

# ADS-B

## EQUIP NOW!

Winter 2017 — Spring 2018

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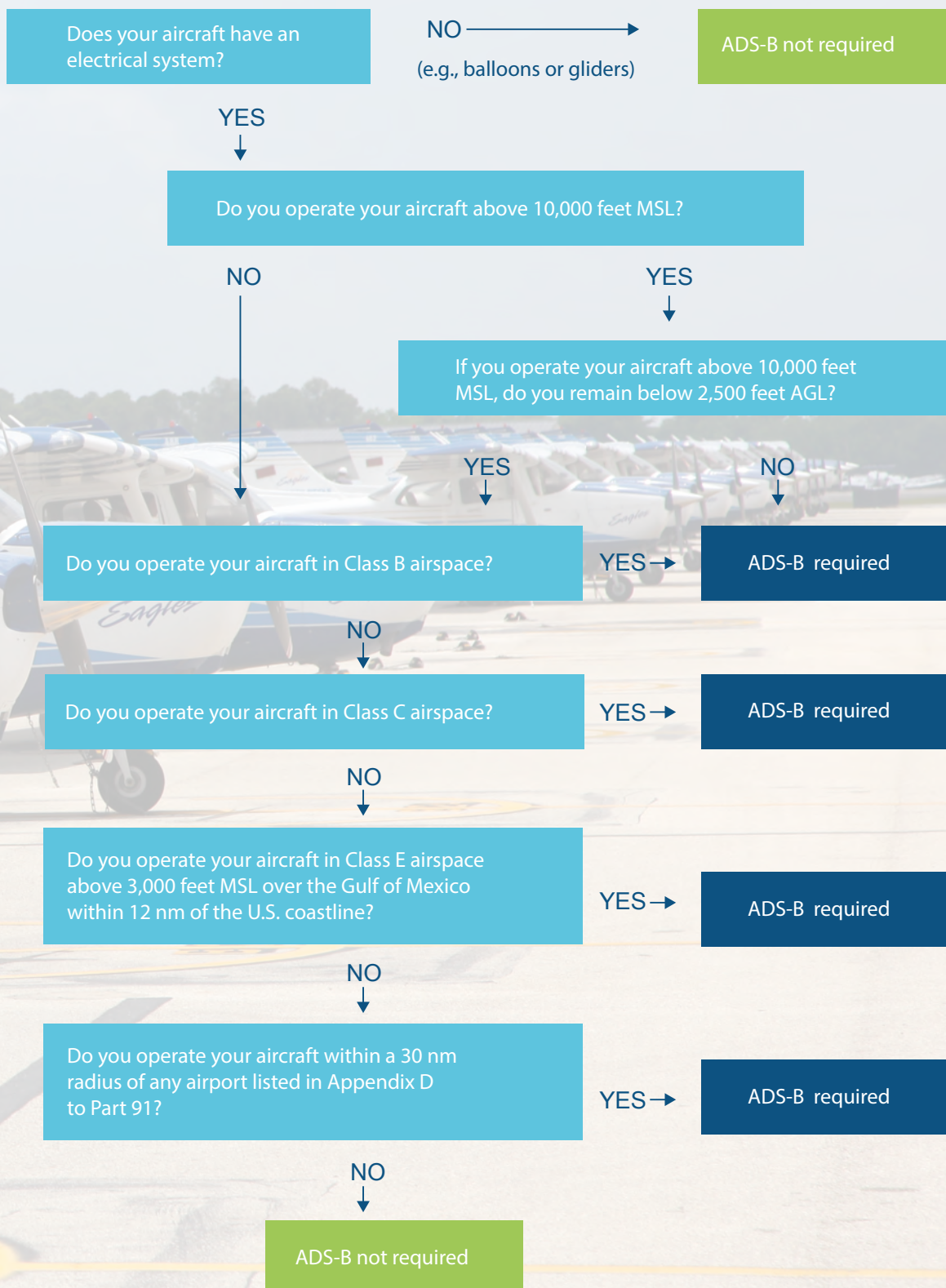
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**Federal Aviation  
Administration**

# Do I Need to Equip with ADS-B?







Coyle Schwab's Cessna 195

## SAFETY

# Going 'Full Boat' with ADS-B

Traffic, weather, and NOTAMS of ADS-B In raise safety, awareness in the cockpit.

By Kyle Osborne

“At first, I considered going the least expensive route, but I’m glad I decided to go ‘full boat,’” said Chicago-area general aviation pilot Coyle Schwab. By equipping with both Automatic Dependent Surveillance–Broadcast (ADS-B) Out and In, Schwab is now directly getting traffic and weather information on a display in the cockpit via ADS-B In, which is in addition to the surveillance services enabled by ADS-B Out.

