

# FAA Safety

## BRIEFING

March/April 2017

*Your source for general aviation news and information*



## INS *and* OUTS *of* ADS-B

ADS-B 101 **P 8**

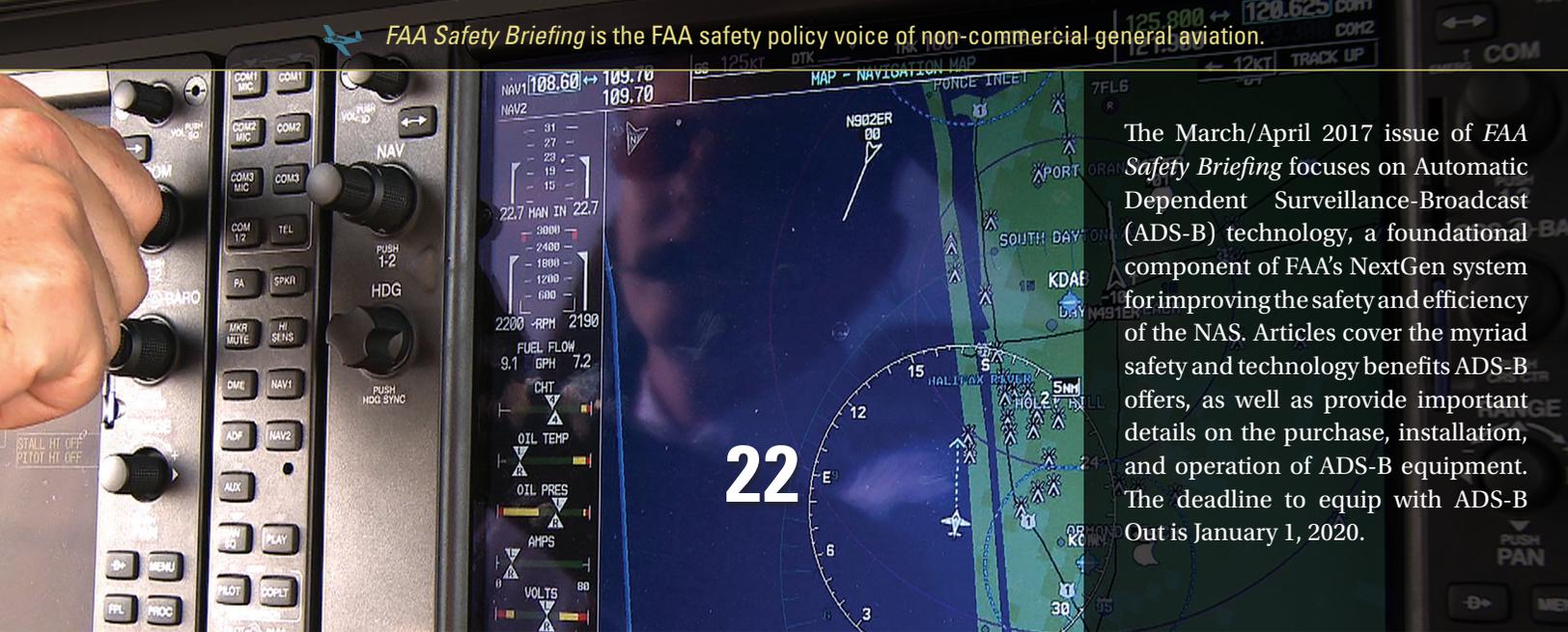
ADS-B Install Errors  
What You Need to Know **P 11, P 31**

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Federal Aviation  
Administration

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The March/April 2017 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. Articles cover the myriad safety and technology benefits ADS-B offers, as well as provide important details on the purchase, installation, and operation of ADS-B equipment. The deadline to equip with ADS-B Out is January 1, 2020.



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## It's Time

*Procrastination is like a credit card: it's a lot of fun until you get the bill.*

— Christopher Parker

The calendar has just turned to the new year as I write this column, and that means that the deadline for equipping your airplane with Automatic Dependent Surveillance-Broadcast Out (ADS-B Out) is now just three years away. When the clock strikes midnight and December 31, 2019, becomes January 1, 2020, an aircraft without ADS-B Out will be limited to where it can legally operate. In the area where I live and fly — the Washington DC metropolis — non-ADS-B-Out equipped aircraft will effectively be grounded.

### But I've Still Got Three Years!

Three years may sound like a long time, but it really isn't. As of December 2016, just over 18-percent of the United States GA fleet is ADS-B equipped. At best, it is going to be a challenge for the remaining 80-percent of the fleet to get avionics shop time for the installation. While the lead time varies from place to place, I can tell you that one of my airplane-owning FAA colleagues made his ADS-B equipment and shop selection in November 2016. The earliest installation appointment he could get is in May 2017, and the airplane will be in the shop for two to three weeks of the prime flying season. That sort of lead time will only increase as the ADS-B installation deadline approaches.

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.

With that picture in mind, getting my own aircraft equipped this year is high on my list of New Year's resolutions for 2017.

### Reasons to Act Now

Procrastination is a very human characteristic, and we are all vulnerable to it, especially when action requires research, decisions, and money. With those issues in mind, the FAA/industry Equip 2020 Team has worked hard to identify and resolve barriers to timely equipage.

Let's start with money. Cost is a significant barrier for many GA aircraft owners. I feel that very acutely myself, since I have two airplanes to equip. At this stage, though, there are several circumstances that can mitigate the financial concerns. First, the avi-

onics industry has come through with 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 Equip 2020 Team developed and introduced the ongoing FAA incentive program that offers a \$500 rebate to help owners of certain GA aircraft equip now with the required avionics. The program runs for one year from its September 19, 2016 starting date, or until all 20,000 rebates have been claimed. A link to information on the Equip 2020 ADS-B rebate is in the "Learn More" section below.

Perhaps ironically, another possible barrier arises from one of the benefits I mentioned above — how to choose among the wide range of ADS-B equipment options that GA aircraft owners now have. To help GA owners overcome that barrier, 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, you will find a number of informative ADS-B articles in this issue of *FAA Safety Briefing*, as well as on the websites of AOPA and other aviation advocacy organizations.

All that said, the most important reason to act now is to gain the safety benefits that motivated this mandate in the first place. Flying friends and colleagues who have already equipped with the required ADS-B Out and some form of optional ADS-B In capability give it rave reviews. Several wonder how they ever flew without the ADS-B boost to see-and-avoid. Even if you don't opt for ADS-B In capability, ADS-B Out still enhances your safety by making it easier for those with ADS-B In to see and avoid you.

It's time. I urge you to 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 'er done. You'll be glad you did.

#### Learn More

##### ADS-B Incentive Program

[www.faa.gov/nextgen/equipadsb/rebate/](http://www.faa.gov/nextgen/equipadsb/rebate/)

##### Equip ADS-B Research

[www.faa.gov/nextgen/equipadsb/research/](http://www.faa.gov/nextgen/equipadsb/research/)



### **FAA Issues General Aviation Medical Rule**

On January 10, the FAA published the final rule that allows GA pilots to fly without holding an FAA medical certificate as long as they meet certain requirements.

Beginning May 1, pilots may take advantage of the regulatory relief in the BasicMed rule or opt to continue to use their FAA medical certificate. Under BasicMed, a pilot will be required to complete a medical education course, undergo a medical examination every four years, and comply with aircraft and operating restrictions. For example, pilots using BasicMed cannot operate an aircraft with more than six people onboard and the aircraft must not weigh more than 6,000 pounds.

For more information, see Advisory Circular 68-1, *Alternative Pilot Physical Examination and Education Requirements*, at <http://go.usa.gov/x9GrB> or FAA's BasicMed web page at <http://go.usa.gov/x9PKf>.

### **Light-Sport, Vintage, and Experimental Under New Branch**

Photo by Tom Hoffmann



Looking for the FAA's Light-Sport Aviation Branch? The branch has a new name and an expanded role. It is now the Specialty Aircraft Examiner Branch. It still manages evaluators for Light-Sport Aircraft (LSA), which are aircraft that weigh 1,320 pounds or less and include the Weight-Shift Control and Powered Parachute categories.

The branch now includes Vintage and Experimental aircraft examiners. The Vintage group includes what some call "warbird" examiners for WWII era aircraft. Experimental examiners conduct certification testing for experimental turbine-powered aircraft, aircraft with a maximum gross

weight in excess of 12,500 pounds, or piston powered aircraft with an engine over 800 HP and a  $V_{NE}$  (never exceed speed) greater than 250 knots.

In addition, the Specialty Aircraft Examiner Branch now manages the Flight Standards Inspector Resource Program (FSIRP), which schedules FAA inspector resources for nationwide 14 CFR part 135/121 checks.

If you need help finding a specialty examiner or have questions about FSIRP, call the branch at 405-954-6400 or go online to <http://bit.ly/2j91DNs>.

### **ADS-B Air/Ground Assessment**

Did you get an Air/Ground failure on your ADS-B Performance Report? You're not alone. The FAA has detected numerous ADS-B equipped aircraft reporting airborne mode while stationary or taxiing. The installer can correct some issues, but other issues stem from decisions made by the avionics manufacturer. The FAA is working with avionics manufacturers to better understand the symptoms and next steps.

To clarify, the ADS-B avionics makes the Air/Ground decision. The ADS-B Performance Report includes an assessment of the ADS-B avionics' ability to determine airborne vs. ground mode. If you receive an Air/Ground failure, please work with your installer for guidance on appropriate corrective action. If the issue remains, reach out to your avionics manufacturer. If you're still experiencing issues, email 9-AWA-AFS-300-ADSB-AvionicsCheck@faa.gov and request a review. Please attach the ADS-B Performance Report with Subject: "PAPR Review Request: Air/Ground Failure" in your email to help expedite a response.

### **No Transponders Required for Gliders**

The FAA is withdrawing a previously published advance notice of proposed rulemaking that sought public comment involving glider operations in the National Airspace System (NAS). The action responded to recommendations from members of Congress and the NTSB and was intended to gather information to determine whether the current glider exception from transponder equipage and use provides the appropriate level of safety. The FAA is withdrawing this action because the limited safety benefit gained does not justify the high cost of equipage.

## FAA International Flight Plan Change

Transition to the International Flight Plan format by FAA Flight Service will occur in spring 2017. All civil IFR and VFR flight plans filed with Flight Service will be required to use the international format. Additionally, in cooperation with NavCanada, all VFR flight plans to Canadian destinations will use the international format. Flight Service will continue to accept NAS format flight plans filed by the military.

Flight Service is working with vendors of the Flight Service operating systems (Harris, Leidos, and CSRA) to modify their software for exclusive use of and improvements to the international format. All three systems exchange data with other NAS systems and require formal testing which began in mid-January. The specific date for implementation is dependent on completion of successful testing; however, the date will be announced a minimum of 30 days in advance.

Improvements to the international form make it easier and more intuitive for pilots to use and increase safety:

- Expands the size of the departure and destination fields to allow a greater variety of entry types.
- Modifies departure and destination fields for use when filing Special Flight Rules Area flight plans.
- Modifies type of flight field for use when filing Defense Visual Flight Rules flight plans.
- Transmits the supplemental pilot data field that includes pilot contact information, along with

the VFR flight plan to the destination facility, which may result in reduced Search and Rescue (SAR) response times by up to 30 minutes. *(Modifying the current SAR process to gain efficiencies and improve the service is a goal of the Flight Service modernization initiative.)*

The international format transition allows for integration of performance based navigation and the ability for enhanced air traffic control services. Learn more about the International Flight Plan format at [www.faa.gov/go/flightservice](http://www.faa.gov/go/flightservice).

## Radio Frequency Reductions

Based on comments received to reduce the number of radio frequencies used by Flight Service Stations (FSS) to communicate with aircraft inflight, the FAA modified its plan to reduce the network of Remote Communications Outlets (RCOs). It will now eliminate 428 duplicate, redundant frequencies and reduce RCOs while maintaining at least 90 percent of the current coverage 1,000 feet above ground level (AGL).

