

FAA Safety

BRIEFING

January/February 2019

Your source for general aviation news and information



AN ALL

"OUT" EFFORT —

A One-Year Countdown Until the ADS-B Out Mandate

Time to Move!

Why ADS-B Matters **p 7**

Is My ADS-B Broadcasting Me?

A Look at Non-Performing Emitters **p 16**

Show Me the \$\$

How to Get Your ADS-B Out Rebate **p 27**



**Federal Aviation
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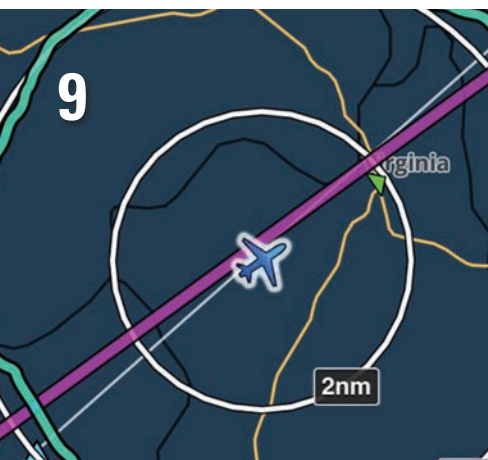


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The January/February 2019 issue of *FAA Safety Briefing* focuses on Automatic Dependent Surveillance-Broadcast (ADS-B) technology, a foundational component of FAA's NextGen system for improving the safety and efficiency of the NAS. Building off our previous ADS-B focused issue in March/April 2017, articles here continue and expand the discussion about the safety and technology benefits of ADS-B, as well as provide important details and updates on the purchase, installation, and operation of ADS-B equipment. Remember — the deadline to equip with ADS-B Out is January 1, 2020.

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The Eleventh Hour *The ADS-B Equipage Deadline Approaches*

Thirty years ago, I thought ten years was a really long time.

Dean Kamen, Segway inventor

By the time you read this column, it will be just a year before the deadline for equipping your airplane with Automatic Dependent Surveillance-Broadcast Out (ADS-B Out) arrives. When the clock strikes 12:01 am on January 2, 2020, an aircraft without ADS-B will be limited to where it can legally operate. In many areas of the country, non-ADS-B-equipped aircraft will effectively be grounded.

No Extensions

As stated in the final rule published in May 2010, all aircraft flying in designated controlled airspace — generally the same airspace where transponders are currently required — must be equipped with ADS-B Out avionics after January 1, 2020. A decade does provide a substantial lead time, and you may have thought that ten years was a really long time when the rule was published. It *was* a really long time — but the remainder of the ten-year phase-in period is dwindling fast. So let me make a couple of important points right up front:

First, if you have been thinking you have until the end of 2020, please read the opening paragraph again. By the start — not the end — of 2020, aircraft flying in what we call “rule airspace” must have ADS-B Out. Only aircraft that always fly outside of “rule airspace,” and aircraft without electrical systems, such as balloons and gliders, are exempt from the mandate.

Second, the FAA is serious about this deadline. In case you are wondering or hoping, let me be very clear on this point: the FAA will not extend the 2020 deadline for ADS-B equipage.

Time to Act

The FAA/industry Equip 2020 Team has worked hard to identify and resolve barriers to timely equipage.

Cost is a significant barrier for many GA aircraft owners, but there are many circumstances that can mitigate financial concerns. First, the avionics industry now offers a wide range of ADS-B equipment options. Today’s avionics marketplace includes everything from bare bones boxes that just meet the regulatory requirement to full Monty machines that offer astonishing capability. That means that there are now choices to fit every budget.

Second, the FAA has re-introduced an incentive program that offers a \$500 rebate to help owners of single-engine piston-powered fixed-wing GA aircraft equip with the required avionics. You can learn more from the FAA’s webpages on ADS-B (see “Learn More”), and from this issue of *FAA Safety Briefing*.

Another possible barrier arises from the challenge of choosing among the many ADS-B equipment options. The Equip 2020 Team has developed an extensive set of resources to help you figure out what you need, and sort through the available options. In addition to the information on the FAA website and the informative ADS-B articles in this issue of *FAA Safety Briefing*, you can also get lots of help from aviation advocacy organization websites.

Please consider the time it will take to acquire and install the equipment you select. Installation lead time varies from place to place, but it will only increase as the deadline approaches.

It’s All About Safety

The most important reason to act now is to gain the safety benefits that motivated this mandate in the first place. ADS-B is transforming the nation’s airspace by providing more precision and reliability than the current radar system, enhancing safety and increasing situational awareness. Those who have already equipped with the required ADS-B Out and some form of optional ADS-B In capability give it rave reviews. Even if you don’t opt for ADS-B In capability, ADS-B Out still enhances safety by making it easier for others to see and avoid you.

Please read the articles in this issue of the magazine. Check out the links below, as well as those provided in other articles. Make a plan, set a date, and get your aircraft ready so you won’t get left on the ground.

The FAA will not extend the 2020 deadline for ADS-B equipage.

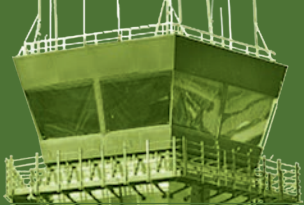
Learn More

FAA Safety Briefing – March/April 2017

www.faa.gov/news/safety_briefing/2017/media/MarApr2017.pdf

FAA Equip ADS-B Webpage

www.faa.gov/nextgen/equipadsb/



NTSB Issues Safety Alert on Fuel Selectors

Pilots should check their fuel selectors carefully to avoid operating their aircraft with worn fuel selector components. Worn fuel selectors have led to fuel starvation and loss of engine power, resulting in serious and fatal injuries.

As fuel selectors wear, the fuel selector handles may become difficult or even impossible to turn. If a pilot applies too much force, the internal components can fracture and obstruct the fuel flow, resulting in a total loss of engine power. In addition, worn detents could make it difficult for a pilot to properly position the fuel selector to the desired tank. Positioning the fuel selector incorrectly to an empty tank or in between tanks could ultimately starve the engine of fuel.

Since 2008, the NTSB has cited the fuel selector in 104 accidents; 63 of those accidents involved incorrect use/operation of the fuel selector, and 28 cited degraded function of the fuel selector.

You can watch a video about this issue at youtu.be/uLYVU7Z0Lzk and download the NTSB's Safety Alert for more information at bit.ly/NTSBfuel.



Updated Data on Aircraft Corrosion

Advisory Circular (AC) 43-4B, *Corrosion Control for Aircraft*, was recently updated. The AC is a summary of the current available data regarding identification and treatment of corrosive attack on aircraft structures and engine materials.

Corrosion inspection frequency, corrosion identification, and especially corrosion treatment continues to be the responsibility of the operator. These inspections should be accomplished per this AC, the manufacturer's recommendations, or the operator's own maintenance program. The procedures in this AC are an acceptable means, but not the only acceptable means, of corrosion treatment. The information in this AC is applicable to aircraft for which the manufacturer has not published corrosion control information. Where the airframe or engine manufacturer has published a recommended corrosion inspection schedule and treatment program, the applicable program must take precedence over the recommendation of this AC.

To download the AC, go to bit.ly/2K5tY28.

PIREP Initiatives See the Light

Pilot Reports (PIREPs) are an important component of safe and efficient flight, and often, the only real-time update to weather conditions for pilots, air traffic control (ATC) and the National Weather Service (NWS). The number of PIREPs received continues to decline as part of the trend of fewer inflight contacts. However, PIREPs tend to rise during the winter months due to an increase in icing conditions, and turbulence and cloud layers, which are primary reasons to submit a PIREP.

NTSB recommendations resulted in several Flight Service improvements that make it easier for pilots to submit a PIREP. Because of the PIREP initiative, specialists only use read-back for accuracy when there is uncertainty about information a pilot provides. In addition, specialists now request specific details pertinent to the current or forecast weather, shortening the time required to obtain a PIREP from pilots eager to return to ATC frequencies.

Inflight electronic PIREP submission gives pilots a simple way to prepare and send PIREPs from the cockpit without having to change frequencies or contact Flight Service. It works with an easy-to-use menu-based interface either on a mobile device or cockpit avionics, which allows word selection to describe the level of the weather experienced, and hitting send to transmit.

As suggested by the NTSB, vendors have modified platforms to accept PIREP submissions up to five hours after occurrence, providing additional valuable data to fill in observation gaps for NWS

forecast models and advisory products. Even PIREPs filed after landing are beneficial if the time and location of the weather phenomena are accurate.

The FAA continues to find ways to educate pilots and improve the process using standardized plain language and new technology for transmission. As part of weather technology in the cockpit research, more than 100 pilots took part in a review of a PIREP submission tool in July at EAA AirVenture in Oshkosh, Wisc., to provide feedback on a tablet device. Pilots evaluated six potential features for electronic PIREP submission to determine ways to make them more likely to submit PIREPs. This exploratory study will analyze pilot feedback and identify what features may make it easier to submit electronic PIREPs.

NVGs May Not See the Light

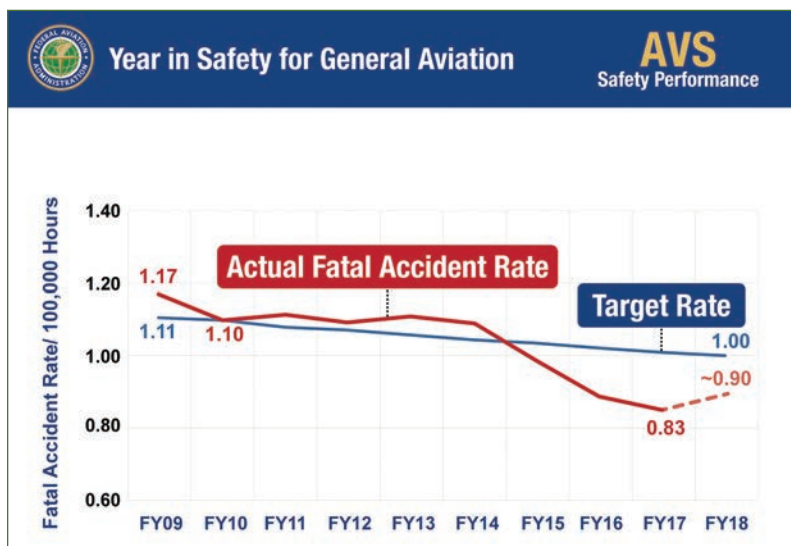
A new safety alert for operators (SAFO) was recently issued that emphasizes the importance of incorporating procedures for the avoidance of obstacles marked with LED obstruction lights during night vision goggle (NVG) operations into manuals and/or standard operating procedures (SOPs).

Airplane and rotorcraft operators and pilots should familiarize themselves with the information contained in this SAFO. In addition, operators and pilots are encouraged to report encounters with obstructions marked with non-NVG compatible LED lighting systems, with pertinent information, to the Aviation Safety Reporting System at asrs.arc.nasa.gov.

To download the SAFO, go to bit.ly/nvg-safo.

GA Fatal Accidents Decrease

In fiscal year 2018, the FAA met its target to reduce the general aviation fatal accident rate to no more than one fatal accident per 100,000 flight hours by 2018.



New FIRC Guidance and Recommendations

The FAA recently published an update to Advisory Circular (AC) 61-83J, *Nationally Scheduled, FAA-Approved Industry-Conducted Flight Instructor Refresher Course*, also known as a FIRC. Among the updates to the AC include two new required core topics — Airman Certification Standards and accepting remote pilot and student pilot certificate

Safety Enhancement Topics

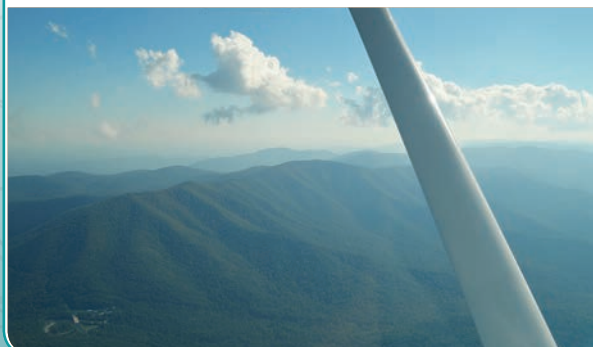
January: Single-Pilot Resource Management

How to manage a crew of just you.



February: Mountain Flying

Understanding the need for training and currency when flying in mountainous areas.



Please visit www.faa.gov/news/safety_briefing for more information on these and other topics.



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applications, as well as improved plain language recommendations for the preparation and approval of training course outlines.

To download the AC, go to go.usa.gov/xPNEf.

Safety Alert Issued for Circuit Breakers

A new safety alert for operators (SAFO) was recently issued that provides guidance to aircrews on the effective identification and manipulation of circuit breakers during abnormal and emergency situations. There have been several fatal accidents where the pilot was unable to identify and pull a circuit breaker (typically the autopilot) during an abnormal or emergency situation. This SAFO is being published in response to an NTSB safety recommendation.

To download the SAFO, go to bit.ly/2K9aGZR.



New AMT-Credit Course for Mechanics

Dr. Bill Johnson, the FAA's chief scientist for maintenance human factors, has developed a web-based training course emphasizing safety culture and procedural compliance for aviation maintenance technicians (AMTs). This web-based training is the first of its kind to address the organizational culture of procedural non-compliance.

To learn how you can champion a commitment to follow procedures every time, visit FAASafety.gov and take the new course, "Follow Procedures: The Buck Stops Here" or go VFR-direct to bit.ly/AMTbuck.

Making a List

“Doc, just give me a list of what medications I can take and still fly.” I get this request on a regular basis. However, addressing this request is more complicated than it might seem. The first question must always be: “Is it safe to fly with the medical condition for which I am taking the medication?” Next, we must consider that there is not a single medication that is safe for everyone in all situations. The good news is that we have made progress toward answering this request where it makes sense.

In November 2017, we updated the FAA information brochure, “Medications and Flying,” which is available in print and online at www.faa.gov/pilots/safety/pilotsafetybrochures. This is a good starting point for pilots.