“ADS-B In allows pilots to improve their situational awareness of nearby traffic as well as en route and terminal area weather,” said James Marks, who leads the FAA’s ADS-B Focus Team. “There have been instances where pilots alerted to nearby traffic have avoided a possible collision with another aircraft.”

Adrian Eichhorn, who flew his Beechcraft Bonanza Model P35 around the world, has become a leading voice for full and early equipage. “I wouldn’t wait until the 2020 deadline,” said Eichhorn, a first officer with JetBlue Airways and general

aviation pilot. “I’d go ahead and equip now, just from a safety standpoint.”

So what do you get with the “full boat” experience? Comprehensive Traffic Information Service–Broadcast (TIS-B), in real time, and graphical weather via Flight Information Service–Broadcast (FIS-B) are among the vital data delivered to the cockpits with ADS-B In.

With TIS-B you see the altitude, ground track, speed, and distance of transponder-equipped aircraft flying within FAA radar coverage out to a 15-nautical-mile radius and 3,500 feet above or below the receiving ADS-B In equipped aircraft. TIS-B enables pilots to see aircraft equipped with transponders flying nearby even if those aircraft are not equipped with ADS-B Out. TIS-B is a transitional service to encourage early ADS-B equipage as everyone moves to a NextGen surveillance environment. ADS-B In-equipped aircraft can also receive ADS-B position data directly from other ADS-B Out aircraft or by ADS-B data relay from the



Avidyne ADS-B avionics are installed in Coyle Schwab's Cessna 195.

ground, bringing the situational awareness benefits of ADS-B to airspace where surveillance was not available before. The FAA maintains an ADS-R (Rebroadcast) function on the ground so that when an aircraft broadcasts its position on 1090 MHz, it will be relayed to aircraft using UAT on 978 MHz, and vice versa.

With FIS-B, the FAA broadcasts graphical and textual weather information to the cockpit of aircraft equipped with a Universal Access Transceiver (UAT). FIS-B graphical products include NEXRAD regional and national weather maps. FIS-B has text-based advisory and aeronautical information products, including Notices to Airmen, temporary flight restrictions, pilot reports, and the status of special activity airspace. (See Page 5 for list of products.)

As someone whose plane is based at an airport in rule airspace, Schwab chose to equip with ADS-B Out prior to the mandate. But as a pilot who travels far from home, the decision to also equip with ADS-B In turned out to be a very good one.

“When I flew from Oklahoma City to Long Island, New York, having all of that data proved to be invaluable,” said Schwab. “I’d find myself bumping through the soup but still able to anticipate weather that was ahead. Throughout that trip, ADS-B allowed me to form my strategy while I was still



Pilot Coyle Schwab

far away from my destination and to see aircraft lining up to land at New York City airports as I approached Long Island.”

Schwab has been flying for 40 years and said ADS-B is “a very good investment” for his classic radial engine powered Cessna 195.

“With TIS-B and FIS-B working in tandem, a pilot has never before had such a level of awareness, safety, and control,” Marks said.

# FIS-B PRODUCTS\*

## AVAILABLE NOW

PRODUCT	UPDATE INTERVAL	TRANSMISSION INTERVAL (95%)
<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	UPDATE INTERVAL	TRANSMISSION INTERVAL (95%)
<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 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.

Kyle Osborne is a writer-editor in the FAA NextGen Performance and Outreach Office. 





## EFFICIENCY

# How to Avoid ADS-B Call Sign Mismatch

A name or aircraft registration number/call sign is critical to the integrity of the ADS-B Out system and defines who you are in the National Airspace System.

By Tom Hoffman

ADS-B is the FAA's new GPS-based surveillance system that improves aircraft separation standards and safety. This more accurate system requires precise data, including the aircraft's identification. The identification can be the aircraft name (approved call sign) or FAA registration number. Some operational inconsistencies with ADS-B Out have resulted from naming errors, or call sign mismatch (CSMM), occurring any time the aircraft identification listed in a flight plan does not exactly match the ADS-B transmitted identification. The requirement for your ADS-B to transmit your aircraft identification is stated in Title 14 Code of Federal Regulations (14 CFR) section 91.227(d)(8).

Having these two IDs match might seem simple, but naming conventions aren't always as straightforward as you would expect. Adding to that is the complexity of a new technology and getting used to all the new procedures it requires.

It's worth noting that a CSMM can lead to significant operational difficulties for air traffic controllers, including distraction and increased workload, so it is important to fully understand these issues.