The reduction will align RCO infrastructure with the decrease in pilot demand for inflight services. The proposal excludes frequencies designated for emergency or military use and those in Alaska.

Of the 1,200 existing RCOs, the 189 that currently use the 122.2 frequency will continue. In addition, 103 RCOs previously dedicated to the En route Flight Advisory Service (EFAS) will return to service on 122.2 or other commonly used Flight Service frequencies, providing more uniformity.

## Safety Enhancement Topics

### March: Maneuvering Flight

The importance of maintaining safety while turning, climbing, or descending close to the ground.



### April: Mountain Flying

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



Please visit [www.faa.gov/news/safety\\_briefing](http://www.faa.gov/news/safety_briefing) for more information on these and other topics.



U.S. Department of Transportation

### Federal Aviation Administration

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Published six times a year, *FAA Safety Briefing*, formerly *FAA Aviation News*, promotes aviation safety by discussing current technical, regulatory, and procedural aspects affecting the safe operation and maintenance of aircraft. Although based on current FAA policy and rule interpretations, all material is advisory or informational in nature and should not be construed to have regulatory effect. Certain details of accidents described herein may have been altered to protect the privacy of those involved.

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### CONTACT INFORMATION

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[http://www.faa.gov/news/safety\\_briefing](http://www.faa.gov/news/safety_briefing)

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- Emailing: [SafetyBriefing@faa.gov](mailto:SafetyBriefing@faa.gov)
- Writing: Editor, *FAA Safety Briefing*, Federal Aviation Administration, AFS-850, 800 Independence Avenue, SW, Washington, DC 20591
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In October 2016, a safety risk management panel determined that all hazards associated with RCO reduction could be safely mitigated.

The following chart shows the decrease in use over time:



**CONUS Inflight Contacts Calendar Years 1993–2015**

Please visit the Flight Service website at [www.faa.gov/go/flightservice](http://www.faa.gov/go/flightservice) to see the list of frequencies retained and those scheduled for removal beginning in the fall of 2017.

### In Memoriam — Larry Enlow

We mourn the tragic loss of Orlando FSDO Aviation Safety Inspector Larry Enlow in a Georgia plane crash on November 17, 2016. Larry was admired and esteemed throughout the GA community for his calm presence, his patience, and his kindness as well as for his dedicated efforts to improve aviation safety through better training.

Larry attended the University of Florida, served with distinction as an officer in the Vietnam War, and held a general contractor license. As Vice President of Hubbard Construction Company, he helped build the foundation of Epcot Center. His hobby as an aviation instructor and Designated Pilot Examiner led him to a second career in the FAA.

As head of the Orlando FSDO’s flight training unit, Larry oversaw nearly all aspects of one of the country’s most active aviation training areas. He contributed substantially to the development, prototype testing, and initial implementation of the new Airman Certification Standards (ACS). Larry enthusiastically mentored less experienced aviators, whom he affectionately regarded as his “pups.”

All of those in Larry’s extensive network of friends, fans, and colleagues deeply grieve his passing. We take comfort in knowing that his many contributions to flight training will be his legacy.

## Consistency for the Start

### *A Message from the New Federal Air Surgeon, Dr. Michael Berry*

The New Year often brings changes in government. One of those changes is that I am now your Federal Air Surgeon, taking over from now-retired Dr. James Fraser. First, let me say that I wholeheartedly share Dr. Fraser's vision that our goal in the Office of Aerospace Medicine is to get as many airmen into the cockpit as is safely possible. As you've read in his reports, we've made great progress on that goal in the last few years.

#### **An Introduction**

I earned my M.D. from the University of Texas Southwestern Medical School in Dallas in 1971. After a general surgery internship in the U.S. Air Force, I spent four years as a fighter squadron flight surgeon in Spain and England. In 1976, I entered a residency in Aerospace Medicine at Ohio State University and earned a Master's Degree in Preventive Medicine in 1977. Following my residency, I became the Chief of the Flight Medicine Clinic at the NASA Johnson Space Center in Houston, Texas, where I was responsible for the screening and selection of new astronauts. I also participated in the certification and training of astronauts for space flight and the extensive medical preparations for the first flight of the space shuttle. That work also allowed me to serve as a Flight Control Team member for the first two flights of the Shuttle Columbia.

After leaving NASA, I entered the private practice of aerospace medicine in Houston, Texas, where I was a consultant and FAA Aviation Medical Examiner (AME) for 25 years. During this time, I also served as an FAA Human Intervention Motivation Study (HIMS)-trained AME, monitoring airline, corporate, and general aviation pilots during their recovery from substance use disorders.

I joined the FAA in 2006 as the Manager of the Medical Specialties Division of the Office of Aerospace Medicine in Washington, D.C., where I was responsible for aerospace medicine policy and procedures. In March 2014, I was selected as the Deputy Federal Air Surgeon, and in January of this year, I was selected to be the Federal Air Surgeon.

#### **The Course Ahead**

As part of our ongoing mission to get as many airmen into the cockpit as is safely possible, we will

continue to expand programs like Conditions AMEs Can Issue (CACI). In fact, we are close to launching four new CACI conditions. CACI has been a great tool in helping us approach our goal of getting 98-percent of airmen their medical certificate when they walk out of the AME's office. We hit 97.7-percent for fiscal year 2016.

I'm also looking to address another issue that often frustrates airmen: consistency. Believe it or not, I'm just as frustrated as you are when you feel like you're getting a different answer from every person you talk to about medical certification issues. We saw major frustrations in the rollout of the original CACI conditions. When we investigated, we found that 39-percent of the time AMEs were inappropriately deferring CACI-eligible airmen. We have seen improvements over time, but we see similar issues every time we introduce a new CACI condition.

Another area of inconsistency arises between our nine regions, the Aerospace Medical Certification Division (AMCD) in Oklahoma City, and headquarters here in Washington, D.C. I realize that you could possibly receive different guidance from a Regional Flight Surgeon (RFS) or from AMCD in Oklahoma City. Each could be correct medically, but that does not reflect the way our policy should work.

We plan to address this inconsistency in two ways. First, we plan to enhance communication among the various elements of the Office of Aerospace Medicine. Second, we are going to focus on making evidence-based decisions. That means asking, "What does the medical evidence say?" Not, "How have we always done this before?" Safety is always the primary concern, but I want the standard question in medical certification to be: "Given the evidence and our experience in this type of case, can we get this airman back into the cockpit safely?"

I look forward to meeting and helping as many of you as I can.

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*Dr. Michael Berry received an M.D. from the University of Texas Southwestern Medical School, and an M.S. in Preventive Medicine from Ohio State University. He is certified by the American Board of Preventive Medicine in Aerospace Medicine. He served as an FAA Senior Aviation Medical Examiner and Vice-President of Preventive and Aerospace Medicine Consultants for 25 years before joining the FAA. He also served as both a U.S. Air Force and NASA flight surgeon.*



# Ask Medical Certification

PENNY GIOVANETTI, D.O.  
MANAGER, AEROSPACE MEDICAL  
SPECIALTIES DIVISION

**Q1.** I passed a kidney stone in 2013 and the CT scan showed four retained stones. In 2015, I saw a urologist and I still had those four retained stones. They are all smaller than 5 mm and so, as I have read, they are more likely to pass on their own. What are my chances of being able to fly again while I have stones, or do I have to wait for them all to pass?

**A1.** Your chances are good. In many cases you do not have to wait for all of the stones to pass. Since your kidney stones were within the last five years, we will need a letter from your urologist. This letter should contain specific information used to assess your risk. Just Google “AME Guide,” then select “CACI Certification Worksheets.” You should bring a copy of this worksheet to your urologist so he or she understands what specific details need to be in the letter to the FAA. Once you have this letter, bring it to your AME appointment. Depending on the clinical information, your AME may be able to issue a medical certificate, or you may need to be considered for special issuance.

**Q2.** I was in an automobile accident a year ago. I was rear-ended by a 23 yr. old texting and driving 75 mph; I was nearly stopped. I lost consciousness for about 15-20 minutes. Since then, I suffer from occasional migraines induced by fluorescent lights, computer screens and excessively noisy environments. Knowing my triggers, I’m usually able to avoid situations that will bring on a migraine, but not always.

My memory loss, irritability, inability to concentrate, appetite, frequency of my headaches and my quality of sleep are vastly improved since the accident. I am taking Cymbalta (60mg/day), Flexoril (10 mg as needed) and MaxAlt (as needed). I feel as if I’m doing much better and on my way to complete recovery; which my neurologist has predicted.

I’ve been told not to see my AME until I’m fully healed. Knowing I may only have one chance at my Class I, I want to get it right. At what point

should I see my AME so I can get my Class I without restrictions? Should I be off all medications? How long needs to pass since my last migraine? Will they need copies of CT scans, EEGs and MRIs? Or can my neurologist write a historical medical summary? What type of documentation will I need to provide? Thanks for your insight.

**A2.** First of all, glad to hear that you are improving. Post-concussion syndromes can be very unpredictable. Your persistent migraines may be an issue depending upon their character and frequency. Based on your duration of loss of consciousness alone, your injury would be classified as mild and the minimum wait time is six months. But there are a variety of factors which must also be considered, such as your clinical status at the time of the injury and the results of your imaging studies. Cymbalta is a disqualifying medication, so you would need to be off that one. Flexeril may be taken on an intermittent basis with an eight day no-fly waiting period after use. Maxalt has a 24 hour no fly period after use. We would need all the documentation from the initial injury and current status from your treating physician. When you do go to your AME, it would be helpful to take all the records with you. After reviewing them, he or she should be able to advise you on what further documentation might be needed and whether the time is right to return to flying.

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*Penny Giovanetti, D.O., received a bachelor’s degree from Stanford, a master’s in Environmental Health and Preventive Medicine from the University of Iowa and doctorate from Des Moines University. She completed a 27-year career as an Air Force flight surgeon. She is board certified in aerospace medicine, occupational medicine and physical medicine/rehabilitation. She is also a Fellow of the Aerospace Medical Association and a private pilot.*

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**Send your questions to [SafetyBriefing@faa.gov](mailto:SafetyBriefing@faa.gov). We’ll forward them to the Office of Aerospace Medicine without your name and publish the answer in an upcoming issue.**

