



AIRCRAFT OWNERS AND PILOTS ASSOCIATION

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Docket Management Facility
U.S. Department of Transportation
1200 New Jersey Avenue, SE
West Building Ground Floor, Room W12-140
Washington, DC 20590-0001

Re: Docket Number FAA-2007-29305 Notice of Proposed Rulemaking; Automatic Dependent Surveillance -Broadcast (ADS-B) Out Performance Requirements to support air traffic control (ATC) service.

The Aircraft Owners and Pilots Association (AOPA) is a not-for-profit individual membership organization of more than 415,000 pilots. AOPA's mission is to effectively serve the interests and needs of its members as aircraft owners and pilots and establish, maintain, and articulate positions of leadership to promote the economy, safety, utility, and popularity of flight in general aviation aircraft. Representing two thirds of all pilots in the United States, AOPA is the largest civil aviation organization in the world.

On October 5, 2007, the Federal Aviation Administration (FAA) issued a notice of proposed rulemaking (NPRM) setting the regulations and procedures for transitioning to Automatic Dependant Surveillance-Broadcast (ADS-B). The proposal requires that all aircraft operating in class A, B and C airspace, plus all airspace above 10,000 feet must be equipped with ADS-B datalink equipment that transmits the aircraft's position, altitude, speed, and aircraft ID.

While the Association is encouraged that the FAA has taken an important step in the implementation of the Next Generation Air Traffic Control system (NextGen) by releasing this proposal, the FAA fails to provide an affordable transition from the radar/Mode C transponder based surveillance system to one based on ADS-B.

The Proposed Rule is Not Acceptable in its Current Form.

It is a high-cost plan that offers little or no new benefits for general aviation, while forcing aircraft owners to retain their existing transponders and spend at least \$6,000-8,000 simply to maintain access in the airspace where they already fly. AOPA urges the FAA to work with the aviation community through the Aviation Rulemaking Committee on ADS-B to analyze the comments; concerns and recommendations submitted and, where appropriate, conduct technical research before developing an alternative proposal. AOPA contends the current proposed rule needs such significant modifications that will alter its scope and policy as to warrant the additional step of producing a Supplemental Notice of Proposed Rulemaking rather than continuing with plans to publish a final rule.

Since 1990, AOPA has been a strong proponent of ADS-B and has been very involved in the development, testing, and promotion of the technology. When AOPA submitted its January 1990, report to Congress, *Aviation: The Future is Now*, AOPA called on Congress to stop the FAA's National Airspace System plan which included Mode S transponders for general aviation and instead move forward with a space/earth air traffic control system with automatic dependant surveillance as "a critical element."

Since that time, AOPA has dedicated a staff position and contributed significant resources to see the development of ADS-B mature in a way that would result in benefits for general aviation. We have taken unprecedented steps to partner with the FAA in developing an ADS-B system that is beneficial to general aviation, the FAA, and other airspace users. AOPA has:

- Participated in numerous FAA and industry standards and policy committees established for the development of technical standards for the equipment, and protocols for their operation, as well as for data exchange;
- Served as the industry co-chair of the joint FAA/Industry partnership to examine and analyze the implementation of ADS-B through demonstration programs in Alaska (Capstone program) and the Ohio River Valley (Safe Flight 21 operational evaluations);
- Equipped its fleet of employee-flown aircraft with ADS-B equipment that includes the display, transceiver, and antennas to support both ADS-B Out and ADS-B In;
- Provided space for the FAA to install and maintain an ADS-B ground station at AOPA headquarters;
- Demonstrated ADS-B technology to pilots, senior FAA management, state aviation directors, members of Congress and legislative staff, numerous university presidents, and international delegations from China and several African nations using staff pilots flying AOPA aircraft; and
- Educated pilots on the potential benefits of ADS-B through:
 - Several feature articles in *AOPA Pilot*, the world's most widely circulated aviation magazine;
 - The AOPA Air Safety Foundation by incorporating information about ADS-B in numerous training courses that address weather and collision avoidance;
 - Regular updates on ADS-B development on AOPA's Web site;
 - Regular communications to AOPA members via *ePilot*, a weekly online newsletter to nearly 300,000 subscribers;
 - Partnership with the FAA on an ADS-B video that was hosted and narrated by AOPA President Phil Boyer; and
 - Hosting FAA presentations and educational seminars on ADS-B at the past seven AOPA Expo annual conventions.

This extensive experience with ADS-B forms the basis for these comments. AOPA has made substantial investments of resources reflective of the association's strong support of the ADS-B concept as a replacement for 1940s radar technology because of its ability to deliver benefits not available with Mode S or other technologies.