The good news is that for most general aviation flyers, CSMM shouldn't be an issue. The problem stems more from operators who use specialized call signs, like an air ambulance flight (more on that later). For the average general aviation pilot, however, the N-number is always the call sign. So, if you own your own aircraft and your ADS-B Out system was properly installed and configured to ensure your registration or N-number mirrors what your ADS-B unit is transmitting, you're good to go.

The best way to verify this is to check your system with the FAA's Public ADS-B Performance Report (PAPR) tool at

[adsbperformance.faa.gov/PAPRRrequest.aspx](https://adsbperformance.faa.gov/PAPRRrequest.aspx). Simply fly in an area of ADS-B coverage and then submit a request.

PAPR reports are typically delivered within 30 minutes and can verify if your system's call sign is matched properly with your aircraft as well as detect any other operational deficiencies with your ADS-B transmitter. Some CSMM issues are caused by a simple typo when the technician is first configuring the ADS-B unit. If that's the case, your repair shop should be able to help correct it. If the aircraft identification input on your unit can be manually configured, you may be able to update it yourself.

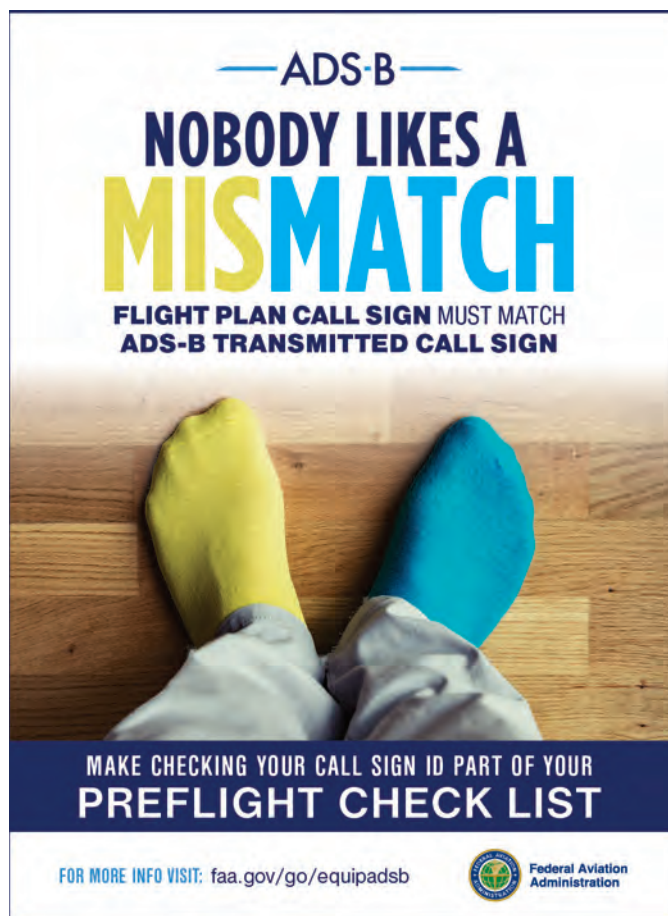
### A TALE OF TWO SIGNS

The CSMM issues tend to be more frequent with operators who use specialized call signs during flights that differ from the aircraft's registration number. These could be used to designate specialty operations like the previously mentioned air ambulance life flights or air taxi operators (either of which may also require a modified N-number), or with volunteer humanitarian flights that involve transporting hospital patients, veterans, or pets. For example, one of the more common special call signs, "Compassion," is used by the many public benefit flying groups that make up the Air Care Alliance. (Angel Flight and Pilot N Paws are two examples.) These call signs help expedite and improve pilot-ATC communications, signify to ATC the type of operation or mission being conducted, and facilitate priority handling if warranted. Many flight planning companies will also permit customers to use a specialized call sign when you contract for flight planning assistance. However, when used in an aircraft with ADS-B Out, there are some things you'll need to consider.

For those who might not be used to using special call signs and their associated telephonies, here's a quick primer. There are three types of call sign designators and telephonies authorized by the FAA:

- International Civil Aviation Organization (ICAO) three-letter designator (3LD)
- U.S. special call sign designator
- Local call sign designator

The ICAO 3LD is typically used by Part 121 and Part 135 operators, as well as corporations, government agencies, and charitable organizations. Using the earlier example



with Air Care Alliance flights, their ICAO 3LD is "CMF" and associated telephony (for radio voice communications) is "Compassion" plus the last three or four digits of the aircraft's registration number. The operator would need to use this code, for example CMF1234, in the aircraft identification block of the flight plan and *make sure the ADS-B transponder transmits that same code* to avoid a CSMM. On the return or ferry leg, the pilot should use the aircraft registration number as the call sign and ensure that ADS-B is transmitting the registration number.