# FAA Safety Forums at

## SUN 'n' FUN 2017

### April 4 - 9, 2017 - Lakeland, FL

|  | 8:30 – 9:30   | 10:00 – 11:00  | 11:30 – 12:30  | 1:00 – 2:00   |
|--|---|--|--|---|
| <b>Tuesday</b><br><b>April 4,</b><br><b>2017</b>   | <b>NextGen Program Meeting</b><br>(Private Meeting)                                       | <b>NextGen Program Meeting</b><br>(Private Meeting)  | <b>Light Sport Aircraft Maintenance</b><br>Adam Valencic<br>First Landings Aviation  | <b>Bahamas Flying</b><br>Elizabeth Vance<br>Bahamas Ministry Of Tourism                         |
| <b>Wednesday</b><br><b>April 5,</b><br><b>2017</b> | <b>Airmen Certification Standards Update</b><br>Eric Crump<br>ACS Working Group           | <b>Cirrus Maintenance Issues</b><br>Tom Bruno, DM<br>AeroSim Flight Academy                  | <b>Loss of Control</b><br>Jim Alsip<br>FAA Team Rep                                  | <b>ADS-B: 2020 Preparation and Rebate Program</b><br>Scott Foose, FAA<br>NextGen Program Office |
| <b>Thursday</b><br><b>April 6,</b><br><b>2017</b>  | <b>Passing your Flight Test</b><br>Ken Wittak<br>S.A.F.E.                                 | <b>Extreme Fuel Planning</b><br>Joe Kemmerer<br>FAA Team Rep                                 | <b>Class-III Medical Reform</b><br>Robert Jex, FAA<br>Orlando FSDO                   | <b>ADS-B Solutions</b><br>Rick Garcia<br>Gulf Coast Avionics                                    |
| <b>Friday</b><br><b>April 7,</b><br><b>2017</b>    | <b>Maintenance and The Law</b><br>John Carmen, Ph.D.<br>Mediator & Arbitrator<br>A&P / IA | <b>Wright Brothers Master Pilot Awards</b><br>Presented by Regional FAA Administrator<br>TBA |  | <b>Meet the FAA</b><br>FAA<br>Leadership  |
| <b>Saturday</b><br><b>April 8,</b><br><b>2017</b>  | <b>Aviation Training Devices &amp; Pilot Certification Allowances</b><br>Marcel Bernard   | <b>Congressional Town Hall Hosted by Sun-n-Fun</b><br>U.S. Congressmen<br>TBD                | <b>In-Flight Loss of Control Prevention</b><br>Dr. Earl Weener<br>NTSB Board Member  | <b>Unmanned Aircraft Systems - Update 1</b><br>Mike Wilson, FAA<br>ASO-220                      |
| <b>Sunday</b><br><b>April 9,</b><br><b>2017</b>    | <b>TBA</b><br>Inquire at<br>FAA Safety Center   | <b>Aircraft Maintenance</b><br>David Dagenais<br>Aviation Program Mgr<br>FL St. Coll. at Jax | <b>Human Factors: Experimental Accident Analysis</b><br>Mike Millard, FAA<br>AFS-830 | <b>Unmanned Aircraft Systems - Update 2</b><br>James Malecha, FAA<br>AFS-830                    |

Link to the Orlando FSDO website for forum schedule updates and other info:  
<http://go.usa.gov/x9MZq>



Schedule subject to change. FAA Forums are held at the FAA's Orlando Field Office (aka FAA Safety Center) located at 4425 Sun-n-Fun Rd. The facility opens daily at 8:00 a.m. and the exhibits are open daily from 9:00 a.m. — 5:00 p.m.

# ADS-B 101



## What It Is, and What It Means to You

As the demand for our nation's airspace grows, NextGen improvements are helping to guide and track aircraft more precisely and on routes that are more direct. The shift to smarter technologies is making air travel safer, more convenient, and more environmentally friendly.

Automatic Dependent Surveillance-Broadcast (ADS-B) is a foundational NextGen technology that uses information from the GPS satellite system to track aircraft in real time and improve situational awareness. Pilots will be able to fly safely with less assistance from air traffic control (ATC). ATC will be able to manage the flow of traffic far better than current infrastructure allows. "ADS-B increases safety and efficiency to help meet the increasing air traffic predicted in coming years," says Bobby Nichols, FAA Surveillance Services Group Manager.

ADS-B has the following characteristics:

- It's **Automatic** — Transmits location and other information, every second (vs. transponder every 5 to 12 seconds), with no pilot action.
- It's **Dependent** — It is dependent on aircraft being equipped with a rule compliant position source and signal transmitter.
- **Surveillance** through GPS information — The signal includes aircraft position and velocity vector derived from the position source, which is typically a GPS receiver. Position accuracy is independent of the distance from the ground station.

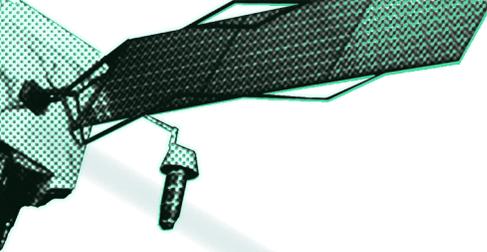
- **Broadcast** of the aircraft's position — ADS-B equipment automatically transmits data to controllers and to any aircraft equipped to receive ADS-B. ADS-B targets display in real time.

### How Does ADS-B Work?

ADS-B works by having aircraft avionics regularly broadcast position, velocity, and identification information from an aircraft to ATC and other aircraft that can receive ADS-B data. Accurate position data, along with the velocity of the aircraft, is derived from satellite navigation signals received by the aircraft's position source. ADS-B avionics integrate this information with data obtained from other aircraft sources (i.e., flight management system, altimeter, and traffic collision avoidance system (TCAS) units) to generate a comprehensive data set for the aircraft. This data is transmitted by ADS-B avionics on one of the approved ADS-B datalinks (more details in the ADS-B Mandate section) at a rate of once per second or better. It provides frequent updates for tracking aircraft movements and determining state changes of the aircraft. This transmission is referred to as ADS-B Out. Aircraft within "line of sight" equipped to receive the data and ADS-B ground stations up to approximately 250 miles away receive these broadcasts. The ADS-B ground system then processes this data and displays it to ATC for use in providing separation services to aircraft.

The ADS-B system combines other surveillance data (i.e., radar, wide area multilateration, etc.) for





non-ADS-B-equipped aircraft, and subsequently transmits this information from ground stations to ADS-B-equipped aircraft as Traffic Information Service-Broadcast (TIS-B), a temporary service to encourage early ADS-B equipage and ease the transition to a NextGen surveillance environment. After the ADS-B mandate takes effect on January 1, 2020 and ADS-B equipage is near-universal, aircraft will be able to receive ADS-B surveillance data directly from other aircraft without reliance on the FAA's ground infrastructure, bringing the situational awareness benefits of ADS-B to airspace where surveillance wasn't previously available.

Properly equipped aircraft also receive the ADS-B Out signals from other equipped aircraft. This use of data in the aircraft on cockpit displays is referred to as ADS-B In. Ground stations also send out, on the universal access transceiver (UAT) link only, graphical weather information and flight information, such as temporary flight restrictions — this is called Flight Information Service-Broadcast (FIS-B).

### ADS-B Mandate

The equipment used to broadcast GPS-derived location information, “ADS-B Out,” is mandated by January 1, 2020, for aircraft flying in certain airspace — generally the same busy airspace where transponders are required today (see Title 14 Code of Federal Regulations (14 CFR section 91.225)).

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

ADS-B is broadcast on two datalinks — 1090 MHz and 978 MHz (UAT). Your decision on which type of ADS-B Equipment you will need is based on where you fly. Aircraft operating above FL180 (18,000 feet) or internationally, must be equipped with a Mode S-transponder-based ADS-B transmitter. Aircraft operating below 18,000 feet and within ADS-B rule airspace, must be equipped with either Mode S transponder-based (1090 MHz) ADS-B equipment or Universal Access Transceiver (UAT) equipment. UAT equipment provides the ability to receive traffic and weather data provided by the FAA ADS-B network.

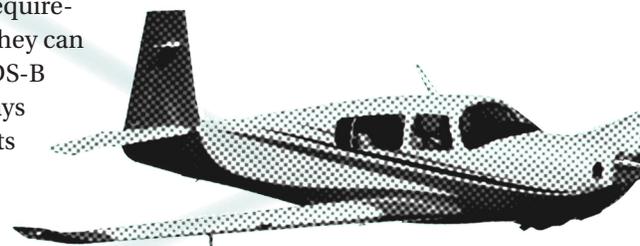
To meet the minimum requirements for ADS-B

Out, an aircraft must be equipped with three things:

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

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

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



### Benefits for General Aviation

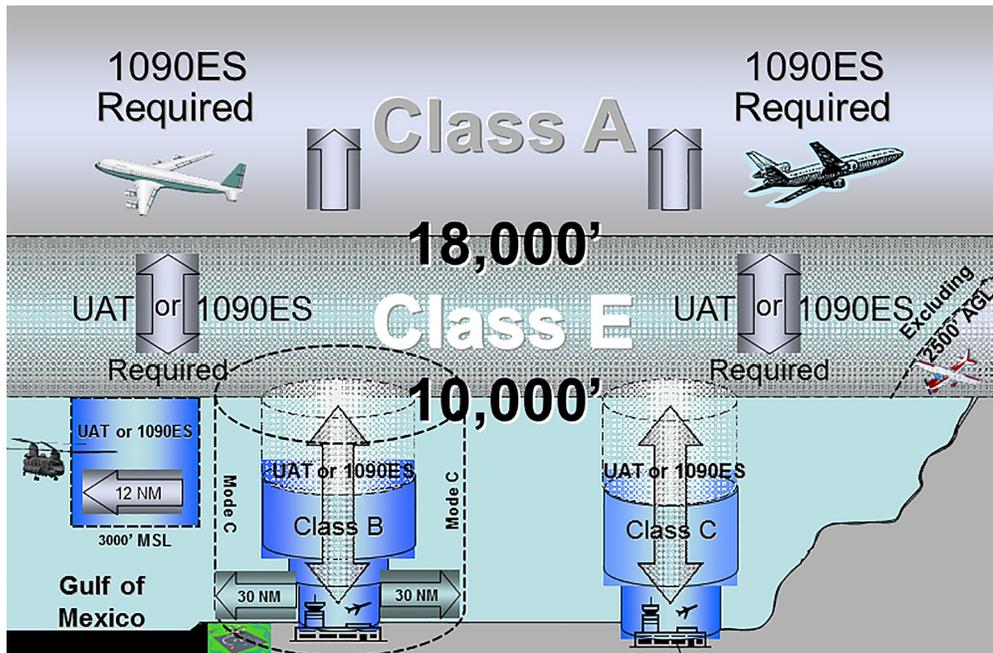
With ADS-B operational across the country, general aviation pilots in equipped aircraft will have access to services that provide a new level of safety and efficiency.

General aviation and air taxi aircraft equipped with ADS-B Out will enjoy more efficient spacing and optimal routing in non-radar environments, including the busy airspace in the Gulf of Mexico, mountainous regions of Colorado, and the lower altitudes of Alaska.

The precise surveillance provided by ADS-B also improves life-saving search-and-rescue operations. Air traffic controllers tracking aircraft with ADS-B Out have much better information about last reported positions and velocity, helping to take the “search” out of search and rescue.

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

With an ADS-B In system that receives the UAT



*This graphic generally depicts the airspace where ADS-B Out will be required by the rule. Visit [www.faa.gov/nextgen/equipadsb/airspace/](http://www.faa.gov/nextgen/equipadsb/airspace/) for more information.*

link, graphical weather displays help pilots make more efficient route decisions and avoid the dangers of hazardous weather. These systems also receive notices of important flight information, such as temporary flight restrictions or closed runways.

“ADS-B pilot advisory services are provided at no subscription cost to the user,” adds Gray.

**Regulation Reminder** – All ADS-B equipped aircraft are required to operate their ADS-B Out transmitter **at all times** including while on the surface of the airport — 14 CFR section 91.225(f).

### When to Equip With ADS-B

Throughout the country, general aviation aircraft owners are equipping with ADS-B. In December 2016, the FAA detected over 22,000 general aviation and air taxi aircraft that are equipped with rule-compliant ADS-B Out. The data also shows that about 20,000 aircraft are equipped with ADS-B In avionics.

“The FAA is encouraging owners to equip as soon as possible to capture the benefits of ADS-B and to ensure they will be able to continue flying in designated airspace when the rule goes into effect in January 2020” says Nichols. “Because the rule has been published since 2010, there are no plans to extend the deadline beyond that date.”

If you are unsure where to begin your path to ADS-B equipage, check out the FAA’s Equip ADS-B website: [www.faa.gov/nextgen/equipadsb](http://www.faa.gov/nextgen/equipadsb). This valuable online tool contains a searchable database of ADS-B avionics solutions provided by the

manufacturers of all commercial and GA aircraft, frequently asked questions, and other information to help you make an informed decision.

Some may wonder whether costs will come down in the next few years. “That is difficult to predict, but it is not expected given that units are now available for as little as \$2,000,” says FAA Air Traffic Systems Technical Advisor Doug Arbuckle. “If too many aircraft owners wait to equip, suppliers and installers will not be able to keep up with demand and prices could possibly increase as the rule deadline draws near.”

