing advanced ADS-B-based applications, such as tools to keep aircraft at consistent distances as they merge together on arrival, and applications that would safely reduce the space needed between planes as they approach for landing. If ITT, Corp declines, the FAA would be free to work with other vendors to develop these applications.

#### **Are any other countries using ADS-B?**

Yes, many other countries are moving toward using ADS-B, both in developed and developing countries. In fact, the FAA recently hosted a meeting at the Volpe Center in Boston, MA, of countries on the forefront of adopting ADS-B. Participants included AirServices Australia, Eurocontrol, and NavCanada.

AirServices Australia has implemented ADS-B primarily for high altitudes, as well as for use in other airspace throughout the country. It will soon have 48 ground stations in operation, and currently has 380 ADS-B-equipped aircraft using ADS-B for separation. Australia will mandate avionics equipage and plans to have all aircraft equipped by 2012.

Eurocontrol, which represents 32 nation states, has deployed a number of ground stations to collect data and has an ADS-B project under which 11 airlines have agreed to obtain airworthiness approval for ADS-B air traffic services. In Europe, ADS-B avionics equipage will begin in 2008 on a voluntary basis, and be complete by 2015.

NavCanada plans to implement ADS-B primarily in the Hudson Bay area where there is no radar coverage, and has awarded a contract to deploy ground stations and integrate ADS-B into their air traffic control centers. To encourage avionics equipage and capitalize on the new technology, NavCanada will set aside some airspace for exclusive use by aircraft equipped with ADS-B.

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