Do Not Issue — Do Not Fly

We also added a chapter in the Guide for Aviation Medical Examiners (AME Guide) entitled, “Do Not Issue — Do Not Fly,” which lists some types of medications that should never be taken while flying. Although written for AMEs, anyone can access the AME Guide online. In the chapter, we included guidelines for a wide array of commonly used drug categories such as diabetes and high blood pressure medications, allergy medications, antacids, anticoagulants (blood thinners), antidepressants, and sleep aids. This information may help guide your treating physician toward a more aeromedically-acceptable treatment when several equally effective options exist. This information should not be used as justification to select an inferior treatment. In other words, “Don’t treat the flying status.”

From a practical standpoint, airmen usually make personal decisions about over-the-counter medications rather than prescription medications. We are currently working with the General Aviation Joint Steering Committee (GAJSC) on a more pilot-friendly version of the information in the AME Guide. No matter what the list looks like, you must always read the product label. Diphenhydramine (Benadryl) is a good example of a drug included in many combinations of cold and allergy medica-

tions, as well as sleep aids, which has prolonged, performance-impairing effects. Printed warnings against use of the drug when driving or operating dangerous machinery should always be a red flag.

Combinations and Complexity

Another reason producing a “pocket guide” for airmen is so difficult is because of the constant influx of so many new medications entering the market. Many combination medications are also available, and one cannot always assume that just because each individual drug may be acceptable, that the combination of these drugs would be. It is difficult to keep up with changes, and nearly impossible to assure outdated lists are consistently discarded. In an effort to stay current, we have recently added a doctoral level pharmacist to our headquarters staff.

In addition, we are often asked to consider a large number of new drugs for their aeromedical suitability. Usually we require the drug to be FDA approved and on the market for at least a year. We eventually approve most of these; however, the underlying disease will often preclude the special issuance of a medical certificate.

When in doubt about medication use, your AME is a good source for advice. If you have a question, ask. That’s what AMEs are for. If the AME can’t answer your question, your Regional Flight Surgeon should be able to provide more clarity. Ultimately, if you feel like you shouldn’t be flying, then you probably shouldn’t fly. We’ll give you as many tools as we can, but safety is up to you as the pilot in command.

“Doc, just give me a list of what medications I can take and still fly.”

For More Information:

Do Not Issue — Do Not Fly:

www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide/pharm/dni_dnf

AME Guide:

www.faa.gov/about/office_org/headquarters_offices/avs/offices/aam/ame/guide



Condition Inspection

LEO M. HATTRUP, M.D.

Migraines

A migraine is a type of recurring headache that affects about 12-percent of Americans. They are three times more common in women than men, and they tend to run in families. Although migraines can occur at all ages, they are most common between 30-39 years of age. Not all bad headaches are migraines, and not all migraines result in a bad headache. But the pain can range from distracting to debilitating. In fact, migraines are identified as one of the top 10 most disabling diseases. Migraines can impair a pilot's ability to fly, causing a serious safety risk due to rapid onset and potentially incapacitating symptoms. Some complicated migraines have neurological aftereffects that can persist for hours to days, or even be permanent.

Approximately three out of four people who suffer from migraines get a warning 24-48 hours before the headache appears. This is the prodrome, and there are medications (triptans) that can be taken during the prodrome to end the migraine. Migraines can be divided into two major types: those with, and those without, aura, a more distinct warning sensation. About one-quarter of migraine cases are associated with an aura and are sometimes referred to as classic migraines. Aurae include visual (the most common and include blank spots or shimmering lights in the visual field), auditory, and other sensory disturbances as well as motor symptoms. Less common manifestations include difficulty with speaking, abnormal sensation, numbness or muscle weakness on one side of the body, a tingling sensation in the hands or face, and confusion. The aurae usually begin between 10 and 60 minutes before the headache, but can be coincident. The headache typically lasts an hour or less, but can be incapacitating. Clearly, either the aura or the headache can impair a pilot's ability to maintain control of an aircraft. While some aura may occur without a subsequent headache, the safety concern remains.

Migraines without aura are called common migraines and are the more prevalent variant. Common migraines can occur without warning and are usually on one side of the head. They are associated with nausea, confusion, blurred vision, mood changes, fatigue, and increased sensitivity to light, sound, or noise.

A number of factors can trigger a migraine, including stress, bright flashing lights, loud noises,

medicines, sudden changes in weather or environment, overexertion, tobacco, caffeine (or caffeine withdrawal), and even certain foods. This is not an exhaustive list and triggers may vary from person to person. Identifying a trigger which can be avoided is beneficial to the individual and a favorable factor for medical certification. A diary recording food, activities, and other pertinent events (weather, etc.) can be helpful in this identification.

There is no cure for migraines at present. If a trigger is not identified or avoidable, treatment focuses on symptom relief for the occasional migraine and preventive treatment for the more severe and/or frequent migraine. Different types of medicines used to treat migraines include over the counter (OTC) pain relievers such as aspirin, Tylenol (acetaminophen), or Motrin (ibuprofen), as well as prescription medications such as the various triptan drugs. Additional medications are used in the ER or Urgent Care to treat associated symptoms such as nausea or vomiting. In some cases, severe headaches may be given narcotics. For all medication use, there is a minimum grounding period before you can fly again. Regardless of the medication used, the headache and other symptoms should be completely resolved before you return to flying. In addition, for most triptans, you are grounded for 24 hours (talk to your AME about your specific medication): 24 hours for Zofran (ondansetron); 36 hours for metoclopramide (Reglan); and 96 hours for Phenergan (promethazine). Migraines severe enough to require the use of injectable medications or narcotics are not acceptable for the CACI (conditions AMEs can issue) program. For migraine prevention, both calcium channel blockers and beta-blockers are permissible.

All migraines are disqualifying and require FAA clearance. However, many of these migraines can be cleared by your AME if specific criteria outlined in the CACI are met. For the remainder, a special issuance is frequently possible after appropriate medical management.

Leo M. Hattrup, M.D., received a bachelor's degree from Wichita State University, a master's in public health from Harvard University, and a doctorate from Vanderbilt University. He is retired from the Air Force in which he spent the majority of his career in aerospace medicine. He is board certified in aerospace and occupational medicine. He is a certificated flight instructor and enjoys flying airplanes, helicopters, and gliders.



SUSAN PARSON

Time to Move!

Why ADS-B Matters

Photo courtesy of US Air Force

“

The world hates change, yet it is the only thing that has brought progress.

Charles Kettering

Ever heard of “status quo bias?” It is something I stumbled across during the process of writing for this issue. Wikipedia describes it as “an emotional bias; a preference for the current state of affairs” in which the status quo is the baseline, and any change therefrom is perceived as a loss.

When money is involved, as it is in anything related to aviation, the emotional bias for the status quo is probably even greater. As an airplane owner through a flying club, I get it. But just as necessity is the mother of invention, inevitability is the driver of acceptance. That reality is that starting on January 1, 2020, Title 14 Code of Federal Regulations (14 CFR) section 91.225 and 14 CFR section 91.227 stipulate that your aircraft must be equipped with ADS-B Out in order to operate in some controlled airspace (typically where a transponder is required).

ADS-B is an awkward acronym for an even more awkwardly (albeit accurately) named technology. It sounds abstract from the outset, and I confess that my initial exposure to puzzling terms like “UAT” and “extended squitter” was painful. As you probably know, though, ADS-B is the foundational technol-

ogy for NextGen, the FAA’s term for the diverse set of technologies and procedures to move the method of managing our National Airspace System (NAS) from today’s ground-based radar to satellite-based GPS technology.

Bias or Progress?

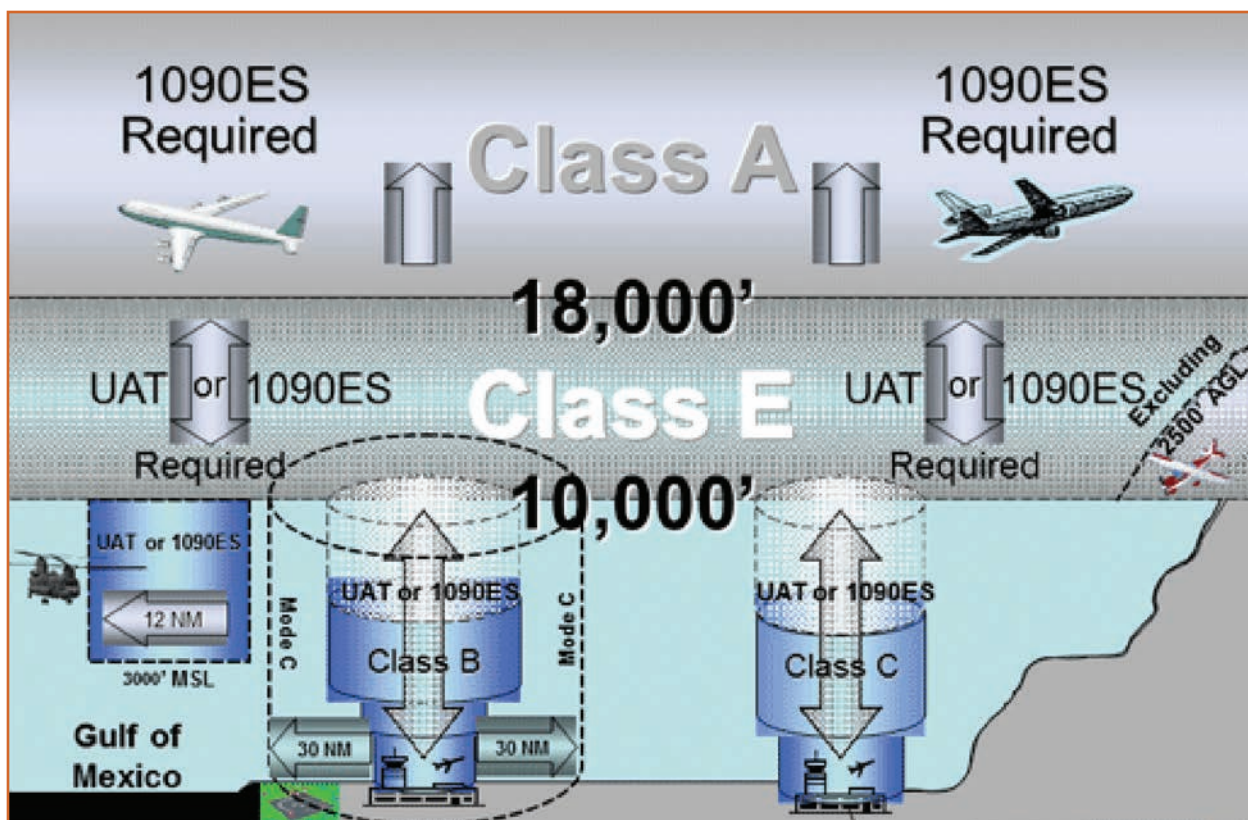
Our dilemma is that we hate change and love it at the same time; what we really want is for things to remain the same but get better.

Sydney J. Harris

Change before you have to.

Jack Welch

It’s a funny thing. Since aviation is one of the most dynamic industries on the planet, you’d think that those of us in aviation should be more open to adopting and assimilating technological changes such as ADS-B. If you are among those still fighting status quo bias when it comes to ADS-B, it might help to remember that everything now familiar was once “new.” It wasn’t that long ago that pilots accustomed to navigating with the Non-Directional Beacon (NDB) and Automatic Direction Finder (ADF) were grouching about the quirks and complexities of Very High Frequency Omni-directional Range (VOR) tech-



Airspace where ADS-B Out will be required after January 1, 2020.

nology. Today, of course, VOR navigation is literally losing ground to satellite-based GPS navigation.

Once you have accepted the inevitability of ADS-B, the next step is to get acquainted with this

technology. As with any technology, the more you learn about ADS-B, the less you fear and the more you want its benefits. That's why we have devoted the first 2019 issue of *FAA Safety Briefing* to help you get more comfortable not only with the requirements and the technology, but also with the many options you now have and the FAA resources available at no cost. Topics we cover in this issue include a review of ADS-B benefits, an updated look at equipment options, applications for the LSA and experimental markets, and how to find the online approved equipment list.

If you already have equipped with ADS-B — thank you for that! — there is still plenty of information in this issue that you can use. We'll take a look at challenges such as "non-performing emitters" and ways to avoid the dreaded "call sign mismatch," as well as resources for checking that your equipment is transmitting as it should.

So join us for this "countdown to ADS-B" issue of *FAA Safety Briefing*. We'll be addressing this topic throughout 2019, and we'll be interested to hear of your experiences in acquiring and using this important piece of progress toward a higher level of aviation safety. ✈️

Starting January 1, 2020, you must be equipped with ADS-B Out to fly in most controlled airspace:

Airspace	Altitude
A	All
B	Generally, from surface to 10,000ft mean sea level (MSL) including the airspace from portions of Class Bravo that extend beyond the Mode C veil up to 10,000 feet MSL (i.e.- SEA, CLE, PHX)
C	Generally, from surface up to 4,000ft MSL including the airspace above the lateral boundary up to 10,000ft MSL
E	Above 10,000ft MSL over the 48 states and DC, excluding airspace at and below 2,500ft AGL Over the Gulf of Mexico at and above 3,000 feet MSL within 12 nm of the coastline of the United States

Airspace within 30 nautical miles (Mode C veil) at all Class B locations from the surface up to 10,000 feet MSL

Susan Parson (susan.parson@faa.gov or @avi8rix for Twitter fans) is editor of FAA Safety Briefing and a Special Assistant in the FAA's Flight Standards Service. She is an active general aviation pilot and flight instructor.



JOHN CROFT

The "In" Thing in Aviation Safety

Making the Most of Your ADS-B System Solution

Pilots and operators of all stripes who are equipping with ADS-B Out face the same question: Should I pay the extra money for ADS-B In?

As a co-owner of a 1977 Piper *Archer* with two other pilots, our answer to that question, when we purchased an ADS-B system, was "Yes." The decision was largely based on intuition rather than hard facts: Wouldn't having traffic and weather at our disposal be a boost to situational awareness and safety?

For us, purchasing an ADS-B system was a necessity since we live and fly inside the Mode C veil around the Washington, DC area, where ADS-B Out will be required by January 1, 2020. Though not required to install ADS-B In, the "In" portion of the ADS-B system only increased the purchase price by about \$500 because we planned to use our portable tablets and smart phones to display the traffic and weather information. This pushed the fully installed ADS-B system to about \$6,000. We had previously been using a portable ADS-B In unit, but were concerned about gaps in traffic coverage — the devices only receive traffic information when an ADS-B Out equipped aircraft is in the vicinity.