There are no obstacles now for owners to equip with ADS-B. All of the necessary standards for certification and operational approvals have been in place since 2011. Additional guidance, such as operations specifications and guidance for field approval, has also been published.

The transformation made possible by ADS-B will improve safety, increase efficiency, and reduce the cost and complexity of the air traffic control system. The sooner aircraft owners equip, the sooner they will enjoy the many benefits of ADS-B surveillance. ✈️

*The FAA Surveillance and Broadcast Services (SBS) Office is responsible for implementing Automatic Dependent Surveillance-Broadcast (ADS-B) technology into the National Airspace System (NAS).*

### Learn More

#### Equip ADS-B Website

[www.faa.gov/nextgen/equipadsb/](http://www.faa.gov/nextgen/equipadsb/)

#### Surveillance and Broadcast Services Program Website

[www.faa.gov/nextgen/programs/adsb/](http://www.faa.gov/nextgen/programs/adsb/)

# Getting it Right

## What You Need to Know About ADS-B Installation Errors

**D**o you hear that? It is the rhythmic tick-tock of time marching ever forward. Time is the one thing we are helpless to stop. By now, you've no doubt realized the theme of this issue of *FAA Safety Briefing*: being prepared for the rapidly approaching ADS-B mandate that will take effect on January 1, 2020. We can all debate the merits of the mandate, but we cannot ignore the reality. To paraphrase the George R.R. Martin novels, *A Song of Ice and Fire*, "January 2020 is coming."

### What's Next?

We explain the functionality and requirements of ADS-B elsewhere in this issue, so this article will look at three specific areas regarding ADS-B installation. First, we will explore some of the things you should know when selecting a shop to do the installation work. Second, we will examine some common problems that can occur during that process. Finally, we will offer some advice as to what aircraft owners should expect before accepting an installation.

### What Difference Does the Shop Make?

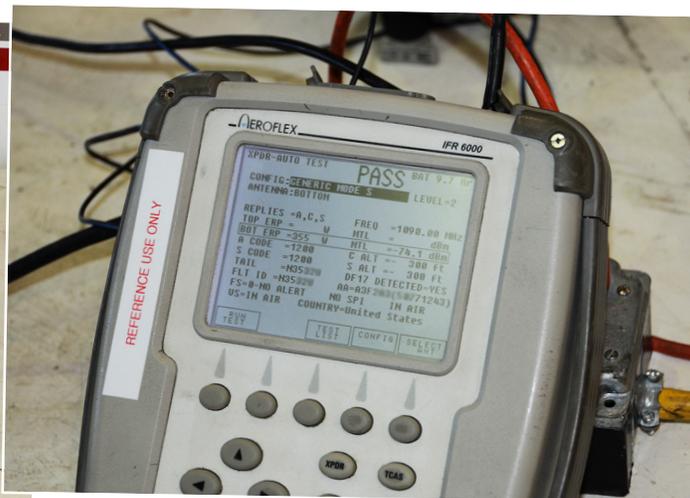
As it turns out, quite a bit. During the FAA's ADS-B panel discussion at AirVenture in Oshkosh, Wisc., I heard several scary stories of shops needing multiple tries to get an ADS-B install right, which lead to many frustrated owners and extensive aircraft downtime. Anecdotes don't make a trend, but it was still troubling. Could it really be that hard? The answer is both yes and no. "With these newer avionics, it's as much about computer programming as it is about installing radios," explains Dawayne Wilcox, the Avionics Manager for Capital Aviation in Manas-

sas, Va. I visited Capital Aviation as they finished up an ADS-B In and Out installation on a Cessna 172. Wilcox recommended using a shop that is familiar with this type of installation, as there are many small details that can render an installation non-compliant (more on that later). Wilcox walked me through the test process Capital uses to ensure that an installation will be compliant. Specifically, this shop utilizes ground testing equipment that can receive and display the signal transmitted by the ADS-B unit. This test allows technicians to verify that all parameters are correct before the test flight.

Not all shops have ADS-B testing equipment, nor is it a requirement. It is a helpful tool that can save time and aggravation, but a shop can certainly do an installation successfully without it. The main thing is to be sure the shop you select has an established process to test the installation. It could be as simple as a test flight and successful performance report. You also want to be sure the shop you select has experience working with modern avionics and the programming that comes with them, along with a proven track record when it comes to successful ADS-B installs. Experience with the process and solid procedure go a long way towards avoiding potential pitfalls. In today's modern social media world, it's a good idea to check not only with other aircraft owners around you, but to also seek feedback on shops with sites like Google or Yelp.

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**The three most common installation errors are transmission of the wrong ICAO code, an incorrect flight identification, and Dual-Out boxes using different ICAO codes.**



ADS-B ground testing equipment, as shown here, can verify all parameters are correct after an ADS-B installation.

Another thing to consider is the level of support you or your avionics shop can expect from the manufacturer. Wilcox reported that while some are better than others, most major manufacturers are very responsive in addressing issues related to a particular installation. Still, it's helpful to check with the manufacturer's user base to see what kind of support to expect both during and after the installation.

### What Could Possibly Go Wrong?

Famous last words — what could possibly go wrong? In a word — lots. FAA data shows that about 5,000 of the 27,000 ADS-B Out installations have performance problems or transmit incorrect data. Most (4,100) of those are single-engine GA aircraft.

To investigate what can happen and, more importantly, how to avoid common problems, I turned to James Marks of the Flight Standards Service's Maintenance Division. Marks is the ADS-B Focus Team Leader and, as such, he is actively working to help cut down on installation errors.

"The three most serious errors that we regularly see are: transmission of a wrong ICAO code, an incorrect flight identification (aircraft call sign), and Dual-Out boxes using different ICAO codes," Marks explained. Here's the story. ADS-B has an FAA-assigned 24-bit ICAO code. This code is different from the flight identification, which should match the aircraft's N-number. The installation technician must enter this information to comply with the rule, and glitches do occur. One of the ADS-B Focus Team's highest priorities is to quickly contact any aircraft owner with incorrect ICAO codes or flight identification. The FAA handles about 200 of these cases per month. A related issue is call sign mismatch for aircraft using a call sign instead of an N-number. This issue doesn't arise for the vast majority of GA, but

you can find more information in the article, "What's in a Name?" in this month's *FAA Safety Briefing*.

While that covers the first two issues, the third is a special twist of technology. When the rule was first proposed, the idea was that aircraft would have to equip with either a Mode S transponder (operating on 1090 MHz) or a Universal Access Transceiver or UAT (operating on 978 MHz). Both meet the requirement for an ADS-B transmitter. To ensure that their aircraft is seen in all airspace (including outside of FAA ADS-B coverage), some aircraft owners are equipping with both device types. This approach can result in a "dual out" problem.

"If the ICAO code in your Mode S transponder (reporting to the ground on 1090 MHz) and your UAT avionics (reporting on 978 MHz) are different, your aircraft may appear on a controller's display as two aircraft in close proximity," Marks explains. "Also, if your aircraft is equipped with ADS-B In, you may see a second aircraft displayed very close to your own position, prompting you to try to avoid an aircraft that isn't there."

The ADS-B Focus Team is also working a reporting issue called Air/Ground determination. That means the FAA has detected ADS-B equipped aircraft reporting in airborne mode while taxiing or stationary. This problem stems from issues with the ADS-B avionics that make the actual Air/Ground determination and relay that information to the FAA's ADS-B system. The FAA is working with avionics manufacturers to better understand the issue and determine how to resolve it.

Other common ADS-B installation issues the FAA team has seen include:

- Missing barometric pressure altitude
- Invalid Mode 3/A Code

- Incorrect emitter category
- Aircraft with position errors

## What Should You See Before You Sign the Check?

“We emphasize making sure your installation is compliant with the rule before signing off on work, because many aircraft equipped with ADS-B are operating with some type of unresolved problem,” Marks said. One way to make sure everything is good is to use ground-based testing equipment. This equipment will detect most issues, but the ultimate test is to fly the aircraft in ADS-B rule airspace and request a performance report. The FAA will provide a performance report free of charge, usually within 30 minutes of a flight. You can request your report here: <https://adsbperformance.faa.gov/PAPRRequest.aspx>.

The performance report will tell you what, if anything, needs to be corrected. That, in turn, will help you figure out who needs to fix it. In most cases, the answer is your avionics shop. ICAO codes and Flight ID are set by the installer, and any conflict between 1090/978 MHz outputs should also be corrected by the installer.

As you probably noted from the discussion above, an Air/Ground determination failure is more complicated. The installer is a good first step, but the culprit could also be an issue with the avionics. If the installer verifies that everything else is correct, you will need to go to the equipment manufacturer. If this source is unable to resolve the situation, please contact the FAA via email at: 9-AWA-AFS-300-ADSB-AvionicsCheck@faa.gov to request a review. This communication should include “PAPR Review Request – Air/Ground Failure” in the subject line, and you need to attach a copy of your performance report in the body of the message.

Speaking of the ADS-B Performance Report, the FAA has prepared a user’s guide to help you understand what it all means. The guide – available at <https://adsbperformance.faa.gov/PAPRUsersGuide.pdf> – explains what each section of the report is measuring. As you can see, getting either a copy of your performance report or the opportunity to generate one is a sound means to verify correct completion of the installation work. Think of it as an authoritative, independent review that enables you to sign off on the installation with confidence.

## So We’re Done Now, Right?

Not quite. Getting the installation done correctly is the biggest challenge, but there are some linger-

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

**Public ADS-B Performance Report**

**Operation Summary**

|                |                       |                 |                     |
|----------------|-----------------------|-----------------|---------------------|
| Operation Id:  | 33133673              | Start Time:     | 01-13-2017 15:47:56 |
| ICAO Reported: | A5BEC0 (51337300)     | End Time:       | 01-13-2017 16:22:48 |
| ICAO Assigned: | A5BEC0 (51337300)     | Duration:       | 00:34:51            |
| Tail Number:   | N47                   | Mod:            | 00:34:51            |
| Country:       | United States - Civil | Rule:           | 00:04:29            |
|                |                       | Total Reports:  | 12466               |
|                |                       | Stationary:     | No                  |
|                |                       | Best Msg:       | 2081                |
|                |                       | TIS-B Client %: | 0.0%                |

Detection:  Airborne  Surface

Link Version: 2      Out Capability: 1090      In Capability: 1090

Last Flight Id: N47

Operator:

**Airborne 1090 Analysis Summary**

|              |                     |           |                     |                    |          |
|--------------|---------------------|-----------|---------------------|--------------------|----------|
| Start Time:  | 01-13-2017 15:47:56 | End Time: | 01-13-2017 16:22:48 | Total Reports:     | 12466    |
| Duration(s): | 00:34:51            | Mod:      | 00:34:51            | Rule:              | 00:04:29 |
|              |                     |           |                     | Processed Reports: | 2051     |

Link Version: 2      Out Capability: 1090      In Capability: 1090

Emitter Category: 2 - Small (15,500-75,000lbs)      Antenna(s): 0 - Dual

Last Flight Id: N47

Last Mode 3A: 0126

*The Performance Report allows you to check your installation. Failures will be highlighted in red. Also NO=Pass while YES=Fail.*

ing concerns. “ADS-B performance problems can still emerge after initial installation, so it is a good idea for aircraft owners to check performance with the PAPR service periodically, especially after maintenance or a software update to an ADS-B system component,” Marks said.

The bottom line is that while physical installation errors can occur, the FAA now sees most ADS-B problems on the “programming” of the units. Given the number of parameters that must be precisely set, it’s easy to see how a mere “typo” could botch smooth and correct operation of the equipment. That’s why it is critical to work with a shop that understands the process and has the right capabilities.