Special call signs are mainly used to enable priority handling by ATC. These might include civil aircraft used for law enforcement, supporting medical emergencies or disasters, or organized events. Operators flying civilian air ambulance flights, for example, might use the call sign "Medevac" or "Lifeguard" and coordinate with ATC on any expeditious handling required. Note that you may see some pilots operating medical emergency flights use the "L" Lifeguard designator before their registration number on their flight plan for example LN777PW. Similarly, air taxi operators who

do not use a call sign should prefix their registration number with the phonetic word Tango, and file “TN ...” in their flight plan.

Finally, there are also local call signs which are used only for local flight operations as specified in a letter of agreement between the local ATC facility and the requesting aircraft operator. Some larger flight schools might have an agreement to use a local call sign in order to reduce confusion and ambiguity among several similar sounding aircraft operating in close proximity. This practice can benefit both the pilots and ATC.

### CALL SIGN OF THE TIMES

As you can see, there are several useful reasons for call signs other than your registration number in the general aviation arena. However, when ADS-B enters the mix, there’s a potential disconnect on how aircraft are identified.

“When the average general aviation pilot is authorized to use a special call sign, they don’t always realize that what they use as a name on their flight plan has to match what their ADS-B unit transmits,” said James Kenney, an aviation safety inspector with the FAA’s Flight Technologies and Procedures Division in Flight Standards. “If you’re transporting rescue dogs and using the call sign ARF234, that’s great. But just remember you have to change your ADS-B aircraft identification to match that call sign. If your ADS-B doesn’t allow you to update the name, you’ll have to revert to using your N-number instead.”

Kenney, who is the FAA point of contact for CSMM, is leading an effort to help educate everyone from general aviation pilots to air carriers on the need to properly align the aircraft identification they transmit. Regular data feeds from ATC help Kenney identify those involved in CSMMs. A single phone call to an air carrier or corporate flight department can often go a long way in preventing future occurrences.

A 30-day snapshot of U.S. air traffic data in July 2016 revealed a total of 44,226 flights with a CSMM. Sixty-seven percent were from parts 121, 135, and 129 commercial operators, but general aviation accounted for nearly 30 percent of CSMMs in the study. Many of the general aviation aircraft were improperly programmed during installation.



New technology means a learning curve is expected.

“We’re currently in a proactive, helpful mode with the industry,” said Kenney. “We realize this is new technology and that there will be a learning curve for some of these procedures.”

### WHAT’S YOUR SIGN?

So what can pilots do to prevent CSMM? Kenney suggests that pilots involved in specialty flying consider an ADS-B unit with a pilot programmable call sign feature. “If you go this route, you’ll probably also want to integrate the call sign update task into your normal preflight checklist so you don’t forget it,” added Kenney.

“Flight schools that use a local sign may want to consider purchasing configurable units, or else make the best of what equipment they have,” said Kenney.

“We’re actively looking at solutions and alternatives for segments of the industry that use specialized call signs or modified N-numbers,” said Kenney. Pilots need to be aware that when an aircraft is equipped with ADS-B, the ADS-B call sign must match exactly with the flight plan call sign. ✈

*Have any questions, comments, or feedback about ADS-B call sign mismatch? Send us an email at*

[9-AWA-AVS-ADS-Programs-AFS@FAA.gov](mailto:9-AWA-AVS-ADS-Programs-AFS@FAA.gov).

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*This article was excerpted from the March/April 2017 issue of “FAA Safety Briefing.” Tom Hoffman is the managing editor. To read the full article, please visit: [faa.gov/news/safety\\_briefing/2017/media/MarApr2017.pdf](http://faa.gov/news/safety_briefing/2017/media/MarApr2017.pdf)*



# Fully compliant

Avoid failures by ensuring correct ADS-B equipment setup.

Installing ADS-B can be quick and easy. The real trick is in the ADS-B setup. Correct setup requires the installed system to accurately identify the aircraft to air traffic control (ATC) and other aircraft in the airspace. This aircraft identification data entry task is the responsibility of the avionics installer during the installation.

James Marks, ADS-B team lead in the FAA's Flight Standards Service, said "too many ADS-B-equipped aircraft are not fully compliant, and the majority of these ADS-B failures result from improper configuration. Incorrect settings typically result in a failure (red flag) within an aircraft's ADS-B performance report."

The most important techniques to set up the ADS-B system properly are:

## VERIFY EMITTER CODE

The ADS-B system transmits the emitter category, or aircraft category, which must accurately portray the aircraft as light, small, etc. for a correct setup.

The emitter category has eight entries in Set A. Most general aviation aircraft are in Category 1 for light aircraft or Category 2 for small aircraft. See FAA Advisory Circular 20-165B, Section 3.2.3.4, for more details.