AOPA's position on ADS-B has been consistent for over a decade. At an August 28, 2006 industry workshop, AOPA formally presented our views on ADS-B to the FAA. These are:

- ADS-B will result in cost savings by ultimately replacing radar and Traffic Alert and Collision Avoidance System (TCAS);
- ADS-B should eliminate the requirement for a Mode C transponder;
- ADS-B implementation should not be a "Mode S implementation in disguise" (meaning the only benefit to installing the costly new equipment is continued access to the airspace);
- ADS-B avionics must be affordable (the average \$6,000 to \$8,000 cost for equipage is too expensive for the majority of general aviation aircraft owners to voluntarily equip or be supportive of ADS-B);
- Cost and complexity should not be an encumbrance to aircraft owners having the equipment installed in their aircraft;
- The datalink for general aviation must be Universal Access Transceiver (UAT);
- The FAA must make a commitment to not change ADS-B avionics standards for at least a decade once these are established;
- All Flight Information Service (FIS) data should be free (along with traffic information FIS serves as an incentive for equipage); and
- The FAA must provide high quality weather and robust traffic information services at least 8 to 10 years prior to mandating ADS-B for general aviation.

The proposed rule either contradicts or ignores the majority of these principals and concepts, essentially imposing costs on general aviation with little or no additional benefit.

The Implementation Plan and Mandate for ADS-B Out Offers Little Benefit to General Aviation Operators.

AOPA is disappointed in the manner in which the FAA has chosen to implement ADS-B. The proposal basically emulates today's radar coverage, resulting in little more than a warmed over version of the Mode S transponder proposal from the 1980's. This approach to implementing ADS-B raises serious questions about the scope and magnitude of the mandate.

This results in the need for general aviation aircraft to install high-cost, high-performance ADS-B avionics. However, because there are so few benefits for general aviation aircraft owners, the FAA must rely on a mandate rather than incentives to equip the general aviation fleet. This strategy is contrary to the goals set out by AOPA during the ADS-B development process.

Throughout ADS-B development AOPA worked in partnership with the FAA to identify the best combination of features and benefits of ADS-B for general aviation. The agreed upon goal was to create a compelling package of safety (primarily weather and traffic in the cockpit) and situational awareness information at a low cost that would lead general aviation aircraft owners to voluntarily equip with ADS-B. This would be similar to what occurred with Global Positioning System (GPS) where, without a mandate, more than 90 percent of general aviation aircraft owners now use GPS.

Unfortunately, this is certainly not the case with the ADS-B proposed rule. FAA's plan for ADS-B Out plus the \$6,000 to \$8,000 per aircraft investment cost needed to comply with the rule fails to motivate aircraft owners to voluntarily install ADS-B avionics. Assuming the cost of avionics were similar to the cost of today's transponder (\$2,500), and the need for a Mode C transponder is eliminated, ADS-B Out must provide at a minimum, the following safety enhancements and operational improvements to make it even remotely appealing for general aviation aircraft owners.

- Air traffic control flight following and radar services in the en route phase of flight, at altitudes most commonly used by general aviation aircraft, usually considered to be below today's radar coverage.
- Terminal air traffic control services at thousands of general aviation airports including radar vectoring and flight following. These services increase operational capacity and safety at general aviation airports by eliminating the one-in/one-out Instrument Flight Rule (IFR) access limitation.
- Automatic closing of instrument flight plans by air traffic control after aircraft have safely landed.
- Using ADS-B position reports to re-trace the flight progress of aircraft that have been reported missing, therefore accelerating the rescue of pilots and passengers.
- Increasing the availability of low-altitude direct-to navigation during instrument operations.
- Enabling a Flight Service Station (FSS) interface for improved weather and flight planning services, including tailored information based on accurate knowledge of the aircraft's position and altitude.

FAA's Contract for ADS-B Services Leaves General Aviation Wanting.

The FAA's September 2007 contract with ITT for ADS-B Out services provides little, if any benefit for general aviation. Under its contract with the agency, ITT will install and maintain the network of ADS-B ground stations, and manage and deliver data to air traffic control and pilots. According to both the FAA and ITT, the ADS-B surveillance coverage will replicate existing radar coverage with nothing more, except for the Gulf of Mexico. While the FAA plans to spend \$1.8 billion to replicate radar, general aviation spends nearly the same amount in addition to the costs associated with maintaining the Mode C transponder.

