

# ADS-B

## EQUIP NOW!

Summer — Fall 2018

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Photo Courtesy of Textron

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# Do I Need to Equip with ADS-B?

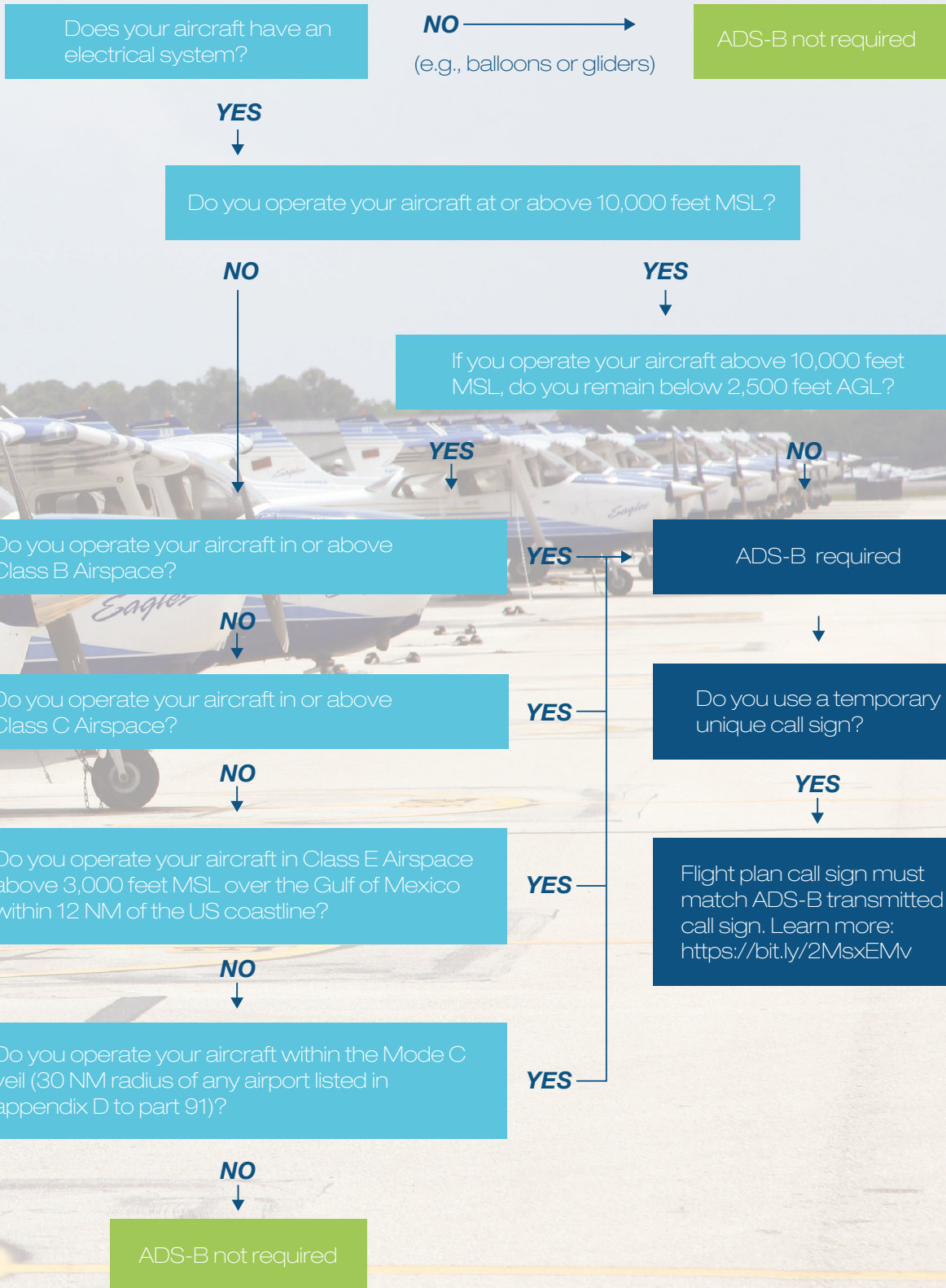




Photo Courtesy of Greta Thorwarth

# Hanging with the "In" Crowd

By John Croft

**L**ike many rural general aviation airports, Massey Aerodrome (MD1) on Maryland's Eastern Shore is a great destination for soft-field landing practice on actual grass. Rarely is there another aircraft in the pattern; that is, unless Massey happens to be holding one of its signature fly-ins.

I flew with my two Piper Archer co-owners to a Massey "Open Hangar" party just before Christmas 2017, seeing firsthand the transformation from middle-of-nowhere to hornet's nest in less than 1 hour. The convergence of traffic over Massey, an "uncontrolled airport," highlighted the indispensable qualities of our newly installed Automatic Dependent Surveillance–Broadcast (ADS-B) avionics ("Don't leave home without it.") and made clear some limitations of the surveillance technology ("Keep your head on a swivel, regardless.").

The FAA is requiring ADS-B Out equipage by January 1, 2020, for aircraft flying in airspace where Mode C transponders are required, including our home base in

Annapolis, Maryland. The agency did not require owners to purchase ADS-B In, which provides traffic and weather on the 978-megahertz link. My partners and I equipped with an Appareo Stratus ESGi 1090 MHz ADS-B Out transponder in October 2017, along with dual 1090 MHz and 978 MHz ADS-B In channels and backup attitude capability.

Though not required, about 70 percent of the owners who install ADS-B Out are also installing ADS-B In, according to David Gray, FAA Surveillance and Broadcast Services program manager. Once pilots experience the benefits of having ADS-B In, especially in crowded airspace, they tend to become believers. In fact, when we interview pilots who have equipped, two observations are universal, both of which are hard to put a price tag on:

- 1. "I never realized how much traffic was out there that I didn't see."*
- 2. "If I'd have had ADS-B In back then, that one really close call would probably not have happened."*

The number of believers will most likely increase as more and more pilots equip ahead of the mandate and see for themselves.