Coming up with an extra \$500 when an old aircraft needs so many other upgrades was painful, but we had a strong feeling that the full package would pay off in better situational awareness and safety.

That intuition was right. Based on the traffic and weather intelligence ADS-B Out and In has provided us over the past 12 months, the extra \$500 was well worth it.

On a sunny Sunday afternoon at the Cape May airport in New Jersey, I was reminded of that wisdom. I was under the hood practicing instrument

approaches, while my co-owner buddies were providing the safety pilot services from the other seats. Given the nice weekend weather, the beach area was buzzing with general aviation aircraft. While my safety pilots were ensuring adequate separation, based initially on the ADS-B position then visually, I had the traffic right there on my approach chart on the iPad, boosting my comfort level, and confirming yet again the decision to equip.

While the extra money was not a showstopper for us, the choice for others can be more difficult and require some deep analytics.

We're All In

Andrew Walton, Director of Safety for Liberty University's School of Aeronautics, used a cost-benefit analysis, rather than intuition, to convince his employer to support the purchase of ADS-B In for its fleet of 25 aircraft. The extra cost was significant — \$5,000 over the purchase and installation costs of the ADS-B Out system for each of the school's Cessna 172s and twin-engine Piper *Seminoles*. Walton analyzed several ADS-B In offerings, some that were lower cost, but favored sticking with their original avionics provider. "We wanted a solution that would show the traffic on the multi-function display," said Walton. "That way we didn't have to install another box and the ADS-B In information would be seamless for our instructors and students."

Money was not initially a factor in Walton's thinking. In 2012, he systematically surveyed the risks for the University's flight training operation as part of a

Because we had ADS-B, we were able to see the traffic coming and take evasive action that had we not taken, would have led to a close call.



Liberty University flight school's Director of Safety Andrew Walton discusses strategic heading options with Liberty flight instructor, Gabrielle Disanza, during a training flight around the crowded Lynchburg, Virginia area.

Safety Management System evaluation, studying more than a decade of flight training accident statistics from National Transportation Safety Board (NTSB) records. He determined that the highest fatality risk for flight training operations was loss of control (LOC), followed by mid-air collisions. To address LOC, the University retooled its stall training and invested in angle-of-attack sensors for all of its aircraft.

To reduce the chance of a mid-air collision, the flight school embarked on several low- and high-technology solutions. They worked with the nearby Roanoke TRACON to set up assigned call signs and transponder codes, arranging for practically every Liberty flight to be under positive ATC contact for every training flight. Training flights also take place in assigned sectors, which are coordinated by flight school dispatchers and pilots. Liberty has 50 flight instructors training about 200 students in any given semester. Its aircraft typically fly 50 times per day, accumulating about 14,000 training hours per year.

On the technology front, ADS-B In promised to provide even more help to pilots through traffic and weather information. But could an economic case be made? Walton used the NTSB crash data, along with FAA estimates of flight training hours nationwide, to determine a fatal mid-air risk per flight hour. Over the study period, Walton estimated that eight of the 24 fatal mid-air crashes could have been prevented by having ADS-B In.

Based on the U.S. Department of Transportation (DOT) methodologies, the cost savings in averting those eight crashes (that would have killed approximately 14.4 instructors and students), boiled down to just under \$4 per flight hour. Since each of Liberty's aircraft fly approximately 600 hours per year,

the break-even point for justifying the added cost of ADS-B In would be reached in just under three years per aircraft. The University determined that the investment was sound and allocated money to buy the ADS-B In equipment along with ADS-B Out. His team started adding the feature in spring 2016 and took about a year to install it in all aircraft.

"We could have installed just ADS-B Out for less cost, but we reasoned that the safety benefits of a system that would tell you 'Traffic! Two o'clock. Two Miles. Same Altitude,' would more than justify the cost," said Walton. "If it avoids one mid-air collision, you've paid for it, easily," he said.

The flight school previously had used the Traffic Information Service (TIS) available with its installed avionics, but Walton said the TIS traffic callouts were based on local radar and did not make audio announcements of the traffic's location, distance, and altitude. He said there were also dead zones in the radar coverage, a shortcoming largely eliminated with ADS-B.

The free weather available on the 978 MHz UAT link also helped with boosting safety for its twin-engine aircraft. Walton said the University was also able to substitute the XM weather subscription it had purchased for its Seminoles with FIS-B, using the savings to help purchase flight envelope protection software to aid in LOC prevention.

Evidence of ADS-B benefits at the flight school is mounting. "We have had various safety reports of traffic conflicts where instructors or students have said, 'Because we had ADS-B, we were able to see the traffic coming and take evasive action that had we not taken, would have led to a close call.'"

One of Liberty's flight instructors, Gabrielle Disanza, was quick to appreciate the automatic audio callouts of the position and altitude of nearby traffic when she is busy instructing. Before coming to Lynchburg, Disanza earned her ratings in very basic aircraft flying out of relatively rural airports in New Jersey. "Traffic avoidance was strictly 'See and Avoid,'" she said. "Down here, where there is training taking place 16 hours a day — a constant coming and going of aircraft — I absolutely couldn't imagine flying without it."

All "In" a Day's Work

Out in Akron, Ohio, a flight department operating a wholly different kind of animal — an airship — took the ADS-B In plunge early on as a strategic move. Michael Dougherty, chief pilot for Goodyear Airship Operations, said when the company was working with Germany's airship builder, Zeppelin,



on the cockpit design for its three new airships seven years ago, long-term choices had to be made, or pay the price later.

Goodyear, which uses its semi-rigid airships to provide TV coverage above sports events and to travel the country promoting the company brand, knew it had to install ADS-B Out for the 2020 mandate because of where it flies, but it had to take a gamble that ADS-B In would be worth the extra investment. “Once we build an airship, it’s really difficult to go back and change the certification for a major modification on the avionics,” said Dougherty. “So we wanted to make sure all the tools that we thought we would need down the road would be included at the start.” ADS-B In was one of those tools, and it has paid off already.

Goodyear’s three Zeppelin NT airships, one each based in Southern California, Florida, and Akron, Ohio, provide TV coverage for events throughout the country. When traveling between venues and occasionally going back to Akron for maintenance, the airships often transition through very busy airspace at low altitudes.

When traveling to events in the New York City area, the airships might fly up and down the hectic Hudson River corridor, or for games in Los Angeles, the busy low-altitude VFR helicopter routes that allow general aviation traffic to navigate across the city without disrupting commercial traffic. “We can be flying the corridor with four helicopters and an aircraft towing a banner,” said Dougherty. “ADS-B is a check and balance on the pilot’s eyes being outside the cockpit and the possibility that air traffic controllers may be too busy to call out traffic.”

As with other ADS-B In users, the 13 Goodyear pilots (Dougherty as chief pilot and four pilots at each regional location) give high marks to the aural alerting features that avionics or software providers typically include with ADS-B In applications. “It alerts you when you have a lot of other things going on, which we often do,” said Dougherty. “We can fly single-pilot TV events where we have a pilot in the cockpit and a camera operator in the back of the gondola.” Communications is complicated. Dougherty said pilots sometimes have to sort out simultaneous directions from the TV director (on the ground), the camera operator at the back of the gondola, and air traffic control.



ADS-B is a prominent feature in the cockpits of all three of Goodyear’s new Zeppelin airships. Here, chief pilot Michael Dougherty prepares for a flight from the company’s base in Akron, Ohio. ADS-B In traffic can be seen in the top right display.

“Since the pilot’s primary function is still to aviate, navigate, communicate, the audible alerts from ADS-B are really helpful,” Dougherty said. “That’s one of our biggest benefits from ADS-B In — enhanced situational awareness and helping the pilot maintain a safe environment under high workload and busy airspace.”

We’re “In” Business

The positive impressions that Dougherty, Walton, Disanza, and I have are not at all unique when it comes to ADS-B testimonials. In seeking out opinions from pilots and operators, I have largely found two camps — those who have equipped and will no longer fly without it; and those who have not equipped and do not yet know what they are missing.

This is not to say ADS-B is a cure-all for the mid-air collision threat.

“ADS-B is another layer in the safety net, but we have to guard against complacency,” noted Walton. That’s even more relevant in Lynchburg, which is outside the airspace where ADS-B Out is required (below 10,000 feet). “Because we’re not within the Mode C veil, there are pilots flying around with no electrical systems. There are birds; there are drones. There are aircraft that might have the transponder turned off.”

But as a new layer in the overall flight safety net, Walton said ADS-B is “really, really nice to have.”

I concur. 

John Croft is an FAA-certified flight instructor and a writer/editor in the NextGen Updates and Messaging Branch. Croft uses ADS-B in the Piper Archer he co-owns with two other pilots, and he regularly flies a small team of FAA communicators to talk to pilots and other stakeholders about ADS-B.

Clearing the Crypto-Fog

Tips for Decoding and Deciding Among ADS-B Equipment Options

JAMES WILLIAMS

The Sentry ADS-B In receiver is one option that allows you to add TIS-B and FIS-B information to an ADS-B Out only solution.

Tick. Tock. Tick. Tock. The clock is ticking and, by the time you read this article, you will have less than a year to get your aircraft ready to meet the FAA's ADS-B Out mandate. I've been watching this process unfold since the beginning. It's been an interesting ride. Since I joined the FAA in 2006, I have seen the ADS-B Out mandate go from concept to a proposed rulemaking to final rule (that in less than a year), and then into effect. I remember vividly in May 2010 thinking that 2020 was such a long way off. Not anymore! It's here, so let's get down to what you really care about: how do you comply?

When the Speed of Light Just Isn't Fast Enough

Most people don't know a whole lot about radar and, frankly, why should they? So you might have nodded off when you read some of the initial "radar is an aging technology" pitches for ADS-B. A more compelling point is the inherent limitations of radar, most of which can be explained with simple physics and geometry. Radar works by transmitting radio waves and then receiving the reflected return of those waves. Those radio waves travel at the speed of light.

While that sounds really fast in terms of our normal understanding of travel speeds, it's actually a significant limitation. That's because the receiver has to "wait" ever so slightly for the return, so the

transit time of the radio wave from the antenna to the object and back limits the radar in terms of range and update times. In general terms, the faster a radar antenna turns, the faster it updates, but at the expense of a shorter effective range. Therefore, every radar system is inherently a compromise between range and update interval. No amount of technology can solve that problem. The speed of light appears to be a limitation across the universe. It limits space travel, radar, and communications. Radar also becomes less accurate over distance due to angular spread.

ADS-B doesn't have these problems. Each user broadcasts a highly accurate position signal every second, one that is not dependent on a radar interrogation to update everyone involved, including the FAA. How does ADS-B do that? It's that "B," which stands for Broadcast. Having each aircraft determine and then broadcast its own location eliminates the directionality of radar.

Let's Talk Tech

There are essentially three components necessary to make the ADS-B system work, and this is where your equipment needs come in. To keep it simple, ADS-B requires three things: a source of position information, a transmitter, and a receiver. Technically speaking, you really only need the first two

components to satisfy the FAA ADS-B Out mandate, but the absence of a receiver deprives you of the system's full benefits. Most pilots would probably agree that most of the benefits to users come from ADS-B In. But first let's look at the required technology.

We'll start with the easiest part, the position source. This is required no matter what, even if you opt only for the required ADS-B Out. FAA recommends a Wide Area Augmentation System (WAAS) GPS. Many popular products from companies like Garmin, Aviadyne, Aspen, FreeFlight, and Bendix King meet (or can be upgraded to meet) WAAS standards. If you don't have a WAAS GPS and don't think that adding one is in the cards — they can be quite expensive — all hope is not lost. Some of the ADS-B solutions either include an internal WAAS position source or can be purchased with an optional internal WAAS position source.

The next piece of equipment is an ADS-B Out transmitter. This is a radio that functions like your transponder. Instead of waiting for a radar interrogation, though, it automatically broadcasts your location and other specified information to ADS-B ground stations and other properly equipped aircraft at one-second intervals.

The final piece of equipment is optional. An ADS-B In receiver allows you to take advantage of all the ADS-B Out information from other aircraft, in addition to that from the FAA. It also allows you to receive subscription-free weather information via Flight Information Service-Broadcast (FIS-B), with one important caveat that we'll cover later. The additional situational awareness and free weather make the incremental investment in ADS-B In well worth considering.

While I've described these items as three separate pieces of equipment, they are often sold and sometimes even packaged as a single unit. I've separated them to illustrate the flexibility you have in tailoring an ADS-B solution to your particular situation. Maybe you have an approved WAAS GPS already and don't want ADS-B In. In that case, a simple ADS-B Out unit would probably be most effective. If you don't have any modern avionics and want to go all in, you might elect for a full ADS-B Out and In unit along with a brand new WAAS navigator. Maybe you want both ADS-B Out and In, but don't have WAAS and don't want to write a check for a fancy new navigator. No problem. Simply select an approved Out/In unit with integrated WAAS. The point is, no matter how unique your situation, there is likely a solution out there that will meet your needs.

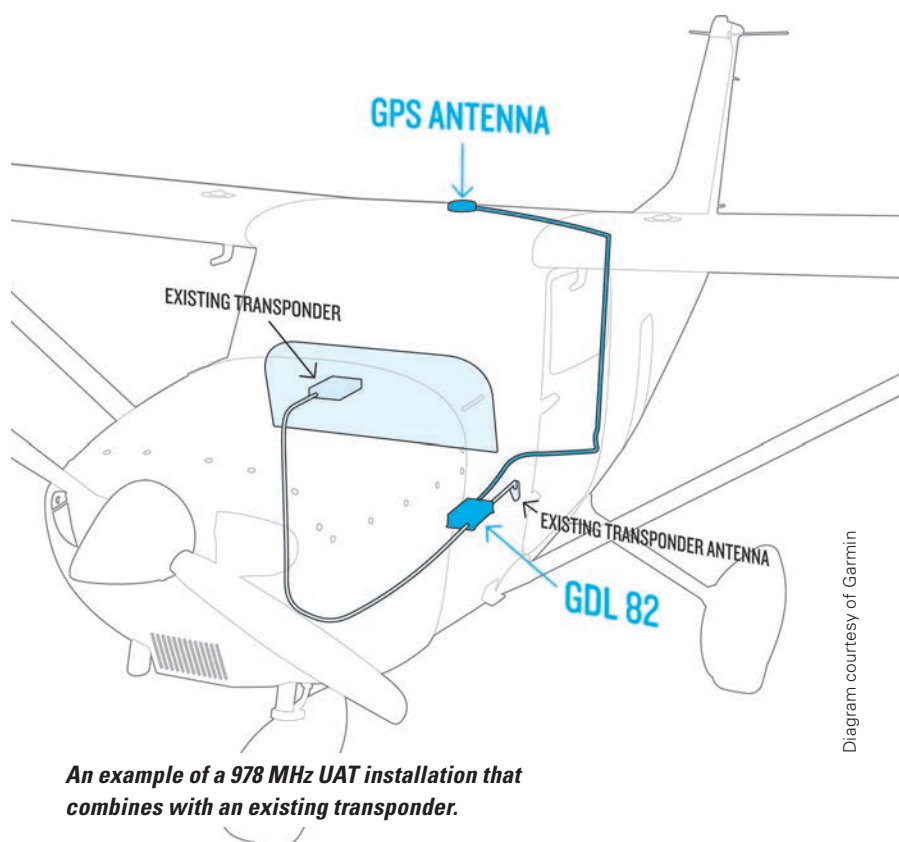


Diagram courtesy of Garmin

What's the Frequency Kenneth?