The benefits of ADS-B are huge. By arming yourself with a better understanding of ADS-B installation pitfalls, you can reap those benefits right away by ensuring that your ADS-B equipment works properly right from the start. 

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

## Learn More

**FAA’s Equip 2020 ADS-B Installation Website**  
[www.faa.gov/nextgen/equipadsb/installation](http://www.faa.gov/nextgen/equipadsb/installation)

# Everyone 's a Rebate



Photo courtesy of Avidyne

## The FAA's General Aviation ADS-B Rebate Program Explained

THE FAA SURVEILLANCE AND BROADCAST SERVICES OFFICE

The FAA launched the ADS-B GA Rebate Program in September 2016 to encourage owners of less-expensive general aviation aircraft to equip with the new avionics required to meet the ADS-B Out mandate, and enjoy the safety benefits of ADS-B ahead of the 2020 deadline. The program will run for approximately one year, or until all 20,000 rebates are exhausted.

The FAA estimates that as many as 160,000 general aviation aircraft will need to be equipped with ADS-B Out. In order to guarantee that general aviation aircraft that operate in rule airspace are equipped by January 1, 2020, approximately 23,000 aircraft would have needed to equip each year beginning in early 2013. This rate would have

ensured a balance between the expected demand and the capacity of avionics installers.

The incentive program is working. As of January 1, 2017, approximately 4,000 rebates have been reserved, and the monthly equipage rates for rebate eligible aircraft have almost doubled.

**As of January 1, 2017, approximately 4,000 rebates have been reserved and the monthly equipage rates for rebate eligible aircraft have almost doubled.**

The rebate program is also helping to reduce the percentage of ADS-B performance problems because it requires a validation step to ensure the avionics equipment is working properly. Since the validation step requires that the aircraft be flown in rule airspace, there is also an increased awareness of where rule airspace is.

Does the rebate program apply to you? Here are the details:

### Rebate Program Rules

#### Eligible aircraft

Eligible aircraft are defined as U.S.-registered, fixed-wing, single-engine piston aircraft operated by an onboard pilot (no unmanned aircraft systems are eligible) first registered before January 1, 2016. New aircraft manufactured after this date are not eligible.

#### Equipment

New ADS-B avionics that are certified to Technical Standard Orders and meet the rule requirements of 14 CFR section 91.227 (software upgrades of existing equipment are not eligible). Rebates are not available for aircraft already equipped with ADS-B Version 2, or for which the FAA has paid or committed to upgrade.

## Where to Fly

To receive the rebate, eligible aircraft must be flown for at least 30 minutes in the airspace where, under 14 CFR section 91.225, ADS-B Out will be required after Jan. 1, 2020:

- In Class A airspace
- In and above all 30-nautical-mile Mode C veils surrounding Class B airspace
- In and above Class B and C airspace
- In Class E airspace at and above 10,000 feet MSL, excluding airspace at and below 2,500 feet AGL
- At and above 3,000 feet MSL over the Gulf of Mexico from the U.S. coastline out to 12 nm.

**Exception:** In Alaska, Guam, Hawaii, and Puerto Rico, a flight of an eligible aircraft above 10,000 feet MSL and within FAA ADS-B coverage will qualify as meeting the airspace requirements for the rebate program.

If you are eligible for this program, visit the Equip ADS-B website to research eligible equipment. To learn more about the ADS-B Rebate process here's a step-by-step guide:

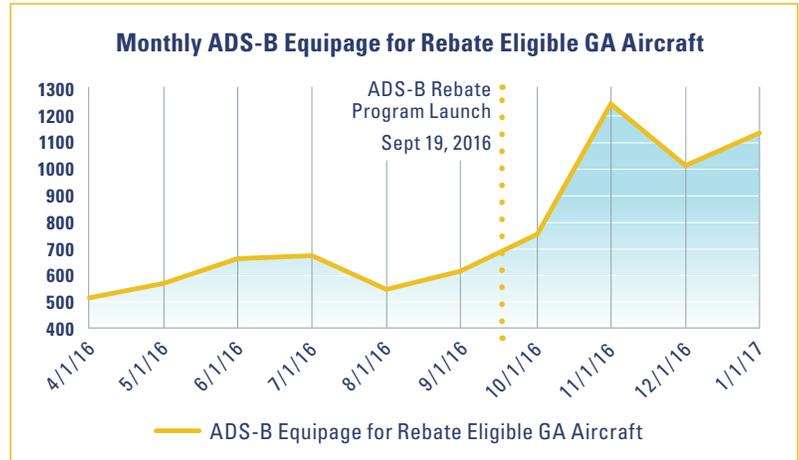
**Decide** on your equipment, arrange for purchase, and schedule installation of TSO-certified avionics. Review and validate the aircraft owner and aircraft-specific information in the FAA's Civil Aircraft Registry (CAR). The FAA will determine rebate program eligibility using the information submitted in the CAR, and all rebates will be mailed to the aircraft owner recorded in the CAR.

**Reserve** your rebate. Before installation, an owner must submit a Rebate Reservation on the ADS-B Rebate website to obtain a rebate reservation code. Ownership information and aircraft eligibility will be checked against the Civil Aircraft Registry during this step.

**Helpful Hint:** The rebate system will only permit reservations to be made 90 days in advance of the installation date. Once your installation date is scheduled, set a reminder 90 days prior to reserve your rebate online!

**Install** TSO-certified ADS-B avionics in the eligible aircraft.

**Fly & Validate** your equipment. Within 60 days of the scheduled installation date, fly your aircraft in the rebate-rule-designated airspace for at least 30 minutes, with at least 10 aggregate minutes of maneu-

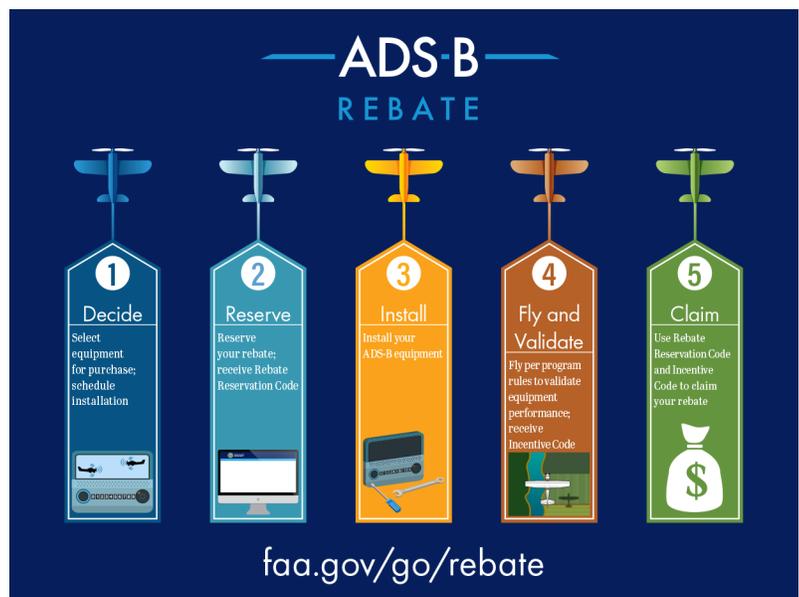


vering flight. After successfully completing this flight, request a Public ADS-B Performance report and General Aviation Incentive Requirements Status report to validate your equipment is working properly.

**If you are eligible for the ADS-B Rebate Program, now is the time to act. There is still time to equip and reserve your rebate before the program ends.**

**Helpful Hint:** Research where rule airspace is near you to ensure you are flying a full 30 minutes within that airspace after your installation. The most common reason for a report failure is that pilots are not flying in rule airspace.

**Claim** your rebate! Upon successful validation of your equipment's performance, you will receive



an Incentive Code via email. Visit the ADS-B rebate website and enter your rebate reservation code and Incentive Code to claim the rebate. After the FAA validates the claim, a check is mailed to the owner.

If you are eligible for the ADS-B Rebate Program, *now* is the time to act. There is still time to equip and reserve your rebate before the program ends.

By participating in the ADS-B GA Incentive Program, you will be ready for the ADS-B mandate and truly able to experience NextGen now. 

*The FAA Surveillance and Broadcast Services (SBS) Office is responsible for implementing Automatic Dependent Surveillance-Broadcast (ADS-B) technology into the National Airspace System (NAS).*

## Rebate Program FAQs

### What is required before registering for the rebate?

The rebate reservation form requires the make and model of the ADS-B equipment planned for installation as well as the scheduled installation date. The rebate reservation software checks for aircraft eligibility using data from the FAA Civil Aircraft Registry.

### Where do I go to make a reservation?

The ADS-B Rebate Reservation System is available from the ADS-B Rebate Website: [www.faa.gov/go/rebate](http://www.faa.gov/go/rebate).

### Why is eligibility limited to TSO-certified equipment?

Since the rebate program is aimed at this segment of the GA community, only TSO-certified Version 2 equipment is eligible. The cost of TSO-certified equipment is typically higher than similar equipment that isn't certified, making it less affordable for cost-sensitive customers. This program is geared to ensure full aircraft compliance to the rule which will ensure continuous access to the rule airspace in 2020. The FAA maintains a list of the eligible equipment at: [www.faa.gov/nextgen/equipadsb/equipment](http://www.faa.gov/nextgen/equipadsb/equipment). This list is updated approximately monthly. However, avionics manufacturers will have the latest status of TSO certification for their ADS-B Version 2 systems.

### Why aren't software upgrades eligible for this program?

Software upgrades are typically much less expensive than new equipment. Since the rebate program is aimed at cost-sensitive owners who need to equip to meet the deadline, eligibility is limited to the purchase of new ADS-B equipment.

### Does a certified installer or repair station have to do the installation to qualify for the rebate?

Aircraft owners who have a standard airworthiness aircraft (e.g. part 23, 25, 27, 29) may have the ADS-B equipment installed by a repair station or an appropriately-licensed A&P mechanic. Owners of aircraft certificated as Experimental or Light Sport must adhere to applicable regulations and established standards when installing ADS-B equipment.

### Why is the FAA requiring that aircraft must be flown in the airspace defined in 14 CFR 91.225 for a minimum of 30 minutes?

This type of flight is essential to validate that the new avionics were installed properly and are rule compliant. Since the target audience is people who generally fly in the designated airspace, they won't find it a hardship to perform the required validation flights.

### After an aircraft owner successfully claims a rebate, how long will take to receive a rebate payment?

Assuming they have met the program rules, applicants can expect to receive a rebate payment in four to six weeks after the FAA has validated their rebate claim and authorized payment.



Photo courtesy of Garmin

# Have you reserved your **ADS-B REBATE** yet?

To be eligible for a **REBATE**,  
your **aircraft** must meet these requirements\*



Fixed-wing single-engine  
piston driven aircraft



Aircraft is U.S. registered



Aircraft not currently  
equipped with Version 2  
ADS-B Out

— **ADS-B** —  
**REBATE**

[faa.gov/go/rebate](http://faa.gov/go/rebate)

\*Complete program rules available at <http://www.faa.gov/nextgen/equipadsb/rebate/>



# What's in a Name?

## How to Avoid an ADS-B Call Sign Mismatch

TOM HOFFMANN

*“What’s in a name? That which we call a rose by any other name would smell as sweet.”*

— William Shakespeare

This enduring line from Shakespeare’s *Romeo and Juliet* deftly underscores Juliet’s effort to interpret the significance of names as mere labels and not let the “Montague” moniker obstruct true love. While that certainly leaves one to ponder the superfluous nature of names, that same logic doesn’t exactly apply in the realm of Automatic Dependent Surveillance-Broadcast (ADS-B) technology. A name, or aircraft registration number/call sign in this case, is critical to the integrity of the ADS-B Out system and pretty much defines who you are in the National Airspace System (NAS).