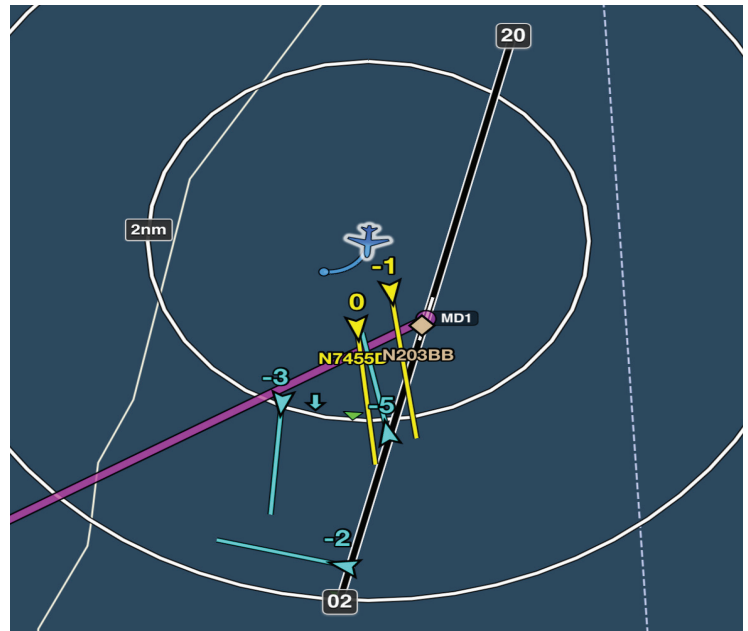
The Massey fly-in illustrated why pilots who do not plan to fly in "rule" airspace may also want to consider ADS-B. MD1 is located 11 nautical miles outside of the 30-nautical-mile Mode C "veil" around Washington, D.C., so no transponders are required. It is also just outside the airspace that will require ADS-B Out equipage by 2020.

Even though it is not required, equipping with both ADS-B Out and In will provide a noticeable payback in situational awareness. Twelve miles out from MD1 on our way to the fly-in, my ADS-B In feed lit up with at least eight airborne aircraft within 5 miles of the airport.

Thanks to Wi-Fi and Bluetooth, all three of us in the Archer had access to traffic on our portable devices, and we split up the duties. I was in the back seat, primarily watching my iPad mini for traffic; Duane piloted from the left seat, scanning outside for traffic; in the right seat, Reid split his attention between watching traffic onscreen and out the window. Having a strategic view allowed us to pick a relatively traffic-free entrance strategy before being able to make visual contact with other aircraft. Depending on visibility, I can typically spot other traffic at a relative separation of 1–3 miles — but not always. For see-and-avoid, knowing where to look based on the ADS-B display is more than half the battle.

Using ADS-B In, eyes out the window and position reports by pilots on the common traffic-advisory frequency, we sequenced ourselves for a downwind leg to Runway 02. On downwind we became sandwiched between a number of aircraft, some of which were not equipped with transponders and did not show up in the Traffic Information Services–Broadcast (TIS-B) feed into ADS-B In.

This experience made it clear that ADS-B In is not a substitute for eyes out the window — at one point a pair of Quicksilver ultralights flying at half our speed were downwind traffic at our 12 o'clock and less than 1 mile away. We had plenty of time to practice this fusion of see-and-avoid, radio position reports and ADS-B In: All manner of airborne and ground traffic constraints led to three go-arounds before the Archer's tires finally kissed the turf and we taxied in for a fantastic lunch.



Even at pattern altitude, ADS-B In provides a wealth of traffic arriving at Massey Aerodrome (MD1), at least to those with transponders.

Leaving that day was a different story: The traffic was just as intense, but aircraft were fanned out in all directions, easing concerns of any unwanted air-to-air contact and making for a less stressful ride back to our Annapolis home base.

Once ADS-B In clues you in to how much traffic may or may not be in your path, it is difficult to imagine not having that situational awareness at your fingertips. Lee Sommer, manager of the College Park Airport in Maryland — one of three general aviation airports inside the Flight Restriction Zone close to downtown Washington — describes it as a security blanket of sorts. “It gives me a sense of security when flying in a congested airspace,” he said. “I know that I’m going to be OK.”

John Theune, a general aviation pilot based in Annapolis, feels the same way about his ADS-B In. “The Big Sky Theory generally works; you’re probably not going to run into another plane,” he said. “But not knowing what’s out there; that’s stressful.”

Having had firsthand experience with ADS-B In after just six months of having it onboard, I can fully attest to Sommer’s and Theune’s senses that the information provides comfort in a crowd. Mix that with a good dose of old-fashioned see-and-avoid and open ears, and you have an awesome new capability for situational awareness and staying safe, whether you’re in “rule” airspace or not. ✈️



Photo Courtesy of FAA/NextGen

# FAA Works to Minimize Call Sign Chaff

By John Croft

Air traffic controllers are masters of multitasking, simultaneously dividing their attention between numerous aircraft, weather and constraints across the U.S. skies. But when unwarranted or too-frequent alerts flash on their traffic displays, controllers' attention can stray from other potentially critical situations.

One alert that became prominent several years ago with the rollout of ADS-B Out was Call Sign Mismatch (CSMM). The FAA responded with a multi-pronged approach to solve the problem, including temporarily disabling the CSMM alerting function for controllers and working with industry to teach operators and pilots how to resolve the issue so that CSMM can be switched back on.

CSMM occurs when FAA en route, terminal and certain ground automation systems detect that the identification tag, or call sign, broadcast from an aircraft's ADS-B avionics differs from its identification in the flight plan, which controllers see on their displays. The CSMM check is included

in the automation software of all en route and terminal radar facilities, as well as in the Airport Surface Detection Equipment and Airport Surface Surveillance Capability ground surveillance systems at larger airports. Although the FAA has disabled the alerting function, the agency continues to collect data on CSMM occurrences across the National Airspace System (NAS).

“At one time, we were getting 25,000–30,000 alerts, NAS-wide, per month,” said Eric Labardini, the National Air Traffic Controllers Association's national representative for ADS-B. “That was really distracting controllers.”