Check the configuration summary to locate the aircraft's emitter category. Verify that the category is correct for the maximum takeoff weight of the aircraft. "A high number of configuration failures have resulted from light aircraft configured as small aircraft," said Marks.



Avoid ADS-B installation errors to prevent problems, such as the aircraft reporting airborne mode while stationary or taxiing.

## VERIFY FLIGHT IDENTIFICATION

The ADS-B system transmits the aircraft's flight identification (FLT ID), or call sign, so ATC and other aircraft with ADS-B In systems can identify the aircraft.

The installer is responsible for entering the FLT ID correctly in an ADS-B system that does not allow the FLT ID to be changed by the pilot. Verify that the FLT ID exactly matches the aircraft registration number.

## VERIFY ICAO CODE

"Fat fingering" input of the 24-bit ICAO code is another common ADS-B setup error. In most cases, the ADS-B manufacturer ships the equipment with a factory default ICAO code. The installer must change the factory default ICAO code to match the aircraft's assigned ICAO code.

## TEST SYSTEM

Perform a ground check and a post-flight check. The ground check verifies what is being broadcast by the equipment.

After completing a test flight in airspace with ADS-B coverage, the owner and installer should do a post-flight check using the FAA's Public ADS-B Performance Report Request service. Visit the FAA's ADS-B website at [go.usa.gov/x9mDG](https://go.usa.gov/x9mDG) to generate a performance report.

The FAA has detected numerous ADS-B equipped aircraft reporting airborne mode while stationary or taxiing and is working with avionics manufacturers to better understand the symptoms and next steps.

If your ADS-B performance report indicates an air/ground failure, work with your installer for corrective action guidance. If you're still experiencing issues, email [9-AWA-AFS-300-ADSB-AvionicsCheck@faa.gov](mailto:9-AWA-AFS-300-ADSB-AvionicsCheck@faa.gov) and request a review. Attach the ADS-B performance report with "PAPR Review Request: Air/Ground Failure" in the subject line in your email to help expedite a response. ✈

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*This article was excerpted from the March/April issue of "FAA Safety Briefing." To read the full article, please visit: [faa.gov/news/safety\\_briefing/2017/media/MarApr2017.pdf](https://faa.gov/news/safety_briefing/2017/media/MarApr2017.pdf)*

## TOP 10 THINGS TO KNOW ABOUT ADS-B

By Jennifer Caron

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

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

Owners can install an ADS-B Out system to meet the minimum requirements of the rule, or 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 ATC 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 S-LSAs, 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 WAAS 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 1090ES ADS-B Out transmitter. Below Class A in the United States, you have a choice between a 1090ES or a UAT 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