Based on AOPA's understanding of the FAA's contract with ITT, nearly 800 ADS-B ground stations will be installed to provide the services. If they are placed on or adjacent to airports, radar-like services could be available where they have not been in the past. However, these 800 ground stations are not sufficient to provide low-altitude coverage to even a fraction of the 5,400 public-use general aviation airports nationwide. With no expansion of important safety services, we are left with serious questions about the value of the ITT contract.

FAA's Strategy on ADS-B In as Incentive to Equip is Flawed.

Under the proposed rule, the FAA assumes ADS-B In datalink capabilities will motivate general aviation aircraft owners to install the avionics necessary for ADS-B In capabilities, estimated to be at least \$16,000 today. According to a study of AOPA members, this would be an unacceptably high cost for nearly all aircraft owners. Assuming reasonable costs, which would be far below the current cost estimates for the ADS-B In avionics, general aviation aircraft owners would need high quality weather and robust traffic data services available for a minimum of eight to ten years before any mandate becomes effective.

ADS-B In provides value added information that improves pilot safety and efficiency. However, ADS-B In equipment must be voluntary because it is cost prohibitive for most aircraft owners today. As AOPA has maintained for nearly a decade, the best way to encourage general aviation aircraft owners to purchase ADS-B In avionics is to:

- Supply all available graphical and textual real-time weather data in the cockpit at no additional charge;
- Supply all available and current graphical and textual airspace status for special use airspace;
- Supply all available textual and graphical information about temporary flight restrictions; and
- Provide all available traffic data whether the traffic comes from either a transponder or ADS-B.

To illustrate this point, that is why AOPA is concerned the FAA's contract with ITT limits the number of traffic targets broadcast via Traffic Information Service-Broadcast (TIS-B). This means that pilots will not be able to see the locations of all known traffic, reducing the effectiveness of TIS-B for the safe and efficient operation of general aviation aircraft. Ironically, this is a degraded level of service when compared to the Safe Flight 21 east coast test bed, which has been in operation for several years.

The Use of two ADS-B Datalinks Raises Numerous Questions.

The proposed rule mandates the use of a 1090 Extended Squitter (1090 ES) ADS-B system for an aircraft that operates above Flight Level 240. Otherwise, aircraft owners have the choice between that datalink and the Universal Access Transceiver (UAT). AOPA opposes a 1090ES requirement for all users because of the performance limitations identified by the FAA and industry research.

The UAT ADS-B datalink was designed in the late 1990's specifically to address the needs expressed by general aviation pilots. In addition to traffic data, the UAT datalink can support the transmission of graphical weather and airspace information into the cockpit, giving pilots who equip with this technology a significant advantage over those using 1090ES. The UAT datalink can also provide greater traffic density and is likely to have a lower cost than 1090ES, making it the likely choice of general aviation aircraft that do not plan to fly above FL240 or outside of North America.

However, the use of two datalinks presents important issues that must be resolved and are not addressed in the proposed rule. These issues include safety, operator privacy, and international compatibility.

1. Dual Link Safety Issue Must Be Resolved

The two datalinks create a safety hazard because aircraft using one link would not be able to "see" aircraft using the other link. This can be resolved by providing ADS-R (re-broadcast capability) at all public airports where a mix of both systems will be encountered. ADS-R receives message from each frequency and retransmits it on the other frequency through a ground relay.

2. Privacy Mode Must Be Available for General Aviation Aircraft

According to AOPA members, the FAA must allow general aviation pilots to maintain their privacy while operating under visual flight rules (VFR). Members object to transmitting their N number (or ICAO 24 bit address) while flying VFR. Therefore, general aviation aircraft must be allowed to transmit a "privacy" message so that their aircraft identification and 24-bit ICAO address are not broadcast.

The UAT datalink has this function and should be permitted by the FAA. When the pilot selects the "VFR mode" on the UAT configuration controls in the cockpit, the UAT datalink system randomly selects an unassigned 24-bit ICAO address. Each time the UAT transmits this ICAO code; it alerts the recipient of the ADS-B message that the operator of that aircraft prefers privacy. None of the other UAT functions are affected when the pilot selects this "VFR" mode. It is the same functional effect of a pilot squawking 1200 today on a VFR flight with a Mode C transponder.

3. The FAA must facilitate international compatibility to ensure UAT operations will be supported throughout North America.

The proposed rule does not address the fact that Canada and Mexico have not committed to UAT. In fact, it appears they will select the 1090ES datalink rather than UAT.