One aircraft with a CSMM on a single cross-country mission can cause a multitude of alerts if the pilot cannot change its ADS-B identification on the fly after air traffic controllers point out discrepancies. “In ERAM [En Route Automation Modernization], the alert is designed to trigger with the first sector the aircraft enters,” Labardini said. “You can acknowledge it and turn it off, but once the aircraft enters the

next sector, it gets re-triggered.” The process is repeated at each new en route center or terminal approach facility along the way.

Controllers first noticed the issue at the Anchorage En Route Center in Alaska, where there were nearly 400 ADS-B-equipped aircraft due to the FAA’s Capstone Project. Under Capstone, which ran from 1999 to 2006, the FAA equipped small aircraft in Alaska with ADS-B in part to boost safety by providing controllers with surveillance where radar was unavailable.

“That was an indication [in Alaska] that there was a CSMM problem,” Labardini said. FAA engineers investigated and verified that CSMM was indeed an issue at Anchorage Center — but the problem did not stop there. “We found that it wasn’t just Anchorage; it was NAS-wide,” Labardini said.

When a mismatch pops up on their screens, controllers have to notify the pilot using VHF radio. “Our expectation was that, if the pilot was able, he or she would reconfigure the avionics in the cockpit,” Labardini said. The mismatch check was created as a direct consequence of ADS-B and the new functionality the GPS-based technology brings to controllers and pilots.

ADS-B Out transmissions from an aircraft give controllers more accurate and timely surveillance compared to radar. The companion technology ADS-B In — which is not mandated by the FAA — gives pilots the same information. That has been a boon to traffic situational awareness for general aviation pilots. However, CSMM causes confusion when a pilot asks a controller about potentially conflicting traffic but they see different call signs on their respective displays.

Improper identification also will be a problem for the future of the NAS, since ADS-B In is key to a number of advanced traffic-management applications, including Cockpit Display of Traffic Information (CDTI) Assisted Visual Separation (CAVS), In-Trail Procedures (ITP) and Interval Management (IM). ITP over the oceans will enable suitably equipped aircraft to safely climb or descend with separation reduced to as close as 15 nautical miles compared to the normal in-trail separation distance of 30–80-plus nautical miles. That gives pilots easier access to more optimal fuel-saving altitudes.

IM includes a suite of applications to help pilots precisely manage a controller-assigned spacing between aircraft pairs. The result will be more efficient flight paths through

— ADS-B —  
**NOBODY LIKES A MISMATCH**  
FLIGHT PLAN CALL SIGN MUST MATCH  
ADS-B TRANSMITTED CALL SIGN

— ADS-B —  
**Should you purchase an ADS-B transmitter that allows you to enter a call sign?**

If you answer **yes** to any of the following questions, you need an ADS-B transmitter with a pilot-changeable call sign feature.

- Do you use an ICAO call sign to communicate with air traffic control? (e.g. DAL123)
- Do you use a local area call sign to communicate with air traffic control? (e.g. RDD123)
- Do you conduct commercial air taxi flights using a Tango November prefix for your ATC call sign?
- Do you conduct emergency medical transportation flights using a Lima November prefix for your ATC call sign?
- Do you conduct volunteer flights for organizations such as Angel Flight or Animal Rescue Flight and prefer to use their ICAO call sign (e.g. ARF223)?
- Does your flight planning company provide a unique call sign for privacy reasons?

MAKE CHECKING YOUR CALL SIGN ID PART OF YOUR  
**PREFLIGHT CHECK LIST**

FOR MORE INFO VISIT: [faa.gov/go/equipadbs](http://faa.gov/go/equipadbs)

Federal Aviation Administration

The flight plan call sign must match the ADS-B transmitted call sign.

congested airspace, and maximized airspace and airport utilization. But the advanced applications will only work if pilots and controllers have an identical view of the traffic situation. “If I’m calling out to American [Airlines] 1 to follow United [Airlines] 1, and United 1 has its ADS-B broadcasting United 123, then the IM procedure turns into lots of confusion for the pilot and the controller, and lots of congestion on the frequency,” Labardini said. “The app fails.”

That is the reason David Gray, the FAA’s Surveillance and Broadcast Services program manager, wants the issues addressed and the CSMM alerts restored. “The FAA and industry feel that safety and efficiencies will be increased through the use of ADS-B-dependent applications,” he said. “Turning on CSMM alerts as quickly as possible is a necessary step in that process. If CSMM is not resolved, it could seriously undermine [the] FAA’s ability to implement more advanced ADS-B In applications.”

Airlines and charter/air taxi operators (Part 135) maintain the fleets most affected by CSMM, where specialized call signs often are a standard operating procedure. Gray said airliners broadcasting their tail numbers over ADS-B rather than their flight-plan identification (AAL456, for example) is the most common cause of CSMM. The FAA is addressing that with outreach efforts. In some cases, ADS-B equipment was installed before pilots received training on the devices. Other times, pilots simply forgot to enter a new flight number into ADS-B before departure to a new destination on a multi-leg route, or they “fat-fingered” the wrong identification into the flight-deck avionics.

A relatively large number of mismatches — about 7 percent — come from Part 135 fixed-wing and rotary-wing emergency medical services (EMS) flights. These sometimes use call signs like AirMed, Life Flight or Medevac. These CSMMs tend to be more problematic because often the operators are equipped with Universal Access Transceiver (UAT) ADS-B avionics, a solution designed for general aviation aircraft flying below 18,000 feet.

While UAT systems are priced less than the alternative, 1090-megahertz extended squitter (1090ES) ADS-B systems, they also typically do not allow pilots to change the identification from the cockpit. 1090ES systems, which airlines typically install on the flight deck, are easily changeable from the cockpit.

“A lot of EMS operators were early [ADS-B] equippers and unfortunately selected UAT,” said Ric Peri, vice president of government and industry affairs for the Aircraft Electronics Association.

EMS operators regularly file an “L” for “Lifeguard” in front of their specialty call sign or N-number as an immediate signal to controllers to provide priority handling without adding to frequency congestion. With a UAT, the L typically cannot be added to the call sign from the cockpit; thus, a CSMM is born. “When N123 [a medical transport helicopter] takes a patient on board and transitions to Lifeguard LN123 [priority call sign], the pilots can’t reconfigure the ADS-B,” Peri said.