### Names Matter

ADS-B is the principal workhorse behind the FAA’s new GPS-based surveillance system that aims to improve aircraft separation standards and provide better safety to pilots and passengers. This more accurate system naturally requires more precise data including the aircraft’s identification. The aircraft’s identification can be the aircraft name (approved call sign) or FAA registration number. A large number of operational inconsistencies with ADS-B Out so far

result from a naming problem, or 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. The requirement for your ADS-B to transmit your aircraft identification is stated in Title 14 Code of Federal Regulations (14 CFR) section 91.227(d)(8).

Having these two IDs match might seem simple, but in real world aviation operations, naming conventions aren’t always as straightforward as you would expect. Adding to that is the complexity of a new technology and getting used to all the new procedures it requires. It’s worth noting that a CSMM can lead to significant operational difficulties for air traffic controllers, including distraction and increased workload, so it is important to be aware and fully understand these issues.

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

The best way to verify this is to check your system with the FAA's Public ADS-B Performance Report (PAPR) tool at <https://adsbperformance.faa.gov/PAPRRequest.aspx>. Simply fly in an area of ADS-B coverage and then submit a request. PAPR reports are typically delivered within 30 minutes and can verify if your system's call sign is matched properly with your aircraft as well as detect any other operational deficiencies with your ADS-B transmitter. Some CSMM issues are caused by a simple typo when the technician is first configuring the ADS-B unit. If that's the case, your repair shop should be able to help correct it. If the aircraft identification input on your unit can be manually configured, you may be able to update it yourself.

### A Tale of Two Signs

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

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

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

The ICAO 3LD is typically used by part 121 and 135 operators, as well as corporations, government agencies, and charitable organizations. Using the earlier example with Air Care Alliance flights, their

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

Special call signs are mainly used to enable priority handling by ATC. These might include civil aircraft used for law enforcement, supporting medical emergencies or disasters, or organized events. Operators flying civilian Air Ambulance flights, for example, might use the call sign "Medevac" or "Lifeguard" and coordinate with ATC on any expeditious handling required. Note: you may see some pilots operating medical emergency flights use the "L" Lifeguard designator before their registration number on their flight plan (e.g., LN777PW). Similarly, air taxi operators who do not use a call sign should prefix their registration number with the phonetic word Tango, and file "TN ..." in their flight plan.

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

### Call Sign of the Times

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

"When the average GA pilot is authorized to use a special call sign, they don't always realize that what they use as a name on their flight plan has to match what their ADS-B unit transmits," says James Kenney, an aviation safety inspector with the FAA's

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**The majority of operational inconsistencies with ADS-B Out involve a Call Sign Mismatch (CSMM) issue. This problem occurs any time the aircraft identification listed in a flight plan does not exactly match the ADS-B transmitted aircraft identification.**



Flight Technologies and Procedures Division in Flight Standards. “If you’re transporting rescue dogs and using the call sign ARF234, that’s great. But just remember you have to change your ADS-B aircraft identification to match that call sign. If your ADS-B doesn’t allow you to update the name, you’ll have to revert to using your N-number instead.”

Kenney, who is the FAA point of contact for CSMM, is leading an effort to help educate everyone from GA pilots to air carriers on the need to properly align the aircraft identification they transmit. Regular

**Pilots involved in specialty flying should consider an ADS-B unit that has a pilot programmable call sign feature.**

data feeds from ATC help Kenney identify those involved in CSMMs. A single phone call to an air carrier or corporate flight department can often go a long way in preventing future occurrences. “But with single GA operators, it’s much more time consuming to track these folks down,” says Kenney. Instead, the agency now hopes to rely more on public outreach and industry briefings to educate pilots on how to avoid CSMM issues.

A 30-day snapshot of U.S. air traffic data in July 2016 revealed a total of 44,226 flights with a CSMM. Most (67-percent) were from part 121, 135, and 129 commercial operators, but GA accounted for nearly 30-percent of CSMMs in the study. Many of the GA aircraft were improperly programmed during installation.

“We’re currently in a proactive, helpful mode with the industry,” says Kenney. “We realize this is new technology and that there will be a learning curve for some of these procedures. However, the sooner we can get CSMM issues down to a more manageable level, the sooner we can move forward with enabling a more complete suite of features and services for ADS-B and begin gathering more comprehensive operational feedback.”

**What’s Your Sign?**

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

Those who have already purchased an ADS-B unit can check to see if it has a pilot programmable call sign and if that feature was activated during the installation. You will need to use your registration number if it isn’t programmable, but you can still use the remarks section of the flight plan and approved telephonics to advise ATC of any specialty flying you plan to conduct.

“Flight schools that use a local sign may want to consider purchasing configurable units, or else make the best of what equipment they have,” says Kenney. Another option may be to program the ADS-B transmitter to align with the call sign, for example RDDL23. This option works well when the call sign is assigned to a particular aircraft as opposed to a particular flight, but may present a problem if the pilot desires to use the registration number as a call sign and the ADS-B transmitter is not pilot-programmable. This is an area the FAA is currently examining and policy changes may be forthcoming.

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

Unlike for Romeo and Juliet, names here do matter. But follow this step and you’ll be smelling like a rose!

*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**

**FAA Advisory Circular 120-26L, Assignment of Aircraft Call Signs and Associated Telephonics**  
<http://go.usa.gov/x9GnH>

The Earth is no longer flat.  
Experience an unprecedented level of safety  
and situational awareness with ADS-B.

[faa.gov/go/equipadsb](http://faa.gov/go/equipadsb)

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TEMPORARY FLIGHT RESTRICTIONS

NOTICES TO AIRMEN



NextGEN



# TOP 10 THINGS

## You Need to Know about ADS-B

### *Quick Tips and Information for GA Aircraft*

JENNIFER CARON

**W**ith the fast approaching January 1, 2020 deadline to equip with ADS-B Out, pilots and owners want to learn more.

Here are 10 things you need to know.

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

Only ADS-B Out is mandated, and only within certain airspace. Starting January 1, 2020, you must be equipped with ADS-B Out to fly in the airspace where a Mode C transponder is required today. ADS-B Out greatly improves your visibility to other aircraft by broadcasting your aircraft's position to other aircraft equipped with ADS-B In and to air traffic control (ATC).

Go to [www.faa.gov/nextgen/equipadsb/airspace](http://www.faa.gov/nextgen/equipadsb/airspace) to find the airspace where ADS-B will be required near you. For more information on the mandate, see 14 CFR section 91.225 at <http://go.usa.gov/x97sm> and section 91.227 at <http://go.usa.gov/x97sG>.

You can also integrate ADS-B Out with ADS-B In avionics and displays. ADS-B In equipment is not required by the mandate, but it's a great addition to your situational awareness arsenal. ADS-B In can receive two types of free broadcast services — one

for traffic information services (TIS-B), and another for flight information services (FIS-B).

The traffic picture displayed in your cockpit includes position information reported by other aircraft on ADS-B Out, as well as traffic information relayed from the FAA ground system (TIS-B).

In addition, you can benefit from graphical weather via FIS-B. FIS-B also broadcasts text-based advisories and aeronautical information such as Notices to Airmen, Temporary Flight Restrictions, pilot reports, and the status of Special Use Airspace. These features are only available via broadcasts on 978Mhz.

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

All ADS-B equipped aircraft are required to operate their ADS-B Out transmitter at all times including while on the surface of the airport — 14 CFR section 91.225(f).

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

air. Increasingly, air traffic systems and ADS-B In products are being developed with alerting logic that depends on your ADS-B Out broadcast.

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

Portable ADS-B Out avionics (also known as “suitcase” units) are not an approved option for ADS-B Out.

Here’s why. First, unlike installed equipment where antennas are appropriately positioned — the GPS antenna sits atop your aircraft, and the ADS-B antenna sits on the bottom — portable units use a suction-cup antenna on the window or the glare shield of the plane. That’s where it needs to be to get a usable GPS signal, but that position puts it in a prime spot to obstruct your view, especially if you’re flying VFR.

Additionally, the portable system wiring potentially hampers controls and instruments and, if the antenna is not in just the right place, the signal suffers. In that case, ATC and other aircraft with ADS-B In can’t see you.

Second, portables can transfer from aircraft to aircraft. That sounds like a great idea at first, but that’s where mistakes can become an issue. On a portable, you have to input your aircraft’s N-number — correctly. If you’re off by just one digit, then the ID in your flight plan won’t match up with the ID transmitted by your portable unit. A high number of call sign mismatch incidents happen for this very reason. To learn more, read “What’s In a Name?” in this issue of *FAA Safety Briefing*.

Portable units are acceptable for use with your tablet only for the ADS-B In (ADS-B receiver) feature.

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

You may only install an uncertified transmitter on amateur-built aircraft and light-sport aircraft with

experimental airworthiness certificates if it *meets the performance requirements of Technical Standard Order (TSO)-C166b or TSO-C154c*.

For S-LSA owners, the ADS-B equipment must meet the performance requirements in TSO-C166b; or TSO-C154c, and the installation (i.e., alteration) must be performed in accordance with an applicable consensus standard and authorized by the aircraft’s manufacturer.

Additionally, you cannot install uncertified equipment, including uncertified transmitters on any aircraft with a standard airworthiness certificate. Uncertified ADS-B transmitters that do not meet the performance requirements of an ADS-B TSO will not be permitted to operate in airspace requiring ADS-B after January 1, 2020. ATC cannot use the data from transmitters that do not meet most of the performance requirements of 14 CFR section 91.227 — this means ATC cannot provide flight-following services or separation services to these aircraft.

For GPS equipment, you may install an uncertified GPS on amateur-built and light-sport aircraft with experimental airworthiness certificates. As stated above, uncertified equipment *must meet the performance requirements of a GPS TSO*.

Again, you cannot install uncertified equipment, including an uncertified GPS on aircraft with standard airworthiness certificates. Additionally, position sources that do not meet the performance 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.

Amateur built aircraft and light-sport aircraft owners wishing to install an uncertified device that meets the performance requirements of TSO-C166b

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**All ADS-B equipped aircraft are required to operate their ADS-B Out transmitter at all times including while on the surface of the airport — 14 CFR section 91.225(f).**



**Get the Facts about ADS-B**

**Where is ADS-B airspace?**

✓ If you need a transponder to fly today, then you need to equip

**Isn't equipment expensive?**

✓ Equipment costs have significantly decreased

**Don't I have plenty of time?**

2019  
If you wait until 2019 for an installation appointment you'll be in crowded company.

or TSO-C154c should ensure they obtain a letter from the equipment manufacturer, stating the device meets the performance requirements of either TSO-C166b or TSO-C154c.

You can search equipment options by manufacturer at <http://go.usa.gov/x9bqW>.

More on this topic will be covered in future issues of *FAA Safety Briefing*. The bottom line is that the equipment option you choose must meet the performance requirements, and it must function properly!

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

Here's a quick tip. Always keep the installation instructions from the supplier, including the statement of compliance, in your aircraft records just in case you have any service problems.

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

Avionics vendors offer reasonably-priced, built-in approved position sources, such as WAAS GPS receivers, and package them with ADS-B transmitters.

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

Any GPS receiver used as an ADS-B position source must be an "approved pairing" with the ADS-B transmitter. A GPS receiver must be compatible with the installed ADS-B transmitter. Go to [www.faa.gov/nextgen/equipadsb/equipment/](http://www.faa.gov/nextgen/equipadsb/equipment/) for a list of certified equipment and pairings.

Mixing and matching GPS receivers with ADS-B transmitters in the field (accomplished via field approval) is not permitted unless the equipment was shown to be compatible via a previous certification effort with the FAA (for example, a Supplemental Type Certificate).

There are many options, but only certain combinations of GPS receivers and ADS-B transmitters function properly. Contact the equipment manufacturer if you are not sure which GPS receivers are approved for your ADS-B system.