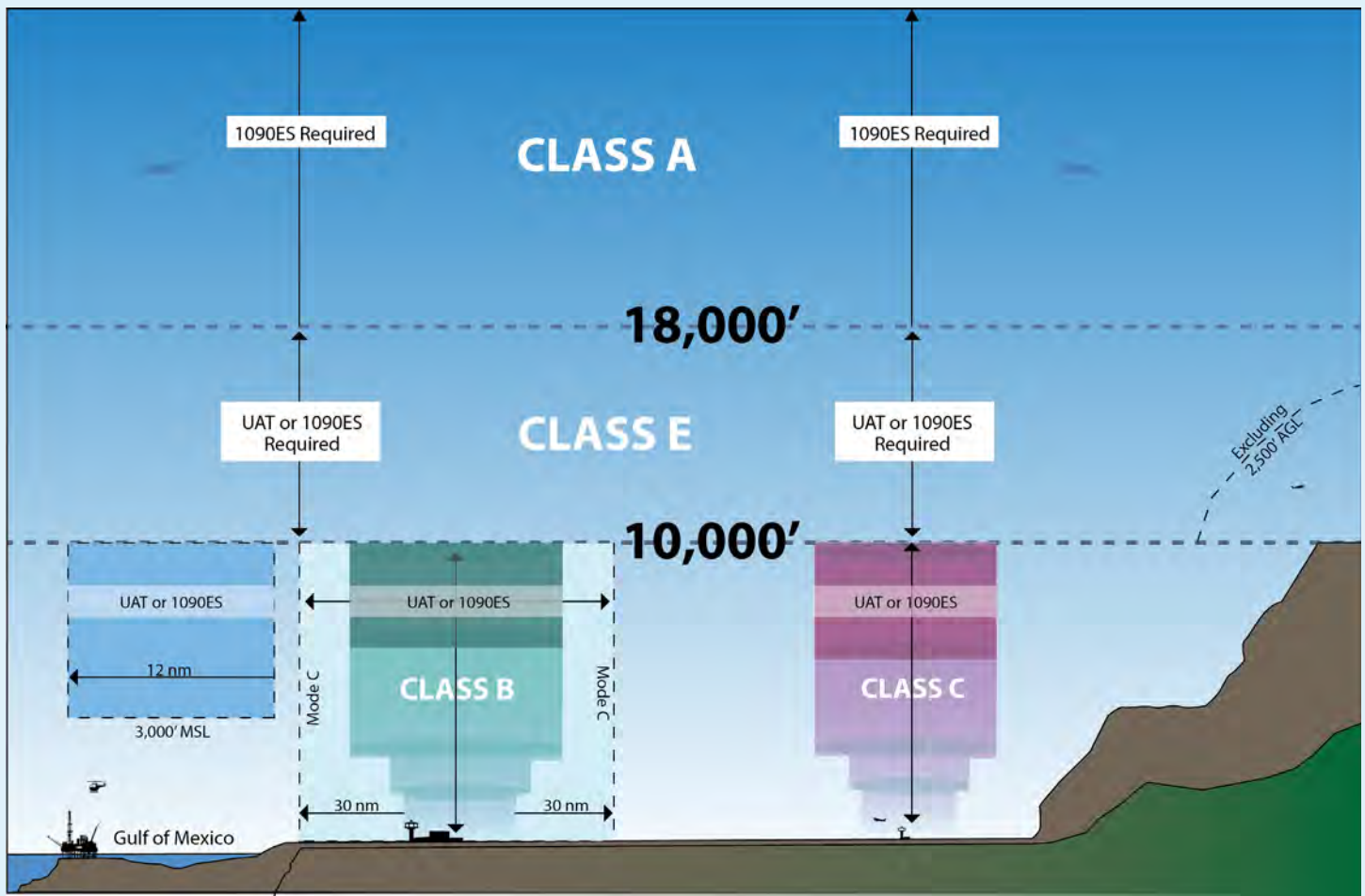


States., must be equipped with an ADS-B Out system that complies with the regulatory performance requirement.

#### 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. ✈️

*This article was excerpted from the March/April 2017 issue of "FAA Safety Briefing." Jennifer Caron is the assistant editor. To read the full article, please visit: [faa.gov/news/safety\\_briefing/2017/media/MarApr2017.pdf](http://faa.gov/news/safety_briefing/2017/media/MarApr2017.pdf)*



This graphic generally depicts the airspace where ADS-B Out will be required by the rule. For more information please visit, [faa.gov/nextgen/equipadsb/airspace](http://faa.gov/nextgen/equipadsb/airspace).

# What ADS-B Is, What It Means to You

Automatic Dependent Surveillance-Broadcast (ADS-B) uses a GPS satellite system to track aircraft in real time, requiring less assistance from air traffic control (ATC). ATC will be able to manage the flow of traffic far better. “ADS-B increases safety and efficiency to help meet the increasing air traffic predicted in coming years,” said Bobby Nichols, FAA Surveillance Services Group manager.

ADS-B has the following characteristics:

It’s **Automatic** and transmits location and other information nearly once per second versus a transponder every 5-12 seconds.

It’s **Dependent** on the aircraft being equipped with a rule-compliant position source and signal transmitter.

**Surveillance** is achieved by the aircraft emitting a signal providing position and a velocity vector derived from a position source, typically a GPS receiver.

**Broadcast** of signal data is sent to controllers and any aircraft equipped to receive ADS-B.

## HOW DOES ADS-B WORK?

ADS-B works by having aircraft avionics regularly broadcast position, velocity, and identification information from an aircraft to ATC and other aircraft that can receive ADS-B data. This data is transmitted on one of the approved ADS-B data links.

This transmission is referred to as ADS-B Out. Aircraft within “line of sight” equipped to receive the data and ADS-B ground stations up to approximately 250 miles away receive these broadcasts. The ADS-B ground system then processes this data and displays it to ATC for use in separating aircraft.

Aircraft equipped with ADS-B In also receive the ADS-B Out signals from other equipped aircraft.

## FAA MANDATE

The equipment used to broadcast GPS-derived location information, “ADS-B Out,” is mandated by January 1,

2020, for aircraft flying in certain airspace — generally the same busy airspace where transponders are required today. (See Title 14 Code of Federal Regulations, 14 CFR section 91.225.)

Except for airspace along the coast of the Gulf of Mexico, if a pilot flies exclusively in airspace where a transponder is not required, then there is no mandate to equip. Also exempt are aircraft not originally certificated with an electrical system, or not subsequently certified with such a system installed, including balloons and gliders.