Other specialty flight operations find themselves in the same situation, including flight schools, the Civil Air Patrol (CAP), humanitarian missions and animal rescue. “This was a big shakeup for us,” Peri said. “We spent most of 2017 making sure avionics providers are asking the operators the right questions before they select one unit or another.” The “right questions” include the potential need for a dynamic flight identification along with the legacy questions of how high the aircraft will fly, whether it will fly internationally and what type of position source is needed. In some cases, operators or avionics installers read the FAA ADS-B rule differently than the agency expected. This finding led the FAA to publish a legal interpretation in July 2017 to clarify the issue. Peri noted the FAA, Aircraft Owners and Pilots Association and others have updated their online decision trees to highlight the potential need for changeable call signs.



Photo Courtesy of Embry-Riddle Aeronautical University  
The FAA and some operators are tying specialty call signs to specific aircraft, such as those used by flight schools, to resolve the CSMM issue.

The FAA is accepting “procedural accommodation” to solve the CSMM problem for certain Part 135 operators, flight schools and others. For example, if an EMS operator dedicates an aircraft to air ambulance flights only, air traffic controllers will automatically associate the aircraft’s call sign (AirMed 123) with the specialty mission (Lifeguard). Embry-Riddle Aeronautical University and the CAP are adopting the same strategy of tying a specialty call sign to a specific aircraft. However, if an aircraft sometimes does double duty as a non-medical charter aircraft, the procedural accommodation likely will not help, cautioned James Kenney, an FAA aviation safety inspector. In that case, the operator will likely have to equip with ADS-B that has a pilot-changeable call sign.

Kenney’s immediate focus is to drastically decrease the number of CSMMs ahead of the January 1, 2020, ADS-B mandate. “We contact these folks and get them educated,” he said about operators with CSMM problems. The outreach appears to be working: CSMM numbers peaked in December 2017 at approximately 31,000 for the 48 contiguous states and dropped in both January and February 2018, Kenney said. “What I and my small team are trying to do is communicate the correct process — buying and installing the right equipment — to as many people as possible,” he said. ✈️



Photo Courtesy of FAA/NextGen

# ADS-B: What Aerobatic Pilots Need to Know

By David Hughes

The FAA will require pilots who are practicing aerobatics, performing in an air show or competing in an event to report their positions via ADS-B Out, just as the agency currently requires an operating transponder.

The agency understands that ADS-B avionics performance will be reduced during aerobatic maneuvers due to GPS signal drops associated with antenna masking and other issues. But aerobatic aircraft should meet ADS-B equipment performance requirements when not engaged in aerobatics — such as during cross-country flights to perform in the next air show or competition, or en route to a practice area after takeoff. The FAA maintains that the ability of controllers and other pilots to identify and track aerobatic aircraft via ADS-B will enhance safety.

The FAA is interested in having aerobatic pilots enjoy ADS-B benefits when flying to or from air shows or other events, or to aerobatic practice areas (APA). According to Sue Gardner, the agency's national aviation events specialist, the FAA has three messages for the community of aerobatic pilots:

1. ADS-B equipment will experience reduced performance during aerobatic maneuvers, and the FAA will not penalize any pilot in that situation. ADS-B equipment is expected to meet established performance requirements during non-aerobatic maneuvering.
2. ADS-B Out is valuable for safety when an aerobatic aircraft is not performing dynamic maneuvers. It will transmit an aircraft's identity and position to controllers and pilots of other aircraft equipped with ADS-B In, even if the aircraft is not being tracked on radar. ADS-B Out will be required in most controlled airspace as of January 1, 2020.
3. Equipping with ADS-B Out and In will help pilots of aerobatic aircraft travel safely to and from events.

With lightweight ADS-B avionics available, more aerobatic aircraft owners are recognizing the value of equipping with ADS-B to enhance safety. Some systems combine ADS-B Out and In into one unit.



Steve Johnson, an aerobatic competition pilot who previously served as safety director for the International Aerobatic Club, said ADS-B can help pilots avoid unsafe situations. He flies a lightweight MX2 experimental aircraft powered by a custom built 330-horsepower engine.

Johnson did his own installation of ADS-B Out on his aircraft, which cost \$2,000 after the \$500 FAA rebate. He watches weather and traffic using ADS-B In on his iPad, which he carries on cross-country flights. ADS-B In alerts him to other aircraft he didn't know were flying nearby. It also helps him spot the traffic pointed out by controllers and determine how fast other aircraft are moving relative to his aircraft, which cruises at 170 knots. "Things happen quickly" at that speed, Johnson said. He also likes using ADS-B In to spot traffic in the pattern when flying into an unfamiliar airport for a refueling stop.

Johnson finds ADS-B In weather helpful for strategic planning, looking at storms and weather 100–300 miles ahead of his aircraft. He uses a subscription weather service for closer-in views. Johnson pays careful attention to staying in visual conditions all the time. He is an instrument-rated pilot, but his aircraft is only equipped for visual flight rules flight.

"ADS-B is another tool in the arsenal of an aerobatic pilot which keeps us safe when flying to and from contests and air shows," he said. He logs more hours on the cross-country flights than he does in the events. Johnson flies in about eight competitions annually and has placed first in regionals and second in nationals.

If aerobatic pilots fly aircraft equipped with optional ADS-B In, they can glance at a screen whenever they are flying to and from aerobatic practice areas, or to other airports, and see if other aircraft are nearby. In some cases, ADS-B In aircraft displays have saved the lives of general aviation pilots in flight by alerting them to another aircraft on a collision course.