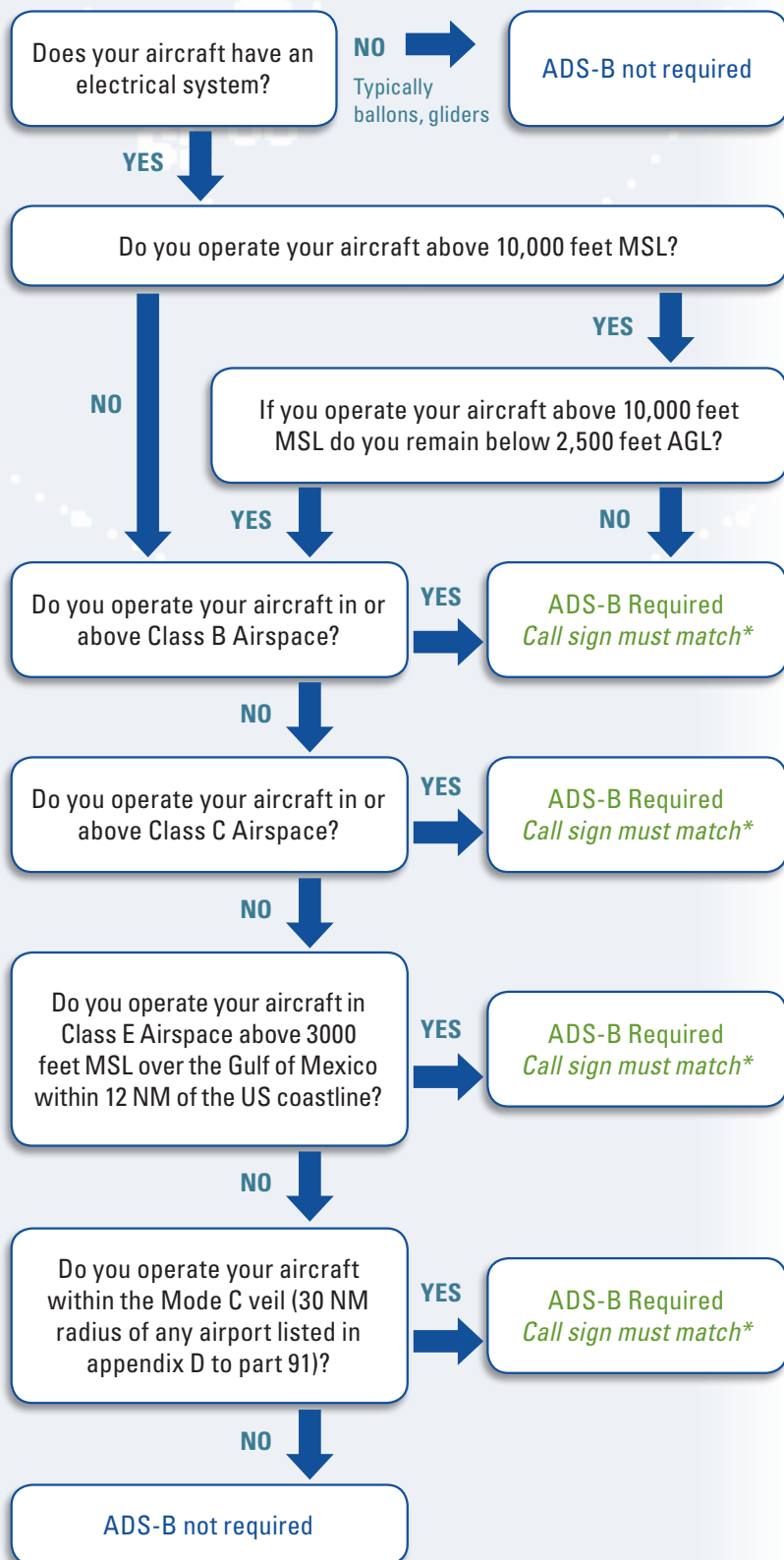
One of the biggest questions when looking at ADS-B is 978 or 1090 — megahertz (MHz) that is. As part of the ADS-B rule, the FAA allowed two different ways to meet the ADS-B Out requirement if you always fly below 18,000 feet MSL. One was a 978 MHz Universal Access Transceiver (UAT) and the other is the 1090 MHz Extended Squitter (ES).

Originally, UAT was envisioned to be the GA solution for ADS-B. UAT is still a perfectly acceptable solution for anyone who flies below 18,000 feet MSL and within the United States. UAT operates in addition to your existing Mode C transponder (which is still required in 2020), essentially adding ADS-B to your current set up. Some UAT systems have the advantage of being slightly less expensive for the hardware, although the Aircraft Owners and Pilots Association (AOPA) notes that they are sometimes more expensive to install. UAT might be the "easiest" solution to add to an existing setup.

UAT at 978 MHz is also the exclusive home of FIS-B information. But there are some drawbacks. The biggest issue is that UAT is currently supported only in the United States, meaning that any international flight requiring ADS-B is off the table. Another potential issue is that you have to maintain your existing Mode C transponder. If you need to add a new Mode C transponder for some reason, the UAT option may be less economical than the 1090 option.

By the time you read this article, you will have less than a year to get your aircraft ready to meet the FAA's ADS-B Out mandate.

Do I need to Equip?



**Do you use a temporary unique call sign?
Call sign and ADS-B transmitter must match.*

So let's talk about 1090 "extended squitter" (1090ES), which is an enhancement of the Mode S transponder. Mode S transponders already squit, but 1090ES sends more information. In case you are wondering about the somewhat funny word, "squit" is essentially the opposite of a squawk, meaning that it sends information automatically rather than waiting for a radar interrogation. The information from 1090ES is identical to that which UAT sends, but it goes at 1090 MHz rather than 978 MHz.

In addition to being the accepted international standard and being required above 18,000 feet MSL in the United States, 1090ES also replaces your existing transponder. This means that one box will meet both the ADS-B and transponder requirement. The major drawback with 1090ES, aside from cost, is that a 1090ES ADS-B In system doesn't receive FIS-B. We'll talk about some fixes for that later. But other than cost and FIS-B compatibility, 1090ES makes a strong case for better operational flexibility, simplicity, and potentially even resale value.

I Challenge you to a Dual

With some customers torn between the pros and cons of each ADS-B Out option, manufacturers created an interesting solution. Enter the dual band receiver. From a technical perspective, this is the "ideal" solution. The dual band units generally have a 1090 ES transponder integrated with an ADS-B-In system that receives both 1090 MHz and 978 MHz. This choice gives the pilot the operational advantages of 1090ES Out, but with the benefit of 978 MHz ADS-B In, namely FIS-B. Another benefit is having ADS-B In on both 1090/978 MHz, which means that your aircraft can receive traffic information directly from both bands. A single band receiver, whether 1090 or 978, only receives traffic information from aircraft on the same band directly from the aircraft. Full traffic information would still be provided, but it would depend on having the information rebroadcast from FAA ground stations. This isn't a huge benefit, but it's something to keep in mind if you fly outside FAA ground station coverage on a regular basis. 1090ES Out transponders also meet Mode C/S requirements anywhere in the world.

Embracing a Split Strategy

While a dual band receiver might be the "technically ideal" solution, it might not be the most financially appealing one. In that case, you might opt to adopt what I'll call a split strategy. The FAA is only requiring ADS-B Out. To meet the legal requirement,



Photo courtesy of Garmin

The Garmin GTX-330ES is an example of a 1090 MHz Extended Squitter.

you can install an ADS-B Out system, 1090ES or UAT. These systems are generally cheaper than a dual band or single band Out/In system. Installing ADS-B Out meets the mandate but doesn't get you FIS-B or any traffic information. To handle ADS-B In, there are a number of portable systems that allow you to add ADS-B In to your other cockpit devices like tablets or portable GPS systems. Many of these systems are even dual band receivers. While they don't integrate into your avionics and are generally limited to displaying on portable devices, they do provide a low cost, no installation option to pilots who want to add ADS-B In to an ADS-B Out only installation. You can also add this option later on if you desire.


Finding the Best Path

The clock is running and, as we have stressed, the FAA is not going to stop the clock or add extra time. The market has responded, and ADS-B options are plentiful. They range widely in price and capability from units that meet the standard and nothing more, to those with a host of features beyond the basics.

Since price and capability are not always highly correlated, a bit of research is in order.

A good place to start is the FAA's Equip ADS-B page: www.faa.gov/nextgen/equipadsb. You can search and see what options are available for your particular aircraft, and that may help narrow your choices. Next, look for an avionics shop with experience installing ADS-B equipment. They can provide options and estimated costs. They can also tell you which options are most popular given your aircraft and needs. This is a great way to benefit from the experience of thousands of pilots who have traveled down this path before you. You are best positioned to find your best path, but it doesn't have to be a solitary struggle.

ADS-B Solutions: *Content disclaimer: Products and services mentioned, and/or external, non-FAA links within, do not constitute official endorsement on behalf of the FAA.*

- AOPA- ADS-B Technologies: www.aopa.org/go-fly/aircraft-and-ownership/ads-b
- Garmin: ads-b.garmin.com/en-US/
- Avidyne: www.avidyne.com/index.asp
- Bendix King: www.bendixking.com/en/pages/get-ads-b-2020-compliant
- FreeFlight Systems: www.freeflightsystems.com/general-aviation
- L3 Lynx: www.l-3lynx.com
- uAvionix: <https://uavionix.com>
- Appareo: www.appareo.com/aviation
- Scout: <https://flywithscout.com> 

James Williams is FAA Safety Briefing's associate editor and photo editor. He is also a pilot and ground instructor.



Photo courtesy of Avidyne

The Avidyne AXP-322 is a remote mounted 1090 MHz Extended Squitter that can be controlled through other cockpit systems like the pictured IFD 550.



JENNIFER CARON

Is My ADS-B Broadcasting Me?

A Look at Non-Performing Emitters



An ADS-B ground station antenna.

One of the radios in my friend's Cessna is a bit tricky. Every now and then it'll give us some trouble, but all it takes is a quick check to make sure the jacks are fully plugged in, and we're good to go. We never experienced any loss of communications — that is until one day when we heard the words, “*carrier only, no voice*” coming from air traffic control. My equally befuddled flying partner and I quickly learned the meaning of this phrase: the tower knew we were transmitting, but they could not hear us. There was no modulation, or voice, broadcasting from our end. Looking back on our experience, I realize that this was the day I discovered — the hard way — what it means to have a non-performing emitter.

An emitter is a device that is designed to broadcast. Your radio is an emitter, and so is your ADS-B Out system. Your ADS-B Out is made to periodically emit/broadcast specific information about your aircraft to air traffic control and other aircraft around you.

According to 14 CFR, section 91.227, which defines the equipment performance requirements for an ADS-B system, your ADS-B Out must broadcast your aircraft's position, velocity, the containment radius around your aircraft (the navigation integrity category or NIC), and several other identifiable parameters that convey your aircraft's location while on the ground and in the air.

If your ADS-B Out is not transmitting the required location data about your aircraft, it is not performing in compliance with the rule and is considered to be a non-performing emitter, or NPE. An NPE can result from equipment that doesn't meet the performance standards or, more commonly, by an error induced during installation. (See the *Nuts, Bolts, and Electrons* column in this issue for more information on how your repair shop can avoid ADS-B installation errors).

Houston, We Have a Problem

Not unlike the “no voice” radio problem I talked about earlier, if you are flying in an NPE condition, your ADS-B system is not communicating correctly to air traffic control (ATC) or other aircraft around

you. For example, your system could be transmitting the wrong ICAO code, or the wrong aircraft category — describing your aircraft as a rotorcraft instead of a light fixed-wing aircraft, for example.

A more common, and vexing problem, is when barometric altitude is not included in the ADS-B message, then ATC and other aircraft might not know how high you are flying. This is not hazardously misleading information, but failing to broadcast barometric altitude is a safety risk.

In the most critical of cases, your system could be transmitting hazardously misleading information, with your aircraft “lying” about its position in the air or on the ground. Obvious issues here involve ATC or other aircraft reacting to traffic information from your system that just isn’t accurate. Pilots could maneuver incorrectly to avoid where they think you are, possibly causing an accident.


The FAA is constantly monitoring for critical NPEs that are “lying” about the aircraft’s positioning. Although the FAA does not come across these critical cases very often, they immediately notify the owner/operator when they do.

The Facts

“From January 1, 2018, to October 1, 2018, we had close to 15,000 aircraft that were newly equipped with ADS-B Out. Out of these 15,000, we only had 98 NPEs,” said James Marks, ADS-B Team Lead in the FAA’s Flight Standards Service. “What that tells me is that most of the NPEs we have now are installations that occurred two or more years ago, prior to the 2016-2017 FAA rebate program.”

Marks explains that the 2016-2017 FAA program, which offered a \$500 rebate to help owners of certain GA aircraft equip with ADS-B Out, was instrumental in reducing the number of new NPEs. “One of the requirements for the rebate program was that you had to fly and verify that your installation was good before you could receive your \$500 check, effectively reducing the overall rate of NPEs resulting from installation errors,” Marks explained. “So the quality of recent installations is much better than it used to be,” he added.