Although general aviation pilots are being offered the option to equip with either UAT or the 1090ES datalink, the 1090ES does not allow for one of the primary benefits of ADS-B to general aviation -- graphical weather and airspace information in the cockpit. That will leave many general aviation operators with a choice between two unsatisfactory options: UAT which limits their ability to fly internationally; or the lower performance and more expensive 1090ES which prevents them from receiving valuable in-flight information.

The FAA must ensure that UAT operations will be supported throughout North America. Even flights originating and terminating within the United States may require brief overflight of Canada or Mexico. For example, a flight between Juneau and Anchorage, Alaska, may require an overflight of Canada following the inland route - a necessity under some weather conditions. And, pilots frequently fly through Canada from the New England region to the Great Lakes region of the continental United States.

The Requirement to Keep Mode C Transponder is Unacceptable.

AOPA strongly opposes the requirement for light aircraft to retain their Mode C transponders. This is a redundant requirement that increases the cost to aircraft operators. General aviation aircraft owners will not only have to purchase the equipment necessary for ADS-B, they will also have to replace their existing transponders as they age, further increasing the total cost of this mandate over the lifetime of the aircraft. The FAA has failed to recognize the costs associated with maintaining and replacing transponders, thereby underestimating the financial impact on general aviation.

The FAA has cited two reasons for this requirement: existing TCAS systems are not compatible with ADS-B; and the plan to use secondary surveillance radar as a backup at large airports in the event of a GPS outage. AOPA counters that the FAA has not fully evaluated the feasibility of upgrading TCAS to use ADS-B transmissions in lieu of transponder replies. Before the FAA takes any further regulatory action on the ADS-B mandate, a policy change is required that results in the development of strategies ultimately

eliminating the need for transponders. Since the publication of the proposed rule, an RTCA committee has been formed to evaluate this issue and create standards for upgrading TCAS to support ADS-B.

The backup strategy is not well thought out, and at a minimum, the FAA needs to look at improving the national GPS system performance, in addition to other strategies rather than taking the path of least resistance, which is mandating general aviation to keep the transponders. For example, during the backup deliberations with industry, AOPA and others recommended pursuing other options, such as:

- Using the ADS-B transmissions, without the GPS information, to triangulate the position of aircraft (sometimes referred to as wide area multilateration); and
- Establishing performance criteria for a suitable general aviation GPS backup capability that not only meets the backup needs for ADS-B but also for navigation.

The Performance Requirements for ADS-B Are Excessive for Low Altitude Operations.

The FAA should reduce the required performance levels for aircraft flying below FL240 by amending two of the proposed minimum performance standards.

1. *Eliminate the requirement for dual antennas.* The requirement for dual ADS-B antennas (top and bottom mounted) is a significant cost driver for ADS-B equipment. In addition, the FAA has not provided sufficient evidence two antennas are needed. Decades of operational experience with Mode C transponders and TCAS do not support the dual antenna requirement.

2. *Reduce the minimum requirement for the transmit power.* RTCA standards permit a low-powered ADS-B transmitter for general aviation operations and the FAA should adopt this for all operations below FL240. Reducing the transmit power requirements also reduces the costs and complexity of the ADS-B system.

Incentives are Needed for ADS-B Equipage.

While AOPA's 2007 survey of its members revealed that the majority would be willing to pay about the same amount for ADS-B equipment as they would pay for a new transponder, current costs are nearly three times this amount and the transponder would still be required. Because ADS-B is the cornerstone of the Next Generation Air Transportation System (NextGen), incentives should be provided to aircraft owners to purchase and install ADS-B avionics. Examples include federal tax credits, early equipage incentives, a government-issued NextGen equipment voucher, and a competition among manufacturers to develop a low-cost ADS-B.

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In addition, the FAA must guarantee the mandated avionics will not require upgrades for at least 10 years after the effective date of the final rule to allow general aviation pilots to effectively spread their equipment costs over time.

Conclusion

The ADS-B proposal is a good starting point for deliberation on the implementation of this cornerstone for NextGen. However, the proposal is not acceptable in its current form. The FAA must commit to working with the aviation community to analyze the comments, concerns and recommendations submitted and, where appropriate, conduct technical research and develop a supplemental notice of proposed rulemaking.

AOPA will continue its historic level of involvement and commitment to addressing our concerns, as well as other issues associated with ADS-B implementation.

Sincerely,

A handwritten signature in black ink, appearing to read "Andrew V. Cebula". The signature is fluid and cursive, with the first name being the most prominent.

Andrew V. Cebula
Executive Vice President
Government Affairs