Tom Haines, at the time editor of AOPA Pilot magazine and now AOPA senior vice president of media and outreach, was flying under the hood in 2014 in his Bonanza with an instructor pilot when he heard a warning of an approaching aircraft. The instructor pilot spotted the other aircraft just in time and told Haines to climb, thus avoiding what Haines said would have been a midair collision. In an example where ADS-B Out and In would have helped, a

pilot practicing aerobatics with a Grumman F8F Bearcat experienced a close call with a Canadair Regional Jet (CRJ). Air traffic control vectored the CRJ to land at an airport, and the aircraft's pilots didn't spot the Bearcat. The warbird's transponder was off, and it was not equipped with ADS-B Out. Fortunately, the Bearcat pilot spotted the CRJ passing through the aerobatic practice area and maneuvered to avoid the passenger jet. The two aircraft avoided a collision, but it was a close call. The aerobatic area was listed in Notices to Airmen, but the information had not registered with the airline or the CRJ crew. The safety observer on the ground did not spot the CRJ soon enough to call out the traffic to the Bearcat pilot.

The FAA has developed policy and advisory circular (AC) guidance for aerobatic pilots on ADS-B. There soon will be a new aviation-events policy in the FAA's Flight Standards Information Management System created by Order 8900.1 and a new AC 91-45D, Waivers: Aviation Events. The policy and the AC should be published this summer.

Gardner said the FAA policy for ADS-B will be similar to that for transponders. The transponder rule has no waiver under Title 14 of the Code of Federal Regulations section 91.205. With few exceptions, pilots are required to turn on the transponder.

More than 400 air shows are conducted in the United States each year, and aerobatic pilots use upwards of 170 long-term practice areas. Aerobatic pilots and aerobatic competency evaluators can establish a temporary aerobatic practice area (Short Term APA) or an Aerobatic Competency Evaluation/Practice (ACE/P) area for 11–30 days. ACE/P is a new program that provides the air show community with a means for access to protected airspace so routines can be practiced and pilots can be evaluated for aerobatic competence. Pilots can fly aerobatic maneuvers above 1,500 feet as long as their aircraft are not within 4 miles of an airway or over any congested area or open-air assembly of people.

"There is less and less uncongested airspace," Gardner said. "This is especially true on the east and west coasts. Having ADS-B installed on an aerobatic aircraft is an important safety tool for pilots flying in [those] regions. It can also help pilots avoid danger in uncongested airspace that can be found outside of major metropolitan locations." Johnson notes that some aerobatic competitions occur in or near airspace where ADS-B Out is required, such as in Class D airspace or under Class B airspace. ✈️

## TOP 10 THINGS TO KNOW ABOUT ADS-B

### 1. ADS-B Out is Mandated; ADS-B In is Not.

Starting January 1, 2020, you must be equipped with ADS-B Out to fly in airspace where a Mode C transponder is required.

Owners can install an ADS-B Out system to meet the minimum requirements of the rule. They can also integrate with ADS-B In avionics and displays to reap the full benefits of ADS-B. Since the advantages of ADS-B In are so extensive, the FAA believes many in the general aviation community will choose to invest without an ADS-B In mandate.

### 2. You Are Required to Operate Your ADS-B Out Transmitter at All Times.

ADS-B Out works by regularly broadcasting position, velocity, and identification information to air traffic control and other aircraft to improve situational awareness at all times — on the ground and in the air.

### 3. Portable ADS-B Out Units Are Not an Option.

Portable units use a suction-cup antenna to get a usable GPS signal and must be in the right place or the signal suffers. This puts it in a prime spot to obstruct view, and the wiring potentially hampers controls and instruments.

Also, portables might easily transfer from aircraft to aircraft, but you have to input the N-number correctly. If you're off by just one digit, then your flight plan ID won't match up with the portable's transmitted ID.

### 4. Uncertified Equipment? Check Your Airworthiness Certificate.

You may install an uncertified transmitter on amateur-built aircraft and light-sport aircraft with experimental airworthiness certificates if it meets the performance requirements of Technical Standard Order (TSO)-C166b

or TSO-C154c. For special light-sport aircraft, ADS-B equipment must meet the performance requirements in TSO-C166b or TSO-C154c. The installation (i.e., alteration) must be performed in accordance with an applicable consensus standard and authorized by the manufacturer.

You cannot install uncertified equipment, including uncertified transmitters, on any aircraft with a standard airworthiness certificate. Equipment that does not meet the performance requirements of an ADS-B TSO will not be permitted to operate in airspace requiring ADS-B after December 31, 2019.

### 5. Keep Your ADS-B Installation Instructions.

Installation instructions from the supplier, including the statement of compliance, will come in handy in case you have any service problems.

### 6. You May Not Have to Buy a New Position Source Suitable for ADS-B.

Many avionics vendors offer built-in approved position sources, such as Wide Area Augmentation System GPS receivers, and package them with ADS-B transmitters.

### 7. Make Sure Your ADS-B Equipment and GPS Equipment is an Approved Pairing.

Any GPS receiver used as an ADS-B position source must be an approved pairing with the ADS-B transmitter.

### 8. The Airspace You Fly Reveals the Type of Equipment You Need.

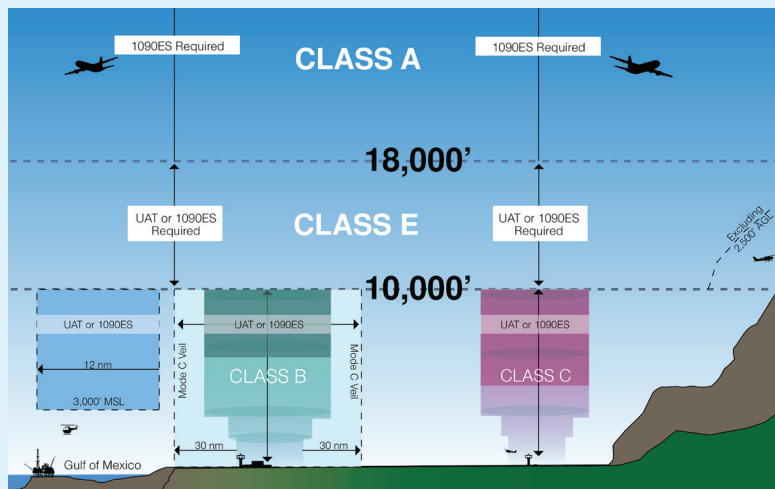
If you're flying in Class A airspace, or operate outside the United States in airspace where ADS-B is required, you will need a 1090-megahertz extended squitter ADS-B Out transmitter. Below Class A in the United States, you have a choice between a 1090ES or a Universal Access Transmitter.