ADS-B is broadcast on two data links — 1090 MHz (Mode S transponder with extended squitter) and 978 MHz (Universal Access Transceiver or UAT). Aircraft operating above 18,000 feet or internationally must be equipped with a Mode S transponder-based ADS-B transmitter. Aircraft operating below 18,000 feet and within ADS-B rule airspace must be equipped with either Mode S or UAT equipment.

To meet the minimum requirements for ADS-B Out, an aircraft must be equipped with three components:

1. A qualified GNSS receiver (See FAA Advisory Circular 20-165B, Appendix 2.)
2. A Mode S transponder with extended squitter or a UAT meeting the performance requirements of TSO-C166b or TSO-C154c
3. Appropriate antennas

Note that portable equipment does not meet the ADS-B Out rule requirements.

Owners can install an ADS-B Out system to meet the minimum requirements of the rule, or 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.

## GENERAL AVIATION BENEFITS

Aircraft equipped with ADS-B Out will enjoy more efficient spacing and optimal routing in non-radar environments,



including the Gulf of Mexico, mountainous regions of Colorado, and the lower altitudes of Alaska.

ADS-B also improves life-saving search-and-rescue operations. ATC will have much better information about last reported positions, helping to take the “search” out of search and rescue.

“Owners who choose to add avionics and displays for ADS-B In will receive truly transformative services,” said David Gray, FAA Surveillance and Broadcast Services program manager. Pilots — for the first time — will see much of what air traffic controllers see on their ATC display. Cockpit displays will show the location of aircraft in the skies around them.

With an ADS-B In system that receives the UAT link, graphical weather displays, as well as notices of important flight information, such as temporary flight restrictions or closed runways, will be visible.

## WHEN TO EQUIP

“The FAA is encouraging owners to equip as soon as possible to capture the benefits of ADS-B and to ensure they will be able to continue flying in designated airspace when the rule goes into effect in January 2020,” said Nichols. “There are no plans to extend the deadline beyond that date.”

To begin your path to ADS-B equipage, visit [faa.gov/nextgen/equipadsb](https://faa.gov/nextgen/equipadsb). This valuable online tool contains a searchable database of ADS-B avionics solutions provided by the manufacturers of all commercial and general aviation aircraft, frequently asked questions, and other information to help you make an informed decision. ✈️

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Safe and efficient spacing are among the benefits of ADS-B.

# Three Ways ADS-B In Can Protect You

**A**utomatic Dependent Surveillance–Broadcast (ADS-B) offers general aviation pilots an unprecedented level of safety and situational awareness, assuming their aircraft are equipped with the proper avionics.

The traffic picture displayed in ADS-B In-equipped aircraft includes other planes' position information reported by ADS-B Out as well as radar. These data are sent to the cockpit via air-to-air reception or relayed from the ground. ADS-B Out's roughly once-per-second broadcast rate is not only automatic, but also depends on equipment on the aircraft for air traffic surveillance — thus ADS-B's cooperative and dependent nature.

General aviation aircraft owners who equip with ADS-B In enjoy more benefits than just having ADS-B Out. Aircraft equipped with Universal Access Transceivers (UAT) operating on a frequency of 978 megahertz (MHz) can receive and display weather and other aeronautical information from FAA broadcasts. This information enhances pilots' situational awareness of in-flight hazards and helps prevent accidents.

Pilots of ADS-B In-equipped aircraft benefit from three types of FAA broadcast services:

**Traffic Information Service–Broadcast (TIS-B):** This air traffic advisory service provides the altitude, ground track, speed, and distance of aircraft flying in radar contact with controllers and within a 15-nautical-mile (nm) radius, as far as 3,500 feet above or below the receiving aircraft's position. General aviation aircraft equipped with ADS-B In can also receive position data directly from other aircraft broadcasting on the same ADS-B Out frequency. In addition, TIS-B enables pilots to see aircraft equipped with transponders flying nearby even if those are not equipped with ADS-B Out.

**Automatic Dependent Surveillance–Rebroadcast (ADS-R):** ADS-R takes position information received on the ground from UAT-equipped aircraft and rebroadcasts it on the 1090 MHz frequency. Likewise, ADS-R rebroadcasts 1090 MHz data to UAT users. In concert with TIS-B,



Pilots equipped for ADS-B In can see the positions of other aircraft reported by ADS-B Out and radar on a cockpit display.

ADS-R provides all ADS-B In-equipped aircraft with a comprehensive airspace and airport surface traffic picture. ADS-R delivers traffic data within a 15-nm radius 5,000 feet above or below the receiving aircraft's position.