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

If you're flying in Class A airspace, you will need a 1090 megahertz extended squitter (ES) transmitter. You will also need a 1090ES ADS-B Out transmitter if you operate outside the United States in airspace where ADS-B is required.

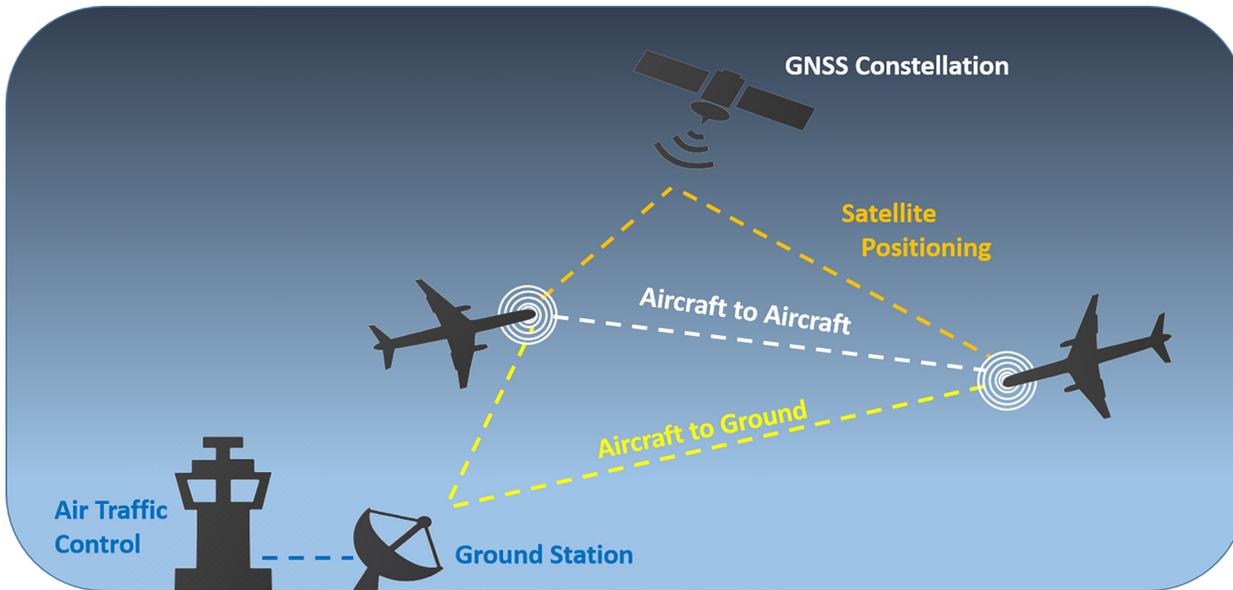
Always flying below Class A, and not internationally where ADS-B is required? Then you have a choice between a 1090ES or a Universal Access Transceiver (UAT) transmitter.

The majority of Class E airspace is outside of ADS-B required airspace. In particular, airspace that starts at 700 / 1,200 feet above the surface up to 10,000 feet mean sea level (MSL), except from the Gulf of Mexico shoreline out to 12 nautical miles offshore. You can still be above 10,000 MSL, but below 2,500 above ground level (AGL) and not be required to have ADS-B.

For a detailed look at the ADS-B requirements per airspace, go to [www.faa.gov/nextgen/equipadsb/airspace/requirements](http://www.faa.gov/nextgen/equipadsb/airspace/requirements).

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

The United States' ADS-B-Out mandate will affect foreign aircraft operators. Starting January 1, 2020, all aircraft, including foreign-registered aircraft that operate in, or fly through the United States, must be equipped with ADS-B Out to operate in ADS-B required airspace in the United States. The ADS-B Out equipment must comply with the



performance requirements found in 14 CFR sections 91.225 and 91.227.

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

As we have noted in other articles, 2020 sounds like a long way off. From a repair shop’s point of view, though, 2020 is just around the corner. As we draw closer to the deadline, avionics shops may become inundated with appointments from owners who waited until the last minute. You may be unable to get a service date before the deadline, and you will not be allowed to fly in ADS-B required airspace until your aircraft is ADS-B Out equipped.

Now is also a good time to install, so you can take advantage of the FAA’s \$500 rebate program for installing ADS-B on certain types of single-engine aircraft. And don’t forget — after the install, you have to fly into rule airspace to validate that your ADS-B Out equip-

ment works before you get the rebate. See the article “Everyone Loves a Rebate” in this issue for more information, or visit <http://go.usa.gov/x92hM>. 

*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

**Check out this question and answer tool to find out if you need to equip, at**

[www.faa.gov/nextgen/equipadsb/equip](http://www.faa.gov/nextgen/equipadsb/equip)

**See the performance requirements of TSO-C166b and TSO-C154c, at**

<http://go.usa.gov/x9ApK> and <http://go.usa.gov/x9FvQ>

**See “The Ins and Outs of ADS-B,” at**

[www.faa.gov/nextgen/equipadsb/ins\\_and\\_outs/](http://www.faa.gov/nextgen/equipadsb/ins_and_outs/)

## GA SAFETY ON THE GO



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## Prepare to be Assimilated ...

*I have a resistance to change in things that I feel comfortable with and that I'm used to.*

— Dennis Quaid

The actor Dennis Quaid is not the only one who doesn't like any change from "things I feel comfortable with and that I'm used to." Indeed, I think he describes a characteristic common to the entire human race. We know what we like, and we best like what we already know.

### Whenever I Feel Afraid ...

Change, however, is as constant and as relentless as the *Star Trek* Borg, who counseled (sort of) that resistance is futile and commanded the conquered to prepare to be assimilated.

Though I wouldn't argue that the kind of change wrought by the (fortunately) fictional Borg was a Good Thing, I do contend that those of us in aviation should be more like the lead character in a certain Rogers

& Hammerstein musical I recently watched, open to adopting and assimilating new things. It helps to remember that everything now familiar was once "new." It wasn't that long ago that pilots accustomed to A-N radio ranges were grouching about the quirks and complexities of the new-fangled Very High Frequency Omni-directional Range (VOR) technology which, in turn, is literally losing ground to satellite-based GPS navigation.

### Is ... a Puzzlement!

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" (!) made my hair hurt. I didn't want to have to learn this new stuff, and I was certainly not anxious to see yet another expense for GA flying.

Just as necessity is the mother of invention, inevitability is the driver of acceptance. The 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 most controlled airspace. As you probably know, ADS-B is the foundational technology for NextGen, the FAA's

term for the diverse set of technologies and procedures to move the method of controlling our National Airspace System (NAS) from today's ground-based radar to satellite-based GPS technology.

### Getting to Know You

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. If your reaction is anything like mine, I think you'll find that ADS-B is, as the Rogers & Hammerstein song goes, "precisely your cup of tea."

To help you through that get acquainted process, the FAA has developed a number of resources available via the links below:

*Is ADS-B Out required where I fly?* Check out the interactive map of the airspace you use for an overview of ADS-B requirements in those areas. ([www.faa.gov/nextgen/programs/adsb](http://www.faa.gov/nextgen/programs/adsb))

*Do I need ADS-B Out equipment?* The FAA website includes a decision tree to help you figure out if you need to equip. ([www.faa.gov/nextgen/equipadsb/equip](http://www.faa.gov/nextgen/equipadsb/equip))

*What equipment meets the regulatory requirement?* The FAA maintains an online list of certified equipment that meets the performance requirements of the ADS-B equipage rule. You can also search the equipment database by aircraft make and model, either as separate components or complete installation solutions. You will find both equipment that is already FAA-certified and equipment in the process of certification. ([www.faa.gov/nextgen/equipadsb/equipment](http://www.faa.gov/nextgen/equipadsb/equipment))

*How do I participate in the incentive (rebate) program?* If your aircraft is a fixed-wing single-engine piston-driven aircraft registered in the United States and not already equipped with ADS-B Out, you could be eligible for a \$500 rebate. ([www.faa.gov/nextgen/equipadsb/rebate](http://www.faa.gov/nextgen/equipadsb/rebate))

*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.*

**Those of us in aviation should be more open to adopting and assimilating technological changes such as ADS-B.**

### Learn More

[www.faa.gov/nextgen/equipadsb/faq](http://www.faa.gov/nextgen/equipadsb/faq)

[www.faa.gov/nextgen/equipadsb/resources](http://www.faa.gov/nextgen/equipadsb/resources)

# Look. Listen. FOCUS

LIVES  
ARE AT  
STAKE!



28

- **IT CAN HAPPEN TO YOU:** You may accidentally land without a clearance when transitioning from a non-towered airport to a towered airport.
- **THE FIX:** Place a brightly colored sticky note reminder on the instrument panel with tower frequencies so you won't forget!



Federal Aviation  
Administration

For additional runway safety education, take the AOPA Air Safety Institute's Runway Safety online course at [www.airsafetyinstitute.org/runwaysafety](http://www.airsafetyinstitute.org/runwaysafety).

# ROLL of HONOR



## Wright Brothers Master Pilot Award

The FAA's most prestigious award for pilots is the Wright Brothers Master Pilot Award. It is named in honor of the first U.S. pilots, the Wright brothers, to recognize pilots who have demonstrated professionalism, skill, and aviation expertise by maintaining safe operations for 50 or more years. The following master pilots were recognized in 2016. For more about the award, go to [faasafety.gov/content/MasterPilot](http://faasafety.gov/content/MasterPilot).