### 9. The ADS-B Out Mandate Applies to Foreign Operators.

Starting January 1, 2020, all aircraft, including foreign-registered aircraft that operate in, or fly through the United States, must be equipped with an ADS-B Out system that complies with the regulatory performance requirement. While U.S. neighbors, including Canada, Mexico, and the Bahamas, do not currently have an ADS-B Out mandate for rule airspace, if they decide to do so in the future, they will require a 1090 MHz ADS-B Out system.

### 10. Beat the Rush. Install ADS-B Out Now.

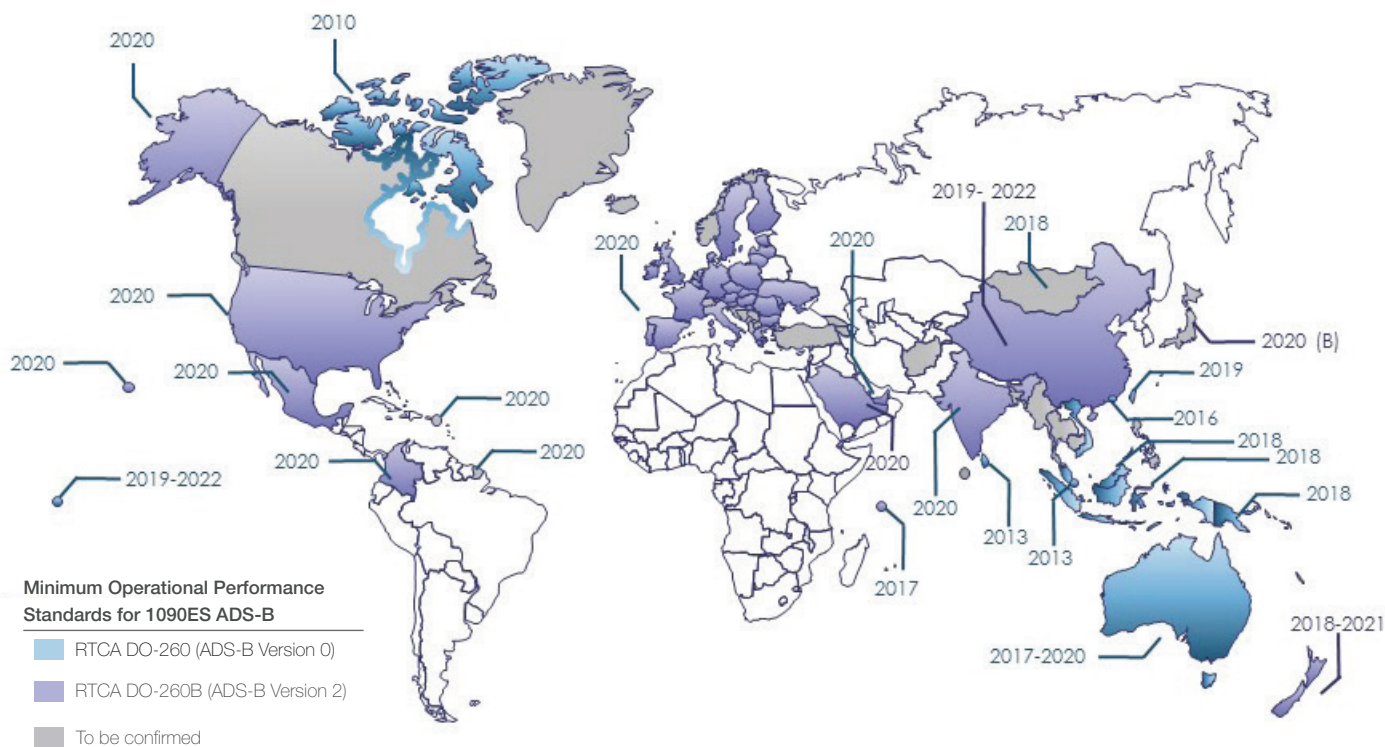
Don't wait! Avionics shops may become inundated with last-minute appointments, and your aircraft may have to be equipped after the deadline. ✈️



ADS-B will be required in most controlled airspace. For more information go to [faa.gov/go/equipadsb](http://faa.gov/go/equipadsb).

## ADS-B MANDATES WORLDWIDE

Courtesy of Thales



A growing number of countries require use of a 1090 MHz Mode S extended squitter (1090ES) transponder to fly in ADS-B airspace.



Photo Courtesy of Shutterstock

# Coming Soon to FIS-B: Lightning, Turbulence, Icing and More!

By John Croft

Pilots will soon have access to new weather data in their cockpits over the 978-megahertz Universal Access Transceiver link.

In June, the FAA began broadcasting six new weather products: lightning strikes, turbulence, icing forecasts, cloud tops, graphical Airmen’s Meteorological Information (AIRMET) and Center Weather Advisories. The new weather information will complement the original 13 “baseline” weather products—including Next Generation Weather Radar (NEXRAD) mosaics, winds aloft and terminal forecasts—in the Flight Information Services–Broadcast (FIS-B) feed.

“There were discussions in the past about lightning, turbulence, icing and cloud tops, and how those would be valuable to general aviation pilots,” said Bob Pomrink, a senior systems engineer supporting the FAA on the program. The FAA added Center Weather Advisories to address a recommendation by the National Transportation Safety

Board to send pilots more timely information on areas of convective weather. Graphical AIRMETs, showing regions of potentially hazardous weather, were added to help pilots more easily visualize the threats.

Pilots generally view weather data in applications on installed or portable devices.

The general aviation community will benefit from the new FAA products, which should boost safety and weather situational awareness. “We have been advocating for these new weather products because of the inflight safety benefits they provide,” said Rune Duke, senior director of government affairs for the Aircraft Owners and Pilots Association (AOPA).