**Flight Information Service–Broadcast (FIS-B):** This service broadcasts graphical weather to the cockpit according to what ground-based weather radar is detecting. In addition, FIS-B broadcasts text-based advisories including Notice to Airmen messages and reports on a wide variety of weather. UAT-equipped general aviation aircraft can receive this information at altitudes up to 24,000 feet.

The FAA has installed hundreds of ADS-B ground stations, making TIS-B, ADS-R, and FIS-B services available across the United States. That makes ADS-B In an attractive option for general aviation. Aircraft owners and operators have the opportunity to be early adopters of ADS-B technology and to be among the first to take advantage of its safety benefits even before the ADS-B Out mandate takes effect on January 1, 2020.

Various manufacturers offer numerous rule-compliant avionics solutions, and the FAA has completed advisory circular guidance to help the general aviation community install the required avionics. ✈️



# PIREP reveals zeal for ADS-B

By Susan Parson

I am a long-time member of a Leesburg, Virginia, based flying club that owns a 1967 Cessna 182 Skylane. Over the years, the significant upgrades club members have made, both voluntary improvements like the GNS430W and “involuntary” upgrades such as those required by a 2006 deer strike repair, have made our 50-year-old bird a lot younger than its chronological age. We love our airplane and consider it priceless in many ways. Still, we, like many other airplane owners, struggled with the idea that ADS-B equipage might cost a significant percentage of the airplane’s appraised value.

We never questioned whether we would install ADS-B Out equipment. Our home base location inside the Washington, D.C., Tri-Area Class B and Special Flight Rules Area made that a true no-brainer decision. The issues we debated were the same “what” and “when” that our fellow owners face.

## TRIGGER POINTS

Until 2016, we took a watch-and-wait approach, figuring — correctly — that manufacturers would provide more options at lower prices as the 2020 equipage deadline drew closer. That strategy also enabled us to start saving money toward the eventual ADS-B acquisition and installation costs.

As more equipment options began to appear, we assigned a member to research and report pros and cons so the board could develop recommendations for the full membership. We concluded pretty quickly that the certified ADS-B Out and In boxes were beyond our budget. Even if finances had allowed, though, we also surmised that the ever-quicken pace of new technology might render one of those devices obsolete almost as soon as it could be installed. Consequently, we narrowed the scope of our search to certified ADS-B Out solutions and decided to use a “bring-your-own-device” approach to ADS-B In.

An aging equipment issue helped us further narrow the field. A properly functioning transponder is essential pretty much everywhere these days, but in our uniquely complex home airspace, it really matters. Over a few months starting in late 2015, another club member and I each had transponder malfunctions that got the attention of the many sets of eyes and ears watching the National Capital airspace.

Because it was clear that we needed a new transponder, we confined our ADS-B options to transponder-based solutions,

and after more duly diligent research both on equipment options and installation facilities, we selected a device that would enable non-certified ADS-B In weather and traffic data for everyone in the club with a tablet and a ForeFlight subscription.

Being skittish about our balky old transponder, we also accelerated our installation timetable. By the end of August, our faithful Skylane emerged from a two-week installation process with a shiny new ADS-B Out transponder and non-certified (but fabulous) ADS-B In capability. While we missed out on the FAA’s ADS-B equipage incentive program rebate by a few weeks, we are confident that we made the right “what” and “when” decisions for our circumstances.

## TARGETS ... LOTS OF TARGETS

The certified part of our new device makes our airplane compliant with the ADS-B Out rule, and we are certainly relieved to have a reliable transponder. However, the addition of the non-certified ADS-B In data, especially traffic, has quickly become “the” benefit. We always knew there were a lot of airplanes in the sky around our home base, but ADS-B In traffic data has provided jaw-dropping confirmation of that fact.

We are well aware that we still need to be looking outside when flying VFR, but most of us already wonder how we ever got along without the assistance of ADS-B information. I personally find that knowing how many airplanes I see on the ADS-B display — but not with my Mark II eyeballs — has made me a lot more diligent about scanning for traffic when I am flying VFR. In addition, ADS-B traffic displays help me spot those airplanes a lot faster.

If you detect the zeal of a new convert in this ADS-B PIREP, you’re right. I think you’ll love it as much as I do, and once you see all you’ve been missing, I think you will be just as eager as I am to get your fellow general aviation pilots ADS-B equipped — stat! 🛩️

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*This article was excerpted from the March/April 2017 issue of "FAA Safety Briefing." Susan Parson is the editor. She is an active general aviation pilot and flight instructor. To read the full article, please visit: [faa.gov/news/safety\\_briefing/2017/media/MarApr2017.pdf](http://faa.gov/news/safety_briefing/2017/media/MarApr2017.pdf)*

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