The FAA renewed the ADS-B Rebate Program for 2018-2019. The program runs for one year from its October 11, 2018 start date, or until all rebates have been claimed, so act soon. It’s not only a great way to offset your costs, but the rebate process can also work to guarantee that your ADS-B installation will be error free. A link to the ADS-B rebate page is in the “Learn More” section below.



**U.S. Department of Transportation
Federal Aviation Administration
ADS-B Performance Monitor**

Public ADS-B Performance Report

ICAO: A5BEC0 (51337300)


Tail Number: N47

Last Flight Id: N47

Period: 03-23-2018 13:11:20 to 03-23-2018 13:59:29

Operation Analysis Overview

	Analysis
Airborne 1090	<input checked="" type="checkbox"/>
Surface 1090	<input type="checkbox"/>
Surface RWY/Taxi 1090	<input type="checkbox"/>
Airborne UAT	<input type="checkbox"/>
Surface UAT	<input type="checkbox"/>
Surface RWY/Taxi UAT	<input type="checkbox"/>



Sample ADS-B Out PAPER Report

A Successful Failure

Keep in mind that NPEs are not always identified by ATC. Your transponder may appear to be working just fine. It’s transmitting out to the ground stations, and your broadcasted information is delivered to ATC for separation services. But the system does not always give the controller any insight into how well your ADS-B is performing or if all information elements comply with the requirements of the ADS-B rule. You should not count on ATC letting you know if you have an issue.

Likewise, your ADS-B system does not always display a caution or warning light in the cockpit to tell you if you’re flying in an NPE condition. Just because everything is greenlight ready on your screen, it doesn’t mean that you don’t have a problem, and it doesn’t confirm that your system is transmitting the correct data.

“The self-checking abilities within the equipment are limited. A fault light will only come on under a handful of circumstances, usually related to an equipment failure of some kind. Anything short of that, then the pilot is probably not even aware that there’s an issue,” says Marks.

If your ADS-B Out is not transmitting the required location data about your aircraft, it is not performing in compliance with the rule and is considered to be a non-performing emitter, or NPE.



ADS-B ground testing equipment can be useful to catch problems before a test flight.

PAPR to the Rescue

The easiest way to check your ADS-B system to ensure that you are not flying in an NPE condition is to run a PAPR report after any flight. PAPR, or Public ADS-B Performance Report, is a quick, easy, and *free* way to check your ADS-B system, and as many times as you'd like. Fifteen to 30 minutes after a flight, go to adsbperformance.faa.gov/PAPRRequest.aspx to request a PAPR report. It only takes a

few minutes to get the report by email. Remember that flying near the surface or at the fringe of ADS-B coverage areas may negatively impact the metrics provided in your PAPR Report.

Please do yourself a favor and run a PAPR report. It will effectively identify any erroneous information that your equipment broadcasts. You can take the report straight to your avionics installer to help identify and rectify any issues.

Prevention Before the Cure

The FAA strongly recommends that you run a PAPR after installation of your ADS-B equipment and annually thereafter. It is not mandatory to run a PAPR report; however, regular requests for a PAPR will confirm whether or not your system is performing in compliance with the rule, and it will give you a heads up if your system is being red flagged as an NPE.

Mission Control

Fortunately, there's a device inside the FAA ADS-B ground system called the ADS-B Performance Monitor (APM). The APM is designed to automatically check your ADS-B system for performance issues, red-flagging any NPE results or other non-compliance concerns. It works by capturing all broadcast information from your aircraft,

including all operations within FAA ADS-B coverage from taxi to takeoff to landing automatically, and every time you fly.

After your flight ends, the data

collected by the APM during that operation is used to perform a compliance assessment and generate a corresponding PAPR.

"The APM completes around fifty different individual compliance checks on each ADS-B message


transmitted during a flight to monitor your ADS-B system's performance against the requirements specified by the rule," says Marks, "and there are compliance thresholds embedded in the APM. For example, your ADS-B has to transmit a navigation integrity category, or NIC, that is equal to or greater than seven to be in compliance. If it transmits anything less than seven, at any time during your flight, the APM will flag those messages as non-compliant and when enough non-compliant messages accumulate, the operation will be flagged as a potential NPE."

When the APM flags an aircraft as an NPE, it stores the data, which is continuously monitored and analyzed by the FAA's ADS-B Focus Team (AFT) via the avionics trend analysis tool, created by Marks, to notify the team if an aircraft has operated at any time in an NPE condition. "Our team of aviation safety inspectors reviews this data to verify whether or not the aircraft is indeed operating with an NPE. There is always a human review of that data to validate the accuracy of what the system tells us," explains Marks.

If your ADS-B is determined to be operating in an NPE condition, a member of the AFT will contact the owner/operator by phone, email, or certified mail to provide notification of the avionics issues and coordinate corrective action.

"What's great about the APM is that we have a performance-based tool that generates ADS-B reports available to the public on-demand, to help determine if their ADS-B is working correctly and complies with the rule," says Marks. He stresses that pilots will benefit from regular use of the PAPR system.

Bottom Line

The best way to check if your ADS-B system is transmitting the correct information about your aircraft, and to ensure it is not operating in an NPE condition, is to run a PAPR report today. It's available online, it's free, and you get the results in 15 minutes. It's such a great tool to help keep you safe in the air and on the ground. Why not give it a try now? 

Jennifer Caron is an assistant editor for FAA Safety Briefing. She is a certified technical writer-editor, and is currently pursuing a Sport Pilot Certificate.

PAPR, or Public ADS-B Performance Report, is a quick, easy, and free way to check your ADS-B system as many times as you'd like.

Learn More

2018-2019 FAA ADS-B Rebate Program

www.faa.gov/nextgen/equipadsb/rebate/

Public ADS-B Performance Report (PAPR) User's Guide

adsbperformance.faa.gov/PAPRUsersGuide.pdf

Equipping without Tripping *Resources to Guide You on ADS-B Selection*

So many roads. So many detours. So many choices. So many mistakes.

Sarah Jessica Parker

Actress Sarah Jessica Parker might have been thinking about her famous TV character's passion for shoes, but the quip goes to a more serious point. In his 2004 book called *The Paradox of Choice*, psychologist Barry Schwartz addressed the idea that the overwhelming abundance of choices in a culture that prizes perfection can lead to "analysis paralysis" and stress. As the book summary notes, "choice overload can make you question the decisions you make before you even make them, it can set you up for unrealistically high expectations, and it can make you blame yourself for any and all failures." Fortunately, Schwartz goes on to offer eleven practical steps on how to limit choices to a more manageable — and less stressful — number.

Schwartz's book is now on my personal reading list, and you might also find it helpful. But if the ADS-B equipage decision has you in the throes of analysis paralysis, perusing a few of the FAA website's pages on this topic could be helpful to your needs.

The landing page on the FAA website's ADS-B portal illustrates the scope of the FAA's ever-increasing trove of useful information on equipping to meet the requirements of the ADS-B Out mandate. One of the first links you'll find is a decision flow chart to help you determine whether you need to equip, which is also on page 14 of this issue. The next link goes to an overview of the rule itself. The third will be of particular help to those working through the large set of choices, because it allows you to view a list of FAA-certified equipment for ADS-B, as well as to search the FAA's database for ADS-B compliant equipment. This database also gives you the option of searching for equipment specific to the make and model of your aircraft.

Using these free resources will help you narrow the set of choices to a more manageable number. If your situation is akin to that of my Cessna 182 flying club, budgetary considerations will further narrow the list. Beyond that, you might find it helpful to make a list of the characteristics or features that you really do or don't want, an exercise that will winnow the list still more. It might be a pretty easy decision after that. If, however, you find yourself dithering over the last two or three possibilities, just remember that the likelihood of a "perfect" selection is probably similar to the likelihood of the "perfect" flight we all hope someday to achieve. As long as your choice meets the requirement of the mandate and checks the boxes you consider most important, you can call it good, get it done, and enjoy the benefits of this technology.

If the ADS-B equipage decision has you in the throes of analysis paralysis, perusing the FAA website's pages on this topic could help you narrow the range of options that meet your needs.

Susan Parson (susan.parson@faa.gov, or @avi8rix for Twitter fans) is editor of FAA Safety Briefing. She is an active general aviation pilot and flight instructor.

Learn More

Equip ADS-B

www.faa.gov/nextgen/equipadsb/

ADS-B FAQs

www.faa.gov/nextgen/equipadsb/resources/faq

ADS-B Resources

www.faa.gov/nextgen/equipadsb/resources

ADS-B Equipment

www.faa.gov/nextgen/equipadsb/installation/equipment/

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Sorry, Wrong Number

TOM HOFFMANN

A Fresh Look at Avoiding Call Sign Mismatch Issues

NextGen is the FAA-led modernization of our nation's air transportation system that aims to improve aircraft separation standards and provide better safety to pilots and passengers. For a change of this size and magnitude to be successful requires NextGen's various interconnected programs, systems, and procedures — each with their own moving parts and pieces — to flow together seamlessly and work in harmony. It's a tall order, but one that the FAA has been assiduously working towards for well over a decade, with several critical milestones in its rearview mirror.

One of the unexpected “blips on the radar” with regard to integration efforts for ADS-B — a cornerstone technology for NextGen — has been an issue with aircraft identification inconsistencies, dubbed a call sign mismatch (CSMM). This issue occurs any time the aircraft identification listed in a flight plan does not exactly match the ADS-B transmitted identification. You may recall a previous article on the topic in our March/April 2017 issue, “What’s in a Name? How to Avoid a Call Sign Mismatch,” which outlined the issue and explored a few mitigation options to help prevent a CSMM. The intent here is to re-acquaint you with the issue and provide some important procedural changes and policy updates that are helping to resolve these mismatches.

Your Call (Sign) is Important to Us ...

Let's start by reviewing why this issue matters. Simply stated, the call sign that an aircraft is broadcasting needs to match what an air traffic controller sees on the scope. The requirement for your ADS-B unit to transmit your aircraft identification is stated in Title 14 Code of Federal Regulations (14 CFR)

section 91.227(d)(8). The result of a mismatch, especially in a busy sector, can lead to significant operational difficulties for ATC, including distraction and increased workload.

For example, were a CSMM to occur with the alerting function activated, a blinking CSMM alert would appear on either the controller's or the ATC supervisor's screen (depending on which platform is used) and require immediate action. FAA's Order JO 7110.65, the chief guidance document for ATC procedures and phraseology, would require ATC to issue the following statement following a CSMM:

(Aircraft ID) YOUR ADS-B CALL SIGN DOES NOT MATCH YOUR FLIGHT PLAN CALL SIGN.

Because of the current frequency of CSMMs, the FAA has had to disable the feature that allows for flight ID matching. This step dilutes the system's integrity and can affect a controller's ability to detect a potential conflict. But it's not just controllers who are affected by CSMMs.

“ADS-B In is negatively affected by incorrect FLT IDs [call signs], which at a minimum impairs a pilot's situational awareness,” says Kerri Strnad, an Air Traffic Specialist with the FAA's En Route Standards and Procedures Division. “It is imperative that operators set the correct call sign into their ADS-B, exactly matching their flight plan aircraft identification.”

You've Got the Wrong Number, Please Dial Again

In the previous CSMM article, we discussed how most GA pilots are not typically affected by this issue since the N-number they use as their call sign is almost always the same number entered into their ADS-B system. Recent data confirms this

is still the case. As long as your ADS-B Out system is properly installed and configured to match your registration or N-number, you're good to go. However, sometimes GA operators are simply unaware they have a mismatch, which is often the result of the installer "fat-fingering" the registration number into the ADS-B unit. But don't worry, there's an easy way to check that.

The FAA's Public ADS-B Performance Report (PAPR) tool, at adsbperformance.faa.gov/PAPRRequest.aspx can verify that your system is configured properly. 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. If you suspect a typo is the cause of a CSMM, your repair shop should be able to help correct it. If the aircraft identification input on your unit can be manually configured, you should be able to update it yourself.

Beyond the "Call" of Duty

The more pervasive problem with CSMM lies with operators who use specialized call signs that differ from the aircraft's registration number, like an Air Ambulance flight. By using a pilot-programmable ADS-B unit, an operator can easily sync the ADS-B call sign with the flight plan call sign to avoid a CSMM. However, some ADS-B transmitters do not have a pilot changeable call sign feature, and many air ambulance operators change their call sign depending on the need for priority handling. This sticking point has required some creative thinking to resolve.

FAA System Operations Security handles call sign policy and is the nexus between call signs and ADS-B equipment. Working with members of the air ambulance community, the FAA drafted new language in Advisory Circular (AC) 120-26M, *Assignment of Aircraft Call Signs and Associated Telephonies*, to resolve this issue. There were differing understandings in the community regarding the use of N-numbers, local call signs, and priority handling. Section 2.4 from the AC addresses priority handling for civilian air ambulance flights, clarifying that when the pilot states "MEDEVAC" before its FAA-authorized call sign or N-number, ATC will provide priority handling in accordance with FAA Order JO 7110.65, no exceptions. For any MEDEVAC flight, there is no additional flight plan filing requirement, such as entering "MEDEVAC" in the remarks section.

— ADS-B —

NOBODY LIKES A MISMATCH

**FLIGHT PLAN CALL SIGN MUST MATCH
ADS-B TRANSMITTED CALL SIGN**



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

FOR MORE INFO VISIT: faa.gov/go/equipadsb



Federal Aviation
Administration

Here's an example of how MEDEVAC is now used during a flight using a local call sign:

- **NO PRIORITY:**
For radio transmissions, use "MID-ATLANTIC Three;" when filing a flight plan, file as MA3.
- **PRIORITY HANDLING REQUESTED:**
For radio transmissions, use "MEDEVAC MID-ATLANTIC Three;" when filing a flight plan, file as MA3.

While this policy change allows air ambulance operators without programmable ADS-B units to still receive priority handling, using a radio transmission to make this request does not automatically communicate this special status to controllers downstream from where the flight is operating. The National Air Traffic Controllers Association (NATCA) and the FAA are currently looking at possible solutions to this problem, which include exploiting data from the

remarks section (Field 18) from the ICAO Flight Plan to convey a MEDEVAC status to other controllers. We'll follow up on their progress in a future issue.