Deciding what data can be uplinked and at what rate is like putting together a puzzle, as available bandwidth is limited on the 978 MHz link. The FAA considered uplinking turbulence forecasts every 60 seconds — the refresh rate of the model-

based graphical turbulence guidance from the Aviation Weather Center — but based on available bandwidth decided on 15-minute updates.

To satisfy a request from pilots for more granular cloud top information at lower altitudes while remaining within the bandwidth budget, the FAA is providing data in 1,500-foot intervals from 1,500 feet mean sea level to 15,000 feet, and in 3,000-foot intervals to 24,000 feet. Pomrink said radar data is broken down into “bins” measuring 1-by-1.5 nautical miles. “In each bin, we’ll tell you if there is a presence of clouds at that altitude,” he said.

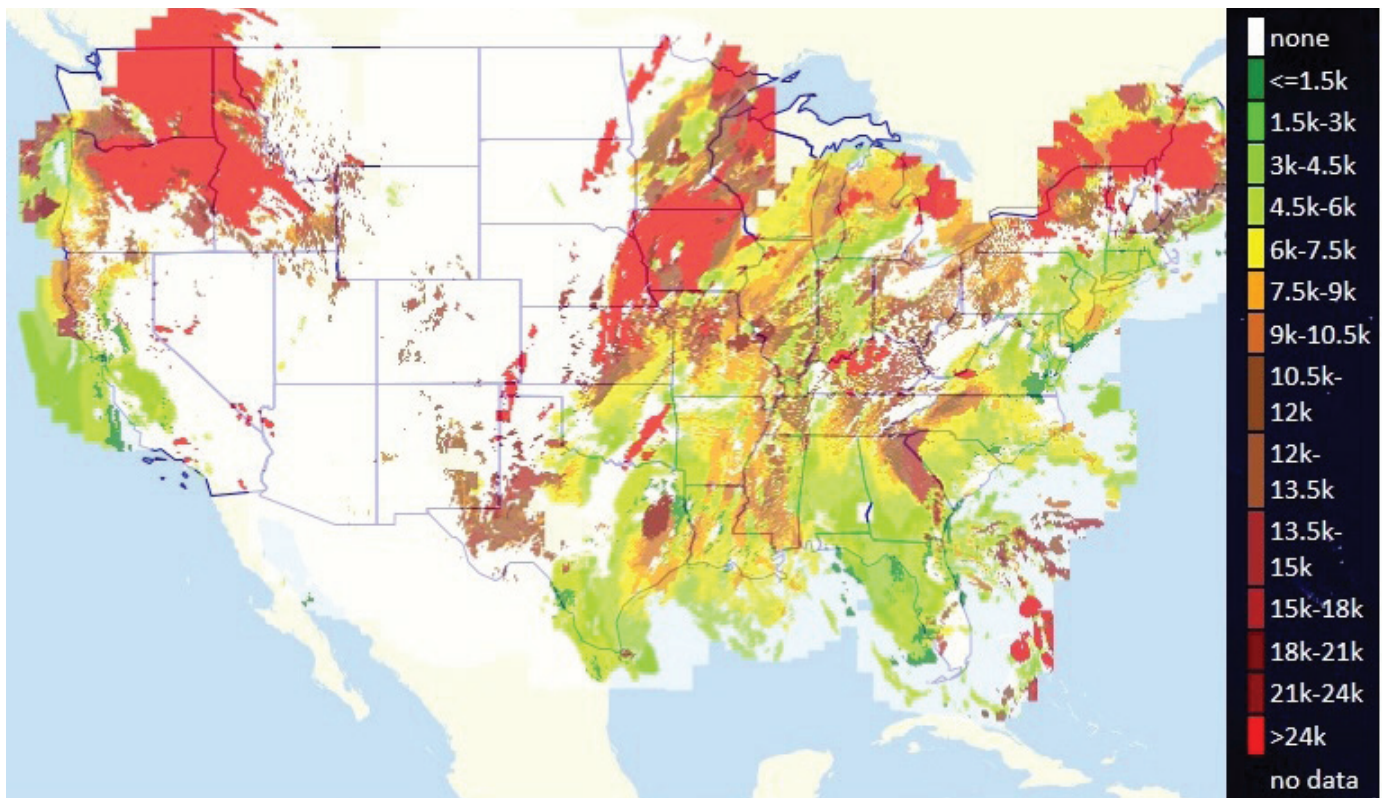
The locations of lightning strikes, which are captured by Vaisala’s U.S. National Lightning Detection Network, are updated every 5 minutes and transmitted every 5 minutes. The relatively high update rate for air-to-ground strikes — an indicator of thunderstorm activity — may be a valuable addition to NEXRAD mosaics of convective weather, which the FAA warns can be 15–20 minutes older than the most recent uplink.

Icing data includes real-time probability for areas where atmospheric conditions may be conducive to icing and supercooled large droplets (SLD), and a forecast for potentially affected areas over the next 12 hours. The

information is updated hourly and transmitted every 15 minutes.

While pilots have had access to current, forecast and SLD icing data in graphical format on the ground, Eldridge Frazier, lead engineer for the FAA’s Weather Technology in the Cockpit program, said research is underway for how to best use the information in the air—work that will lead to technical standards. “Time is more critical when using the current, forecast and SLD icing products in the cockpit compared to when [a pilot is] doing a pre-flight on the ground,” said Frazier. “For that reason, we’re doing a rigorous study.” The work, which includes flight-simulator sessions with volunteer pilots flying specific weather scenarios using FIS-B icing products on their displays, will culminate later this year in recommendations for companies that will incorporate new FIS-B data into their weather applications.

The new FIS-B data will be active this summer, and pilots will only get access to the new information when their individual applications are updated. AOPA’s Duke says the benefits will be worth the wait, but he reminds pilots to do their homework. “Pilots should review the FAA’s guidance on the new products to get the full benefits of FIS-B and to understand the limitations,” he said. ✈



The FAA is broadcasting six new weather products in FIS-B, including cloud tops.

# FIS-B PRODUCTS\*

## AVAILABLE NOW

PRODUCT	HOW OFTEN THE PRODUCT IS UPDATED	HOW OFTEN THE PRODUCT IS TRANSMITTED VIA FIS-B
<b>AIRMET</b>	As available	5 minutes
<b>Convective SIGMET</b>	As available, then at 15-minute intervals for 1 hour	5 minutes
<b>METAR/SPECI</b>	1 minute (where available), As available otherwise	5 minutes
<b>NEXRAD Reflectivity (CONUS)</b>	5 minutes	15 minutes
<b>NEXRAD Reflectivity (Regional)</b>	5 minutes	2.5 minutes
<b>NOTAMs-D/FDC</b>	As available	10 minutes
<b>NOTAMs-TFR</b>	As available	10 minutes
<b>PIREP</b>	As available	10 minutes
<b>SIGMET</b>	As available, then at 15-minute intervals for 1 hour	5 minutes
<b>SUA status</b>	As available	10 minutes
<b>TAF/AMEND</b>	6 hours (±15 minutes)	10 minutes
<b>Temperature aloft</b>	12 hours (±15 minutes)	10 minutes
<b>Winds aloft</b>	12 hours (±15 minutes)	10 minutes

## NEW IN 2018

PRODUCT	HOW OFTEN THE PRODUCT IS UPDATED	HOW OFTEN THE PRODUCT IS TRANSMITTED VIA FIS-B
<b>Center Weather Advisory</b>	As available	10 minutes
<b>Cloud tops</b>	30 minutes	15 minutes
<b>Graphical-AIRMET</b>	As available	5 minutes
<b>Icing, Forecast Potential</b>	60 minutes	15 minutes
<b>Lightning strikes</b>	5 minutes	5 minutes
<b>Turbulence</b>	1 minute	15 minutes

\*FIS-B information, including weather information, NOTAMs and TFR areas, are intended only for advisory use for the sole purpose of assisting in long- and near-term planning and decision-making. The system lacks sufficient resolution and updating capability necessary for tactical aerial maneuvering around localized weather phenomena. In particular, in extreme scenarios, the oldest NEXRAD CONUS or Regional weather radar data on the display can be up to 15–20 minutes older than the display's age indication for that weather radar data. Also, FIS-B information must not be used in lieu of a standard preflight briefing.

# PAPR Chase: Don't Lose Your ADS-B Traffic

By John Croft

Pilots accustomed to receiving live ADS-B traffic updates from FAA radar through the Traffic Information Service–Broadcast (TIS-B) will feel blind — and less safe — if that service gets shut off. But that is exactly what might happen if their ADS-B equipment is transmitting hazardous information or performing incorrectly over a given number of flights.

Under a change to the ADS-B ground infrastructure software made in mid-December 2017, aircraft flagged by the FAA's ADS-B performance monitoring system as not complying with the criteria spelled out in the ADS-B rule could be placed on a No Services Aircraft List (NSAL). Once on the list, the aircraft will no longer receive traffic from FAA radar through the TIS-B uplink, and the aircraft's ADS-B information will not be displayed on controllers' screens. While the onboard ADS-B equipment itself does not alert pilots to such errors, the FAA's Public ADS-B Performance Report, or PAPR (pronounced "paper") does. The agency is asking equipped pilots to check their systems regularly using PAPR, a free check completed online (<https://adsbperformance.faa.gov/PAPRRequest.aspx>) after a flight in airspace with ADS-B coverage. Pilots receive the analysis, which rates the actual performance compared to ADS-B specifications, through email shortly after submitting the request.

"Understanding the issues we're seeing with ADS-B avionics over the past three years, I recommend that pilots who are flying every weekend check their ADS-B performance every fourth or fifth flight," said James Marks, the FAA's ADS-B Focus Team lead. Typical issues include aircraft transmitting the wrong ICAO codes (a fixed number set during aircraft registration), wrong flight identification (tail number), incorrect air-ground registration (the ADS-B unit reporting that the aircraft is in the air when it is on the ground, and vice versa) and position errors.

Marks notes that an ADS-B system is more complex than a transponder and its performance is dependent not only on

properly functioning and configured avionics but also on the availability of GPS/Wide Area Augmentation System services, the FAA's ADS-B ground infrastructure and its available coverage, terrain and other factors. "Just because your ADS-B passed the initial test after installation doesn't necessarily mean your system will comply with the rule afterward," Marks said.

Marks has a team of nine avionics inspectors and three analysts working full-time to identify and analyze errant ADS-B outputs, and when avionics problems are confirmed, they notify the aircraft owner. Marks and his team have shifted their ADS-B compliance machinery into high gear as equipage nears 50,000 aircraft and the 2020 mandate looms.

Under the changes made in December 2017, an aircraft can be placed on the NSAL if the ADS-B-equipped aircraft is emitting "erroneous or hazardously misleading" information. "Over the past three years, [FAA monitoring] has identified some ADS-B Out aircraft with non-performing equipment transmitting data used by [air traffic control] and ADS-B In-equipped aircraft that present a safety hazard to the National Airspace System," an FAA notification of NSAL to the public on December 20, 2017, said.

NSAL aircraft, those with persistent or more serious problems, are a subset of the so-called non-performing equipment (NPE) aircraft, the latter of which number in the thousands. Marks' team is trying to reach owners of all NPE aircraft through a mass mailing of notification letters, hoping to correct the issues before having to place the aircraft on the NSAL.

As of mid-January 2018, more than 400 aircraft were on the list, mostly foreign-registered airliners with a common ADS-B Out issue for which a fix has been developed. Marks expected the number of general aviation aircraft on the list to increase over time. "Our goal will always be to resolve avionics issues first, when possible, to avoid the need to put an aircraft on the NSAL," he said.

For pilots, the FAA's actions highlight the importance of regularly requesting a PAPR, not least of which is that the cover page will tell you in red if you are on the NSAL. Specific issues with the unit also are highlighted in red, and anything red means the aircraft has NPE.

"A lot of pilots install the ADS-B equipment and assume everything is fine," Marks said. "If it's not, a member of my team will, at some point, contact them." ✈

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