AC 120-26M also provides additional clarity on programmable ADS-B equipment and strongly recommends it for anyone using new or existing FAA-authorized call signs (ICAO Three-letter Identifier, U.S. special, or local) in the NAS. However, if an aircraft operator does not have a pilot program-mable ADS-B transponder, the FAA-authorized call sign may be used by having a mechanic or other qualified person preset the call sign in the ADS-B equipment

One of the unexpected “blips on the radar” with regard to integration efforts for ADS-B — a cornerstone technology for NextGen — has been an issue with aircraft identification inconsistencies, dubbed a call sign mismatch (CSMM).

before flight. Otherwise, the pilot must use the aircraft registration number as the aircraft identification when filing a flight plan and for use during radio communications.

To sum up, if the pilot is able to ensure that the local or other FAA-authorized call sign is programmed into the ADS-B equipment before flight, the pilot can continue to use that FAA-authorized call sign. If the pilot is unable to do so, use of the N-number is required.

Answering the Call

In our 2017 CSMM article, we reported a monthly snapshot of about 44,000 flights with mismatch events in the lower 48 states, with general aviation (GA) accounting for about 30-percent of that number. As of October 2018, that total number of CSMMs has been reduced to just less than 17,000. GA operators not using call signs dropped by almost half to only 16-percent of the total. When you discount non-operator related CSMMs caused by technical and procedural errors, that number drops to 14,000 events. This change accounts for slightly more than 1-percent of the total number of flights for aircraft with ADS-B, down from a previous rate of 4.5-percent.

“I think we’re making a lot of progress, but we still have a ways to go,” says Jim Kenney, an aviation safety inspector with the FAA’s Flight Technologies and Procedures Division in Flight Standards. Kenney, who is on the frontline of the CSMM issue, is leading an effort to help educate everyone from GA pilots to air carrier pilots on the need to properly align the aircraft identification they transmit. “Most people have been very understanding and they get it

Three Tips to Help Prevent a CSMM


- Get a PAPR report after install and at regular intervals.
- Take the time to carefully enter your ADS-B call sign when using a programmable unit, or better yet, integrate the procedure into your preflight checklist.
- Seek out some training on the features of your ADS-B unit, including how to program your call sign.

corrected right away,” says Kenney. “But obviously as we get more and more new aircraft to equip, we have to keep the pressure on since we’ll have more folks using the system.”

According to Kenney, there are several minor and easily preventable mistakes that can lead to a CSMM. “Maybe the technician forgot to put the N in front of the registration number or mistakenly entered a serial number during the ADS-B installation,” he says. “Or perhaps the pilot hasn’t been properly trained on the unit, or simply forgot to enter the right call sign.”

To help prevent these mistakes, Kenney advocates getting familiar with your ADS-B system and getting training on its features. Check to see if it has a pilot-programmable call sign and if that feature was activated during the installation. If it is programmable, be sure to integrate the call sign update task into your normal preflight checklist so it’s not forgotten.

Finally, and as we mentioned earlier, be sure to run an ADS-B Performance Report, or PAPR request, after installation and at regular intervals thereafter to ensure everything is working properly. “You might want to consider a PAPR request when it comes time for your annual,” says Kenney. “Then if there’s a problem, you can hand it to your mechanic and they can handle it during the inspection.”

Have any questions, comments or feedback on the ADS-B Call Sign Mismatch issue? Send us an email at 9-AWA-AVS-ADS-Programs-AFS@FAA.gov. 

Tom Hoffmann is the managing editor of FAA Safety Briefing. He is a commercial pilot and holds an A&P certificate.

Learn More

Choosing Equipment with Changeable Call Signs
www.faa.gov/nextgen/equipadsb/installation/call_sign/



ADS-B *Light*

TOM HOFFMANN

Exploring ADS-B Out Options for Light-Sport and Experimental Aircraft

If you are the owner of a light-sport or experimental aircraft, you're probably aware that your aircraft can use uncertified ADS-B Out equipment to meet the impending 2020 mandate. This option can certainly make things easier in some respects, but there are some important details that you'll want to consider to ensure your equipment meets the requirements of the new airspace rule.

Equipment Check

For starters, if you are considering using uncertified ADS-B Out equipment, check your airworthiness certificate. You can install uncertified ADS-B Out systems only on amateur-built aircraft and light-sport aircraft with an *experimental* airworthiness certificate, as well as on special light-sport aircraft (with some restrictions on the installation end). Any type-certificated aircraft must use FAA-approved ADS-B Out equipment and obtain installation certification. Keep in mind that even if you are able to use an uncertified ADS-B Out system, it must still meet the performance requirements of the FAA Technical Standard Order for 1090 MHz equipment (TSO-

C166b), or for Universal Access Transceiver (UAT) 978 MHz equipment (TSO-C154c).

This is important because, unless specifically authorized by ATC, uncertified ADS-B transmitters that do not meet the performance requirements of an ADS-B Out TSO are not permitted to operate in airspace requiring ADS-B Out after January 1, 2020.

Air Traffic Control (ATC) would not use the data from transmitters that do not meet most of the performance requirements listed in the regulations for ADS-B Out performance (Title 14 Code of Federal Regulations (14 CFR) section 91.227). This means ATC cannot provide flight-following services or separation services to these aircraft.

To qualify non-TSO equipment as compliant for operations in ADS-B airspace, the avionics manufacturer must provide a statement of compliance that indicates the equipment — when installed in accordance with the installation instructions — complies with all requirements of 14 CFR section 91.227, and with the performance requirements of the appropriate TSO. Manufacturers of uncertified ADS-B Out equipment are expected to perform the appropriate

engineering efforts to ensure their systems meet the required specifications. They should also be able to provide product support to include design changes, equipment modifications (or instructions for performing them), and revisions to the installation, operating, and maintenance instructions.

Installation Check

Along with a statement of compliance, owners equipping with non-TSO systems should also obtain installation instructions from the applicable avionics manufacturer. These manufacturers should consider the guidance in AC 20-165, *Airworthiness Approval of Automatic Dependent Surveillance - Broadcast OUT Systems* when creating installation instructions.

For special light-sport aircraft (SLSA) owners, the installation of any ADS-B Out equipment (certified or non-certified) must be performed in accordance with an applicable consensus standard and authorized by the aircraft's manufacturer. This installation authorization has presented a challenge for some LSA owners whose aircraft manufacturer either went out of business or decided not to support and approve an ADS-B Out installation process.

As a workaround to either of these situations, the LSA owner/operator may continue to operate the aircraft without ADS-B Out in allowable airspace, or exchange the SLSA airworthiness certificate for an

Important Tip!

Retain the ADS-B Out installation instructions from the equipment supplier, including the statement of compliance, in the aircraft records to support the equipment's compliance with the regulatory requirements. This will also help in resolving any in-service issues that might crop up.

experimental LSA special airworthiness certificate and install the ADS-B Out as an alteration under the provision of the experimental LSA operating limitations. Another option for those "orphaned" LSA aircraft is to find a viable entity, such as another manufacturer, type club, user group, or other interested party, to provide the continued airworthiness support needed to be able to install the ADS-B Out system and maintain the SLSA airworthiness certificate.


Another consideration for both LSA and experimental aircraft owners is choosing and installing a position source for their ADS-B system. For GPS equipment, you may install an uncertified GPS on amateur-built and light-sport aircraft with experimental airworthiness certificates, but it must meet the performance requirements of a GPS TSO. Position sources that do not meet the performance



requirements of a GPS TSO will not comply with 14 CFR section 91.227 and will not be permitted to operate in airspace requiring ADS-B Out.

Although the list is limited to TSO-certified ADS-B products, you can search on the FAA's website for equipment options at www.faa.gov/nextgen/equipadsb/installation/equipment.

Operation Check

The FAA continuously monitors compliance to the ADS-B Out equipment performance requirements. As of November 1, 2018, the total number of LSA and experimental aircraft that were equipped with ADS-B Out was 6,139, but 1,637 of those aircraft had systems with non-performing emitters (i.e., systems that did not meet the performance requirements). While that number is beginning to decrease, the best way to get off and stay off that list is to perform a Public ADS-B Performance Report (PAPR) request. A PAPR request will verify the performance of your ADS-B Out system and identify any equipment non-compliance conditions. The FAA encourages operators to perform a PAPR request after ADS-B system installation and at least annually thereafter. You can perform a PAPR request free at any time by going to adsbperformance.faa.gov/PAPRRequest.aspx. 

Tom Hoffmann is the managing editor of FAA Safety Briefing. He is a commercial pilot and holds an A&P certificate.

Learn More

FAA Advisory Circular AC 90-114A, ADS-B Operations
www.faa.gov/documentLibrary/media/Advisory_Circular/AC_90-114A_CHG_1.pdf

Keep TABS on ADS-B

If you own a glider, balloon, or an aircraft that was not originally certificated with an electrical system, your aircraft is likely exempt from carrying a transponder or ADS-B Out equipment while operating in the NAS. This provision was made in consideration of the limited or non-existent power sources found in these aircraft. However, there are equipment options available that can still allow these aircraft to be "seen" by other NAS users.

The intent of a Traffic Awareness Beacon System (TABS) is to increase safety within the NAS by encouraging the voluntary equipage of a low-cost, compact, easy-to-install device that will allow other properly equipped aircraft to track and display the TABS aircraft. Aircraft equipped with ADS-B In capability (as defined in TSO-C154c, TSO-C166b, and TSO-C195b), as well as certain Traffic Collision Avoidance Systems, will be able see aircraft using a TABS device.

It's important to note that TABS is not a rule-compliant solution for entry into ADS-B Out rule airspace and that equipment broadcasting with TABS will not appear as a target to an ATC controller. For more information, see the TABS TSO here: <https://go.usa.gov/xPPPy>.



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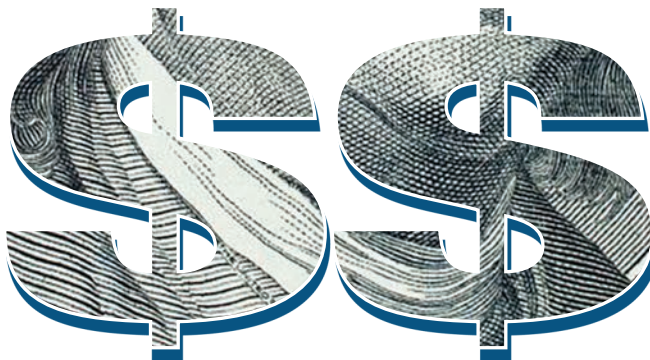
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— **ADS-B** —
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How to Get Your ADS-B Out Rebate

As you probably know by now, starting in 2020 all aircraft flying in airspace where a transponder is required today will need to be equipped with compliant Automatic Dependent Surveillance–Broadcast (ADS-B) Out technology. As an incentive to equip now, the FAA relaunched its \$500 rebate program that makes \$4.9 million available for 9,792 ADS-B Out installations.

If you want to learn more about this incentive program, then read on. Last time this rebate was made available, a little more than 10,000 were paid.

If you own a fixed-wing, single-engine piston aircraft that requires an onboard human pilot and was first registered before January 1, 2016, then you are eligible for the current rebate program. However, owners of multiple eligible aircraft may apply for only one rebate. Rebates are not available for aircraft already equipped, or where the FAA has already paid or committed to upgrade. The program will run until October 11, 2019, or until the funds for all the remaining rebates are exhausted, whichever comes first.

AVAILABLE NOW

— ADS-B — REBATE

LEARN MORE

- 1 Decide:** Select equipment for purchase; schedule installation
- 2 Reserve:** Reserve your rebate; receive Rebate Reservation Code
- 3 Install:** Install your ADS-B equipment
- 4 Fly and Validate:** Fly in ADS-B airspace to validate equipment performance; receive Incentive Code
- 5 Claim:** Use Rebate Reservation Code and Incentive Code to claim your rebate

Decide

Since the rebate program is aimed at a segment of the general aviation (GA) community, only certified Technical Standard Order (TSO) Version 2 equipment is eligible. The FAA maintains a list that is updated monthly of eligible equipment at bit.ly/equipADSB. However, avionics manufacturers will have the latest status of TSO certification for their ADS-B

As an incentive to equip now, the FAA relaunched its \$500 rebate program that makes \$4.9 million available for 9,792 ADS-B Out installations.

Version 2 systems. If you ever operate your aircraft using a call sign other than your N-number, be sure to select an ADS-B transmitter with a pilot-changeable call sign feature.

Discuss your plans with a certified installer to ensure it will work correctly in your airplane. Once you schedule your appointment to install the TSO-certified avionics, you are ready to reserve your rebate.

Reserve

When you are within 90 days of the scheduled ADS-B Out installation date, reserve your rebate online at bit.ly/reserveADSB. You will need to check all the boxes about eligibility to proceed to the rebate reservation form. You will then need to provide your aircraft tail number using its properly formed N-number as found in the FAA Civil Aircraft Registry. Do not enter spaces or dashes.

Next, you will need to review the tail number, airplane manufacture date, airplane model, aircraft type, name of owner, and address of owner. *To be sure information is correct beforehand, check the FAA's aircraft registry at registry.faa.gov/aircraftinquiry.* Then, select your ADS-B link, select your transmitter from the list, and enter the scheduled install date — the selected date can only be in the future. Enter your email address, and check the “I’m not a robot” box.

Once these steps are completed, a rebate reservation code will be generated. Later, you will need the exact code including the “RR” and dashes (e.g., RR-1234-1234) for your rebate claim.

Install

Aircraft owners who have an aircraft with a standard airworthiness certificate, e.g., part 23, 25, 27, and 29, may have the ADS-B equipment installed by a repair station or an appropriately-licensed airframe and powerplant (A&P) mechanic.

Fly and Validate

The ADS-B rebate program has allotted 60 days after the scheduled installation date to fly, validate, and claim the rebate. This allows you to resolve unforeseen issues with the installation or avionics. If the rebate is not claimed within 60 days of the initial scheduled installation date, the rebate reservation will be voided. If this happens, you may apply for a new rebate reservation code, but there is no guarantee that another rebate reservation will be available.

This step in the rebate process is what causes many rebates to go unclaimed. You do not need to make a special flight for the rebate. You can use one of your routine flights to claim your rebate, as long as it meets the criteria of the program.

The FAA provides an automated tool to assist aircraft owners, operators, and avionics shops in validating the performance of ADS-B Out equipment installed on aircraft. It's called a Public ADS-B Performance Report (PAPR), and it will confirm if the ADS-B installed equipment is working properly. In order to request a PAPR report, you will need to fly your airplane in the airspace defined in 14 CFR 91.225 for a minimum of 30 consecutive minutes, with at least 10 aggregate minutes of maneuvering (see sections 4.3.2.3-4.3.2.6 of AC-20-165B for more information). This validation flight can be completed any time you are flying in airspace where a transponder is required today. If you are unsure about your local airspace, go to bit.ly/ADSBairspace for more information. There is also a handy KMZ file for download from this site that can be uploaded to Google Earth.

Minimize flight time near or at the fringe of ADS-B coverage areas because it may negatively impact the metrics provided in your PAPR validation report.

After you have flown through ADS-B rule airspace, you need to request a PAPR. Go to bit.ly/validateADSB and enter the following information: date of your flight entered as the date recorded in Zulu (UTC+0) time at the start of the flight; your N-number; an email address to send your report to; the configuration of the ADS-B Out equipment and GPS source installed on your aircraft; and the equipment installer. A notes area is included if you do not find your specific equipment.

Successful PAPR processing depends on the accuracy of the information provided. All fields should be completed and verified prior to submitting your request.


Using the above information, the tool will search through its inventory of past aircraft operations for a flight meeting the selections. If a flight with matching identification can be located on the requested date, a PAPER and General Aviation Incentive Requirements Status (GAIRS) report will be emailed within 30 minutes. The GAIRS report will indicate either a "pass" or "fail" for the GA rebate program. Once the report indicates "pass," it will include an incentive code. This incentive code will be required to claim the rebate. If you do not receive these reports, check your spam or junk email folders.

Claim

If you are still within 60 days of the installation date that's recorded on your rebate reservation, you can go to bit.ly/claimADSB to claim your rebate. You will need your rebate reservation, email address used during reservation, and incentive code from the GAIRS to file the online claim form.

If you need help at any time, send an email to ADSBRebateHelp@faa.gov.

We know that some owners of GA aircraft may be particularly price sensitive and therefore may be postponing their installations. With more than 100,000 GA aircraft likely to require ADS-B Out, there is a near-term need to accelerate equipage in order to ensure that pilots, manufacturers, and retail facilities have adequate time and capacity to equip aircraft in a timely and efficient manner.

While \$500 will only cover a portion of your total cost for ADS-B Out, a survey of aircraft owners found that getting costs below \$2,000, which is an approximate minimum cost to equip, would encourage many price-sensitive owners to equip now. The FAA chose \$500 as an amount that would get the price to that more-attractive range, while maximizing the total number of rebates available. So if you want to see the money, then reserve your rebate now! 

Paul Cianciolo is an associate editor and the social media lead for FAA Safety Briefing. He is a U.S. Air Force veteran, and a rated aircrew member and volunteer public affairs officer with Civil Air Patrol.



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Federal Aviation
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— ADS-B —
EQUIP NOW!



Drones, Remote ID, and ADS-B

While ADS-B has been transforming traditional aviation, you may be asking yourself — how will it interact with drones? It's a fair question. And one that's been discussed regularly since the FAA first issued its regulations on the civil use of drones.

In March 2017, at a Senate hearing on unmanned aircraft, Senator Tammy Duckworth asked Earl Lawrence, the executive director of the FAA's Unmanned Aircraft Systems Integration Office at the time — "Why wouldn't we require ADS-B Out on [larger drones]?" She further noted that drones, even smaller drones such as quadcopters, should have the capacity of continuously emitting an identification code. It's a concern that was born out of her own experience of almost colliding with a drone while piloting a manned airplane. It's a concern that many pilots, including general aviation (GA) pilots, have shared with the FAA. At the time, the FAA had been collaborating with a wide array of industry members to plan an aviation rulemaking committee (ARC) on that specific subject.

The remote identification and tracking ARC was formed on May 4, 2017. It was chartered to provide the FAA with recommendations on possible approaches to remote identification, including available technologies, shortfalls in available standards, and on how remote identification may be implemented. Throughout the summer of 2017, the committee met multiple times to discuss these issues, and ADS-B was a regular discussion point for the committee. But the report noted that there was concern for congestion on the 1090 MHz frequency associated with ADS-B and that "existing studies suggest that this frequency is nearing capacity limits in certain high density airspace areas (e.g., the Los Angeles Basin)." So while the ARC included ADS-B in its recommendation for technological solutions to remote identification, it recommended that any proposal for using ADS-B frequencies be analyzed for the impact on the performance of current and future secondary surveillance radar (SSR), airborne collision avoidance systems (ACAS), and ADS-B. Ultimately, in the ARC's recommendation to the FAA, ADS-B was just one of multiple technological solutions proposed by the ARC on remotely identifying unmanned aircraft systems (UAS).

How ADS-B is going to fit into the concept of remote identification is certainly an interest, and the

FAA continues to work through the recommended analysis on ADS-B in UAS. But what's probably more of interest to traditional aviators, especially GA pilots, is how remote identification will support their safety. The FAA has made it clear that one of the reasons for remote identification requirements is to support the ability for law enforcement and security agencies to be able to respond to potential threats. But as Senator Duckworth suggested, the aim for transmitting an identification is also to support safety in the National Airspace System.

It comes down to managing the airspace. To mitigate potential collisions between drones and manned aircraft, the FAA is driving the development of an unmanned traffic management system (UTM). In the same way that traffic is managed on the ground by way of roads, traffic lights, license plates, signs, onboard navigation, and other capabilities, UTM will be a suite of capabilities to UAS traffic in the air. Remote identification, as noted by current Executive Director of the FAA's UAS Integration Office Jay Merkle at the 2018 UAS Symposium, would be designed on those principles of UTM. It'll be a capability among the suite of UTM services to manage the airspace.

The FAA continues its efforts with UTM, remote identification, and its assessments of ADS-B. A rule-making effort is targeting publication of a proposal by the summer of 2019. Additionally, Congress included UTM and remote identification in its recent reauthorization to the FAA. There's still much work to do, but you can be sure there will be continued engagement with the public as these initiatives develop and, as we enable new UAS operations, safety will be our priority.

Emanuel Cruz is the manager of the Safety and Operations Branch in the FAA's Office of Unmanned Aircraft Systems.

Learn More

Read the ARC report at
go.usa.gov/xPS6s

The transcripts of the hearing are available at
go.usa.gov/xPS66

See the UTM Architecture presented at the March 2018 UAS Symposium at
go.usa.gov/xPS6t



Correct Data — The Key to ADS-B Accuracy

When it comes to ensuring the proper set up of an ADS-B system, ***the number one, most important thing to do is to verify that the system configuration data is correct.*** The second most important thing to do is to verify that the system configuration data is correct, and the third? You guessed it. Verify that the system configuration data is correct!

The aircraft identification data entry task is the most important step during the installation of the ADS-B system. Why? Correct ADS-B setup requires the installed ADS-B system to *accurately identify the aircraft* to air traffic control (ATC) and other aircraft in the airspace.

It is the responsibility of the avionics installer to verify the data configured in the ADS-B system following installation. According to James Marks, ADS-B Team Lead in the FAA's Flight Standards Service, "too many ADS-B-equipped aircraft are not fully compliant with the performance requirements for the equipment, and the majority of these ADS-B compliance failures result from improper configuration of the equipment."

Three of the most common errors that we regularly see are: transmission of a wrong emitter category, an incorrect flight identification (aircraft call sign), and transmission of a wrong ICAO code," Marks explains. These common errors can be easily avoided by making sure that the system is set up correctly during the aircraft identification data entry process.

1. Verify the Emitter Category

The ADS-B system transmits the emitter category, or aircraft category, to describe the weight class of the aircraft. This information must accurately portray the aircraft as light, small, large, rotorcraft, glider, etc., for a correct set up of the ADS-B system. Most GA aircraft are in category 1 for light fixed-wing aircraft (less than 15,500 lbs. maximum takeoff weight), or category 2 for small fixed-wing aircraft (between 15,500 lbs. and 75,000 lbs. maximum takeoff weight).

Check the configuration summary or maintenance page to locate the aircraft's emitter category information. Verify that the emitter category is correct for the maximum takeoff weight of the aircraft. See FAA Advisory Circular 20-165B, section 3.2.3.4, for more details.

2. Verify the Flight Identification

Like a Mode S transponder, the ADS-B system transmits the aircraft's flight identification (FLT ID), or aircraft call sign, so ATC and other aircraft with ADS-B-In systems can identify the aircraft. This field *must* match the call sign filed in your flight plan. It is the responsibility of the installer to enter the FLT ID correctly in an ADS-B system that does not allow the FLT ID to be changed by the pilot. Unless the ADS-B unit contains a pilot-programmable call sign feature, the owner often cannot make changes to, or reconfigure, the system setup once the repair shop releases the aircraft.

FLT ID errors are usually the result of configuration mistakes. If a FLT ID is not entered, it results in the "Missing FLT ID" or "No FLT ID" readout, another common cause of ADS-B set up error. To avoid errors, check the configuration summary page and verify that the FLT ID exactly matches the aircraft registration number or an FAA-authorized call sign if requested by the operator.

3. Verify the 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 FAA-assigned ICAO code (also known as the "Mode S address").

Checking for the presence of an ICAO code during a ground check is not sufficient. Marks advises avionics equipment installers to "carefully review the configuration summary, or maintenance page, to make sure that the Mode S/24-bit ICAO code you entered exactly matches the code assigned to that aircraft by the FAA, to allow proper ATC identification and tracking."

Some manufacturers have developed fail-safes that prevent system activation until the installer enters a new ICAO code. Still, "several aircraft are flying today with the pre-assigned default ICAO factory codes," says Marks. The bottom line: it is the installer's responsibility to make sure that the transmitted ICAO code exactly matches the aircraft's FAA-assigned ICAO code. There is often no way for

The aircraft identification data entry task is the most important step during the installation of the ADS-B system.

Missing Elements

Category	NACp	NACv	Vel	Flight Id	Mode 3A	Emit Cat	Baro Alt	Geo Alt
% Fail	0.21%	0.03%	0.10%	0.13%	0.00%	0.13%	2.87%	2.88%
Max dT	00:00:07	00:00:02	00:00:03	00:00:13	00:00:00	00:00:13	00:00:37	00:00:27
MCF	3	1	2	12	0	12	430	417

Integrity & Accuracy

Category	NIC	NACp	NACv	SIL	SDA
% Fail	0.18%	0.00%	0.00%	0.21%	0.21%
Max dT	00:00:07	00:00:00	00:00:00	00:00:07	00:00:07
MCF	3	0	0	3	3

Category	NIC	NACp	NACv
Avg	8.0	10.0	1.1
Min	0	10	1
Max	8	10	2

Sample PAPR report identifying parameters, highlighted in red, where the ADS-B Out system failed to meet performance requirements.

Three Tips to Help Ensure a Successful ADS-B Out Install:

1. Verify the Emitter Category
2. Verify the Flight Identification
3. Verify the ICAO Code

the aircraft owner to access the ADS-B set up system to make this correction.

Finally — Test the System

After configuration, it is essential to test the ADS-B system. Most ADS-B equipment manufacturers provide checkout tools that an installer can use to edit and view the system configuration. “The configuration summary page verifies the data configured in the avionics, but it is not an actual test of the system,” explains Marks. You need to perform both a ground check and a post-flight check to validate the system configuration and its performance.

The ADS-B system ground check verifies what is being broadcast by the equipment. Some avionics installation shops have ramp test equipment or other system interface tools on hand to display data transmitted by the ADS-B unit. This equipment allows technicians to verify that all parameters are configured correctly prior to the first flight after the installation. Additionally, your shop can confirm a successful installation following the first flight by requesting an FAA ADS-B performance report.

After the owner completes the post-installation validation flight in airspace with ADS-B coverage, the owner and installer should request an equipment performance report using the FAA’s Public ADS-B Performance Report Request (PAPR) service. Visit the FAA’s PAPR request website at

adsbperformance.faa.gov/PAPRRequest.aspx, fill out the required information, and submit the request. The PAPR service sends an email with all the configuration and performance details of the ADS-B Out equipment installed on the aircraft. Any equipment configuration or performance errors will show up in highlighted red, and if the report isn’t flagged red, you’re all set. Any areas of the report highlighted in red should be addressed and verified by requesting a PAPR following the next flight.

The integrity and accuracy of the ADS-B equipment itself is determined by the manufacturer. However, it is your job as the avionics installer to make sure that the ADS-B system hardware is installed and configured correctly, including having the appropriate component software loads to enable the equipment to meet regulatory performance standards. Use these techniques to keep your ADS-B installs error free.

Jennifer Caron is an assistant editor for FAA Safety Briefing. She is a certified technical writer-editor, and is currently pursuing a Sport Pilot Certificate.

Learn More

Visit the FAA’s Equip ADS-B Installation site at <http://go.usa.gov/x9m5e>



Mitigating Mid-air

Balancing Biology with Technology To Help You “See and Avoid”

We all know the strengths and weaknesses of our aircraft, including the inevitability that what might be a clear advantage for one can be a complete detriment for another. Nowhere is this distinction more evident than in maintaining visual separation from other aircraft, aka, see-and-avoid. The near polar opposite blind spots found on many high and low wing GA aircraft have all too often been a leading cause in mid-air or near mid-air collisions. Although Cessna and Piper owners may vehemently argue why each of their respective models offers superior collision avoidance, it really boils down to pilot know-how more than having any kind of built-in design advantage.

Pilots actually have several techniques and tools at their disposal during flight to avoid a mid-air, such as communication, clearing procedures, and visual scanning techniques. But any pilot knows that these techniques all have limitations and that even the most skilled and diligent pilot is still susceptible to an unseen aircraft encounter. That's where technology can help, particularly Automatic Dependent Surveillance-Broadcast (ADS-B) technology. ADS-B has greatly improved situational awareness for GA operators. With ADS-B, each aircraft broadcasts its own GPS position along with other information including heading, ground track, groundspeed, and altitude (ADS-B Out). With its counterpart system installed (ADS-B In), avionics have the ability to receive and process those data signals and present a visual display of that traffic to the pilot.

Realizing the great potential technology like ADS-B has to help enhance the visual depiction of traffic, the National Transportation Safety Board (NTSB) issued a Safety Alert titled “Prevent Midair Collisions: Don't Depend on Vision Alone,” available at www.nts.gov/safety/safety-alerts/Documents/SA_058.pdf. The Alert highlights some of the recent mid-air collision accidents the agency has investigated and which it believes that cockpit traffic display technology, like ADS-B (In), could have helped to prevent. The Alert also advises pilots to become familiar with any new equipment they use for collision avoidance and fully understand its limitations. “High-density traffic around airports can make interpreting a traffic display challenging due to display clutter, false traffic alerts, and system limitations,” the report states.

A personal connection to a mid-air collision over Warrenton, Virginia in 2012 was the motivation for Aviation Adventures Flight School owner Bob Hepp to equip nearly all of his fleet of 45 aircraft with both ADS-B Out and In. The accident, which involved one of Hepp's chief instructors, made him realize just how inadequate see-and-avoid by itself was, as well as the need to get more traffic information into the cockpit. “If anybody's operating an aircraft in a high-traffic area, I really can't understand why they would not want to get ADS-B In when they're just meeting the mandate of ADS-B Out.” You can see a video of Hepp's comments at youtu.be/zoiArdxTjvI.

While ADS-B technology can be a game-changer when it comes to improving situational awareness, pilots also need to be wary of spending too much time on displays rather than their outside environment. FAA Advisory Circular (AC) 90-48D warns pilots about maintaining this sort of vigilance. The AC states that traffic information equipment does not relieve a pilot of the responsibility to see and avoid other aircraft, and that managing distractions caused by the use of technology in the cockpit is critical to the safety of the flight.

In addition, the NTSB Safety Alert also reminds us that “unless your system is also capable of providing resolution advisories, visual acquisition of and separation from traffic is your primary means of collision avoidance (when weather conditions allow).” So to make sure your technology is complemented by the proper biology, please review AC 90-48D. It has plenty of tips on how to flex those Mark Ones and keep your visual acuity in tiptop shape.

Learn More

FAA Advisory Circular 90-48D, *Pilot's Role in Collision Avoidance*

[go.usa.gov/x96NU](https://www.faa.gov/x96NU)

How to Avoid a Mid-Air Collision, FAA Safety Team publication

www.faa.gov/gslac/ALC/libview_normal.aspx?id=6851

FAA Video: ADS-B and General Aviation

<https://youtu.be/saEdkbq0ZT8>

Going All “Out”

Here in Texas, where the Rotorcraft Standards staff is based, we like to talk in plain English (with a few embellishments tossed in). Now, I understand that with the Automatic Dependent Surveillance-Broadcast (ADS-B) Out installation deadline approaching January 1, 2020, you might have a few questions and concerns. Well, bless your heart.

We’re going to try to give you an easy-to-understand primer regarding the new rules. So keep your saddle oiled as we begin the trail ride through the corn maze of federal regulations.

Here are some of the most important rules for ADS-B — a system that uses satellite-based positioning to improve situational awareness for both pilots and air traffic controllers. Effective January 1, 2020, your helicopter must have an ADS-B Out system if you’re going to fly in:

- Class A, B, and C airspace.
- Class E airspace within the 48 contiguous states and the District of Columbia at and above 10,000 feet MSL, excluding the airspace at and below 2,500 feet above the surface.
- Class E airspace at and above 3,000 feet MSL over the Gulf of Mexico from the coastline of the United States out to 12 nautical miles.
- Within 30 nautical miles of the airports identified in 14 CFR part 91, Appendix D (Mode C Veil).

What does all this mean? “Class A airspace” is airspace at or above 18,000 feet mean sea level (MSL). Few helicopters fly this high, so we’ll mosey on down to the other airspace classes and rules.

For example, if you plan to fly within 30 nautical miles (Mode C Veil) of any airport listed in Appendix D, you will need to use an ADS-B system up to 10,000 feet MSL. Suffice it to say, you cannot fly a helicopter in the general area of major airports, known as Class B airports, without an ADS-B Out system. If you fly near smaller, air-traffic-controlled airports, known as Class C airports, when approach control and the airport control tower for that airport are operating, then you will need ADS-B Out for about five miles from the airport.

If overflying Class C airspace, you also must have ADS-B Out for up to 10,000 feet MSL within the lateral boundary of the Class C airspace.

If you plan to fly at or above 10,000 feet MSL, excluding the airspace at or below 2,500 feet above the surface, you must use an ADS-B Out system within the 48 contiguous states and the District of Columbia. Generally, this means you need the system if you fly above 10,000 feet MSL, except if you’re near a mountain. An ADS-B Out system is not required when flying in Class E airspace between terrain and 2,500 feet above that terrain.

You also must use an ADS-B Out system at and above 3,000 feet MSL over the Gulf of Mexico from the U.S. coastline out to 12 nautical miles.

So, unless you only plan to fly your helicopter low in a remote, rural area, well away from the busiest airports, plan on getting ADS-B Out installed by January 1, 2020.

So why the need for ADS-B?

ADS-B uses satellite-based positioning technology to provide three-dimensional information (latitude, longitude, altitude) about a helicopter’s position for ATC to use. Since it is broadcast, properly equipped ADS-B In aircraft can display the position, altitude, and direction of nearby ADS-B Out aircraft in the cockpit. This capability offers an unprecedented level of traffic situational awareness — particularly useful for helicopters operating in congested airspace.

ADS-B can also provide coverage in remote, mountainous areas since receiving antennas can be placed on top of mountains and can detect signals from aircraft below.

Radar looks out, not down, and has a limited ability to track low flying aircraft, such as helicopters. Large parts of the Gulf of Mexico lack radar coverage, making it a prime candidate for ADS-B. Despite radar’s limitations, it will continue to be used as a back-up system for ADS-B in the busiest airspace.

If you need more information, visit: www.faa.gov/nextgen/equipadsb/resources/faq. Happy flying!

Gene Trainor is a technical writer/editor for the Rotorcraft Standards Branch in Fort Worth, Texas.



Flight Forum

Loving the Fundamentals

I love the article [Thinking for Two, Managing Instructional Risk in the Jul/Aug 2018 issue] and the direction!! Understanding why and risk management ... two vital, yet underappreciated and employed skills. I also like the Fundamentals of Instructing, yay!

— Kawehi

Hi Kawehi, thanks for your email. We are happy to hear that you found it useful. Happy reading!

Casablanca Theming

Your Jul/Aug 2018 article using the theme from Casablanca was very effective in driving (flying) home key elements of our pilot errors. I [like] your sense of humor while still making important points. Keep up the good work!

— Bill

Hi Bill, thanks for the feedback — happy you enjoyed the article and the issue. The team had a lot of fun with it.

Cessna On Our Minds

Cessna Pilots Association really appreciates you including us in [the feature article, The Space Between Strategy and Tactics, in the Sep/Oct 2018 issue]. This is a great publication that I read every month.

— Kris, Cessna Pilots Association



Here's some feedback we received on Facebook about two of our articles featured in the Jul/Aug 2018 issue.

From the article, *Maybe Not Today ... — Avoiding the Perils (and Regrets) of VFR into IMC*, by guest writer Sabrina Woods:

There needs to be more instrument training associated with the private pilot certificate ... training is key.

— Byron

From the article, *Not an Easy Day to Forget — Remembering Fuel Management Before It's Too Late*, by James Williams:

Fuel up for primary destination, backup destination, plus one hour — minimum (per a pilot I used to work with).

— Robert

ADS-B EQUIP NOW!



12 Months Left to make the ADS-B Out Deadline!

Starting January 1, 2020, you must be equipped with **ADS-B Out** to fly in most controlled airspace.

Q: What is the difference between ADS-B Out and ADS-B In?

A: ADS-B Out refers to an aircraft broadcasting its position and other information. ADS-B In refers to an aircraft directly receiving the ADS-B Out broadcasts as well as messages from the ground network such as TIS-B and FIS-B. Only ADS-B Out is mandated by the ADS-B Out rule. For information on installation and certification, refer to AC 20-165B at go.usa.gov/xQKs7 for ADS-B Out and AC 20-172B at go.usa.gov/xQKs6 for ADS-B In.

Q: When will ADS-B services be available in my area?

A: ADS-B services are already available across the U.S. including Hawaii, Alaska, Guam, San Juan, and the Gulf of Mexico. A coverage map is available at faa.gov/nextgen/programs/adsb/coverageMap/.

Let us hear from you! Send your comments, suggestions, and questions to SafetyBriefing@faa.gov or use a smartphone QR reader to go "VFR-direct" to our mailbox. You can also reach us on Twitter @FAASafetyBrief or on Facebook facebook.com/FAA.

We may edit letters for style and/or length. Due to our publishing schedule, responses may not appear for several issues. While we do not print anonymous letters, we will withhold names or send personal replies upon request. If you have a concern with an immediate FAA operational issue, contact your local Flight Standards Office or air traffic facility.



It. Just. Works.

“Where is he?”

A few months ago, I was in the right seat of my flying club’s Cessna 182 *Skylane* conducting an instrument proficiency check for a fellow member of our flying club. The pilot was under the hood, of course, and she was focused on entering the course reversal procedure turn at an airport we often use for instrument approach procedure work. Since the airport is convenient to our home base, and because it has a number of different approaches on offer, it’s a popular location for the sort of work we were doing.

The Back Story

As you might remember from the Pilot Report (PIREP) I offered in our first ADS-B focused issue of *FAA Safety Briefing* (March/April 2017), there was never a question of whether our club would install ADS-B Out equipment. Our home base loca-

tion inside the Washington, D.C. Tri-Area Class B and Special Flight Rules Area made that a true go/no-go decision. The issues we debated were the same “what” and “when” that our fellow owners face. To recap, we initially took a watch-and-wait approach, figur-

ing — correctly — that manufacturers would provide more options at lower prices as the 2020 equipage deadline drew closer. That strategy also enabled us to save money toward the eventual ADS-B acquisition and installation costs.

We concluded pretty quickly that the certified ADS-B Out and In boxes were beyond our budget. Even if finances had allowed, we surmised that the ever-quickenning pace of new technology might render a “full Monty” device 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. In our uniquely complex home airspace, a properly functioning transponder *really* matters. Since our balky existing transponder was in need of replacement, we confined our options to transponder-based ADS-B solutions. We eventually selected a device that would provide certified ADS-B

Out and enable non-certified ADS-B In weather and traffic data for everyone in the club with a tablet and a ForeFlight subscription.

So we can boast (pilots do that, right?) that we made the move to ADS-B relatively *early* (okay, six years from the date of the rule, but more than three full years before the deadline).

It’s a Beehive!

The certified part of our ADS-B solution 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, quickly became “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.

On the day of the instrument approach practice I described at the beginning, the ADS-B In data showed my colleague and me that we had company. The tag on the tablet target told us it was another Cessna, and we even had the tail number. But never once did we hear the pilot make any positions reports or other transmissions. Even with both of us searching the sky where ADS-B In said our “bogey” should be, never once did we see it with our own eyes.

To make matters more challenging, the other pilot appeared oblivious to our presence notwithstanding the radio calls we made. As we weren’t keen on either unbriefed formation or (worse) swapping paint, my friend and I decided that discretion was the better part of valor. We broke off the approach, flew to a safe distance, and rejoined after our all-but-invisible friend had landed.

I don’t know what might have *actually* happened that day without ADS-B, but both of us realized what could have happened. Now more than ever, I wonder how we ever got along without the assistance of ADS-B information. Once you have it, I think you will agree.

Susan Parson (susan.parson@faa.gov) is editor of FAA Safety Briefing and a Special Assistant in the FAA’s Flight Standards Service. She is an active general aviation pilot and flight instructor.

Our certified ADS-B Out solution makes our airplane compliant with the rule, but the non-certified ADS-B In data, especially traffic, quickly became “the” benefit.

FAA Faces

Paul Von Hoene

Aviation Safety Inspector, Flight Technologies and Procedures Division



Flying has always been an interest for Paul Von Hoene. When he was offered a chance to fly with the Navy right out of college, he took it.

As a Naval aviator, Paul got to fly the Sikorsky SH-3 *Sea King*, the Bell UH-1N *Twin Huey*, and the Sikorsky SH-60F *Seahawk*. His assignments included several aircraft carriers, amphibious assault ships, and a destroyer where he spent a combined 22 years in the Navy and Navy Reserve. When he left active duty, Paul became an airline pilot. He flew eight years with the regional air carrier Comair and another eight years with Northwest Airlines.

"For family reasons, I decided to look for aviation opportunities outside the airline business," Paul said. "Then I found my way to the FAA's Flight Technologies and Procedures Division, where I am now."

The division works to improve flight operations, flight standardization, and aviation safety within the United States and in international airspace as part of the Next Generation Air Transportation System, or NextGen. NextGen is the FAA-led modernization of America's air transportation system to make flying even safer, more efficient, and more predictable.

"Our office is involved in programs that touch flight operations, aircraft, airspace, airports, and flight procedures," notes Paul. "We're involved in just about every new technology in the NAS."

Some of these new technology programs involve aviation weather, data communications, Automatic

Dependent Surveillance-Broadcast (ADS-B), Electronic Flight Bags (EFB), Traffic Alert and Collision Avoidance Systems (TCAS), and Airborne Collision Avoidance Systems (ACAS-X).

Paul's office was also involved with bringing six new weather products for upload to Flight Information Services – Broadcast (FIS-B) for ADS-B In users — lightning strikes, turbulence, icing forecasts, cloud tops, graphical Airmen's Meteorological Information (AIRMET), and Center Weather Advisories.

However, with new technology comes the risk of over reliance on that technology. When used properly, these advances have the potential to improve general aviation (GA) safety. Pilots need

to understand the capabilities and limitations of the system they are using.

"Safety depends on a lot of fundamentals, understanding your systems, adherence to sound procedures, and just looking out the window," Paul explains. "The latest, newest things tend to get attention, but they must be used properly."

One such example is the use of ADS-B. With ADS-B Out, you are increasing your opportunity to be seen by the growing number of ADS-B In equipped aircraft. Air Traffic Control (ATC) is able to provide services in more airspace, and controllers can pick up aircraft in some areas where radar cannot. However, if you only use ADS-B In, you don't get the full benefit you would receive when you also have the mandatory ADS-B Out on your aircraft. If you have a 978 MHz receiver, you also get subscription-free weather and other aeronautical information. That's a lot of value for the cost.

When everyone in the national airspace system (NAS) is on the same page — and equipped with ADS-B Out when required — we can all feel a little safer knowing that technology is being used for the greater good.

Paul Cianciolo is an associate editor and the social media lead for FAA Safety Briefing. He is a U.S. Air Force veteran, and a rated aircrew member and volunteer public affairs officer with Civil Air Patrol.



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