|                    |    |                     |    |                       |    |                     |    |                    |    |
|--------------------|----|---------------------|----|-----------------------|----|---------------------|----|--------------------|----|
| John Brown         | AK | Robert Hall         | CA | James Beisner         | FL | John Carter         | GA | Philip Gutwein     | IN |
| Merle Frank        | AK | Thomas Harnish      | CA | Joseph Blandford      | FL | William Coody       | GA | Raymond Hodgson    | IN |
| Terry Holliday     | AK | Gerard Hufnagel     | CA | Leroy Buell           | FL | Harold Davidson     | GA | Peter Keys         | IN |
| Dale Moore         | AK | Richard Jensen      | CA | Harris Collier        | FL | Richard Donica      | GA | John Lutz          | IN |
| Richard Randolph   | AK | Robert Jerauld      | CA | Robert Courtney       | FL | Ralph Dougherty     | GA | Louis Owen         | IN |
| Jack Schnurr       | AK | John Keenan         | CA | Allan Cragg           | FL | Thomas Fisher       | GA | Michael Stock      | IN |
| Orin Seybert       | AK | John Krizman        | CA | Michael Day           | FL | Ronald Gause        | GA | Stewart Van Dyke   | IN |
| —————              |    | George Lessard      | CA | Salvatore DeVincenzo  | FL | George Harrison     | GA | —————              |    |
| Richard Coxey      | AL | Robert Leuten       | CA | Lincoln Dexter        | FL | Robert Jones        | GA | Ronald Albertson   | KS |
| William Dobbs      | AL | Barry Lloyd         | CA | Edmund Dunn           | FL | Ralph Knight        | GA | Stephen Berry      | KS |
| Jerry Ford         | AL | James Markel        | CA | George Even           | FL | Willie Leach        | GA | Dlemar Cowan       | KS |
| Alan Freiberg      | AL | Gary Mourning       | CA | Ross Ferland          | FL | Dickie Long         | GA | Mel Crist          | KS |
| Thomas Holer       | AL | Mark Oberman        | CA | Estan Fuller          | FL | Dennis Noll         | GA | Thomas Elliott     | KS |
| Thomas Messer      | AL | Ted Price           | CA | Virginia Gallenberger | FL | Douglas Palmer      | GA | Steve Gunter       | KS |
| Authur Persky      | AL | Thomas Rolander     | CA | Benjamin Gilbert      | FL | Robert Payne        | GA | Alvin Larson       | KS |
| Edward Stevenson   | AL | Gordon Smith        | CA | Marcia Gitelman       | FL | David Reynolds      | GA | Cleland McBurney   | KS |
| Milton Stokey      | AL | Carroll Stephens    | CA | Paul Good             | FL | Clyde Schnars       | GA | Gale McKinney      | KS |
| —————              |    | Keith Thomassen     | CA | Grover Gorman         | FL | Joseph Shepherd     | GA | James Price        | KS |
| Joel Buckner       | AR | Daniel Tyler        | CA | Charles Haggett       | FL | David Stoller       | GA | Karl Svaty         | KS |
| John Ciasca Jr.    | AR | William Willson     | CA | William Hoenstine     | FL | George Stone        | GA | Michael Thomas     | KS |
| Fredrick Dodd      | AR | —————               |    | James Hughes          | FL | Bobby Sweat         | GA | Willard Van Wormer | KS |
| Daniel LaMaster    | AR | David Ayers         | CO | Donald Kerr           | FL | Calvin Tax          | GA | David Waters       | KS |
| Gary Matheny       | AR | Michael Bertz       | CO | Dennis Kochan         | FL | Joseph Watkins      | GA | —————              |    |
| Larry Prentiss     | AR | P. Bovaconti        | CO | Edward Leffingwell    | FL | Theodore Williams   | GA | Robert Allen       | KY |
| James Sheppard     | AR | John Buschmann      | CO | Roger Lund            | FL | Jerome Zaucha       | GA | Carl Leming        | KY |
| Robert Voll        | AR | John Cawood         | CO | Richard MacLeod       | FL | —————               |    | Mark Leming        | KY |
| Curtis Weedman     | AR | David Cole          | CO | M. Mellon             | FL | Robert Bartholomew  | IA | Thomas Odehnal     | KY |
| —————              |    | Lawrence Denton     | CO | Robert Mosley         | FL | Romaine Bendixen    | IA | —————              |    |
| Brian Baker        | AZ | Robert Gold         | CO | Richard Nadeau        | FL | Terry Edmonds       | IA | John Keenan        | MA |
| Phillip Currier    | AZ | Kenneth Gray        | CO | Merle Perrine         | FL | Alois Langasek      | IA | Wayne Mansfield    | MA |
| David Dobson       | AZ | Frank Krutzke       | CO | Daniel Polchinski     | FL | Richard Loven       | IA | George Merriam     | MA |
| Walter Donovan     | AZ | Robert Lynn         | CO | James Porter          | FL | —————               |    | —————              |    |
| William Goin       | AZ | Lowell Manary       | CO | Peter Rummel          | FL | Walter Bender       | ID | Frederick Lagno    | MD |
| Fred Gorrell       | AZ | Jerry Marshall      | CO | Richard Russell       | FL | James Crawford      | ID | Ludwig Rudel       | MD |
| Glenn Jones        | AZ | Ron Randel          | CO | Joseph Sichler        | FL | —————               |    | John Sands         | MD |
| Randall Lippincott | AZ | William Schoen      | CO | Wilbert Sorenson      | FL | Richard Barthel     | IL | Norman Understein  | MD |
| Cary Marmis        | AZ | Lawrence Sittig     | CO | Thomas Talton         | FL | Patrick Boyle       | IL | —————              |    |
| William McLearn    | AZ | Thomas Smith        | CO | Larry Traskos         | FL | James Brian         | IL | John Daniels       | ME |
| Roy Milke          | AZ | William Wagner      | CO | Col. Eugene Vaadi     | FL | Carl Catlin         | IL | Herbert Jones      | ME |
| —————              |    | Robert Wilson       | CO | John Walker           | FL | Barton Cole         | IL | —————              |    |
| Vernon Ackerman    | CA | —————               |    | Thomas Weitzel        | FL | James Gastel        | IL | Robert Deuker      | MI |
| William Armstrong  | CA | Robert Baker        | CT | Leigh White           | FL | Lewis Haines        | IL | Blake Doyle        | MI |
| Barry Brannan      | CA | Joseph Butler       | CT | Betty Williston       | FL | Jerome Lawler       | IL | Robert Heisler     | MI |
| Thomas Bria        | CA | —————               |    | Everett Williston     | FL | Gerald Mitchell     | IL | Leon Jarema        | MI |
| Edwin Dearborn     | CA | Karl Bambas         | FL | Robert Wilson         | FL | Robert Mukenschnabl | IL | William Klungle    | MI |
| Barrett Duff       | CA | David Barron        | FL | David Wright          | FL | Jerrold Seckler     | IL | Clarence Leazenby  | MI |
| James Edwards      | CA | Herman Bayerdroffer | FL | —————                 |    | Kenneth Starzyk     | IL | Donald Mericle     | MI |
| Leonard Federico   | CA | Jack Beall          | FL | William Barry         | GA | —————               |    | David Pratt        | MI |
| James Ford         | CA | Michael Beccario    | FL | George Bowlus         | GA | John Brown          | IN | Jeffrey Randall    | MI |
| Jon Hagstrom       | CA | John Becker         | FL | Paul Canney           | GA | Robert Gibbs        | IN | Floyd Schluckebier | MI |

|                    |    |                   |    |                    |    |                   |    |                   |    |
|--------------------|----|-------------------|----|--------------------|----|-------------------|----|-------------------|----|
| Louis Seno         | MI | Gerald Gable      | NC | Herman Poulton     | OH | David Porter      | TN | Byron Dickson     | VA |
| Dwayne Trovillion  | MI | Kenneth Glass     | NC | Earl Pounds        | OH | Lester Richardson | TN | Lee Fox           | VA |
| Paul Welke         | MI | Thomas Henderson  | NC | Mark Sanderson     | OH | Joseph Roberts    | TN | James Kellet      | VA |
| _____              |    | Joseph MacCabe    | NC | Donald Stamp       | OH | Roscoe Trivett    | TN | George Kickhofel  | VA |
| Frank Ahlman       | MN | David Manzel      | NC | Richard Stepler    | OH | _____             |    | Paul Lilly        | VA |
| Allen Alwin        | MN | Joseph McCabe     | NC | Robert Valcanoff   | OH | Charles Alexander | TX | James Loudermilk  | VA |
| Roderic Broome     | MN | Jack Parks        | NC | Robert Zimpfer     | OH | James Armstrong   | TX | John Molumphy     | VA |
| Jerry Chapman      | MN | Robert Reynolds   | NC | _____              |    | Roscoe Armstrong  | TX | T. Proven         | VA |
| Walter Fricke      | MN | Joseph Spencer    | NC | John Pearsall      | OK | Joseph Beasley    | TX | Frederic Scott    | VA |
| Richard Haas       | MN | _____             |    | _____              |    | William Benton    | TX | M. Takallu        | VA |
| Derwin Hammond     | MN | Verl Addison      | ND | Harold Bauman      | OR | Ralph Boyd        | TX | Robert Walker     | VA |
| James Hammond      | MN | Robert Hanson     | ND | Larry Beck         | OR | William Cole      | TX | _____             |    |
| Daniel Huschke     | MN | Thomas Kenville   | ND | Safron Canja       | OR | Tom Drake         | TX | Stephen DeClue    | VT |
| Richard Johnson    | MN | Donald Kornkven   | ND | Phillip Groshong   | OR | Freddie Eades     | TX | _____             |    |
| Kenneth Kreutzmann | MN | Thomas Nord       | ND | Wayne Hoard        | OR | Larry Ferguson    | TX | Daniel Barry      | WA |
| Dennis Nelson      | MN | Virgil Olson      | ND | John Pike          | OR | Homer Feuchter    | TX | James Cox         | WA |
| Robert Reichel     | MN | Stephen Vivian    | ND | Clifford Robson    | OR | Dale Garber       | TX | Steven Cramer     | WA |
| _____              |    | _____             |    | Sherry Sisson      | OR | Larry Garrett     | TX | Stanley Dammel    | WA |
| James Abbitt       | MO | Ronnie Mitchell   | NE | _____              |    | Billy Gifford     | TX | James Fish        | WA |
| Leonard Ahnsbrak   | MO | Donald Streeter   | NE | Robert Basinger    | PA | Richard Gilliam   | TX | Donald Flick      | WA |
| Norbert Becker     | MO | _____             |    | Frank Bria         | PA | Richard Graham    | TX | Roger Gerhardt    | WA |
| Max Bradley        | MO | Kenneth Costa     | NH | Joseph Chabal      | PA | Clayton Harper    | TX | Michael Haynes    | WA |
| Robert Burke       | MO | Robert Martin     | NH | John Green         | PA | Robert Henry      | TX | Douglas Herlihy   | WA |
| Charles Eakle      | MO | Harvey Sawyer     | NH | Frederick Kessler  | PA | William Hooten    | TX | Dwight Irby       | WA |
| John Everly        | MO | _____             |    | Larry Kreider      | PA | William Jones     | TX | William Jackson   | WA |
| Mark Ingram        | MO | Craig Johnston    | NJ | John Marsh         | PA | James Kerr        | TX | Albert Jones      | WA |
| George Knirsch     | MO | James Mancini     | NJ | Geoffrey Nye       | PA | James Knox        | TX | David Kriener     | WA |
| Irvin Langa        | MO | Terrell Stacey    | NJ | William Rhoadarmer | PA | Roland Kukis      | TX | Ove Larsen        | WA |
| Lee Magnuson       | MO | George Swede      | NJ | Laurence Rutt      | PA | Leonard Kule      | TX | John Miller       | WA |
| David Matheny      | MO | Ronald Wiley      | NJ | Allen Taylor       | PA | George Lenhart    | TX | Lauren Rice       | WA |
| James Mize         | MO | _____             |    | _____              |    | Kenneth Lifland   | TX | Ellsworth Shewell | WA |
| Marlin Opie        | MO | Timothy Hawkins   | NM | Daniel Allen       | SC | Charles Luigs     | TX | Mark Smith        | WA |
| Gregory Pochapsky  | MO | Ronald Miller     | NM | David Buchanan     | SC | Don Marek         | TX | Leonard Stonich   | WA |
| Robert Prest       | MO | Phillip Oppedahl  | NM | A. Caiazza         | SC | James Marino      | TX | John Torvik       | WA |
| Mark Reinert       | MO | David Pepitone    | NM | Charles Copley     | SC | Thomas Mayo       | TX | Steven Turoski    | WA |
| John Riddick       | MO | _____             |    | Charles Craddock   | SC | Charles McCleary  | TX | Alan Williams     | WA |
| Timothy Rudy       | MO | Bryce Herndon     | NV | Gerald Gaige       | SC | Martin Mitchell   | TX | Robert Wright     | WA |
| Daniel Scott       | MO | John Kelly        | NV | Maurice Hall       | SC | James Murphy      | TX | _____             |    |
| Gerald Smith       | MO | Charles Murray    | NV | William Hipp       | SC | Chip Murphy       | TX | Timothy Anderson  | WI |
| Robert Somerville  | MO | Horace Noble      | NV | Ronald Horton      | SC | Ronald Nelson     | TX | Harold Burton     | WI |
| Jay Underdown      | MO | David Ruth        | NV | Xen Motsinger      | SC | Donald Olson      | TX | Edward Colbert    | WI |
| James Yaiser       | MO | Vince Terrell     | NV | Ralph Pierson      | SC | Robert Parker     | TX | Duane Esse        | WI |
| _____              |    | Vincent Colling   | NY | Donald Purcell     | SC | Larry Reese       | TX | Robert Gillette   | WI |
| Buddie Phillips    | MS | Walter Drago      | NY | Alphonso Rigby     | SC | John Richard      | TX | Thomas Kalina     | WI |
| Jimmy Vaughan      | MS | David Grimm       | NY | William Shook      | SC | John Roosevelt    | TX | Donald Kiel       | WI |
| _____              |    | Gabor Nadasdy     | NY | Darwin Simpson     | SC | Cy Russum         | TX | Gary Schulz       | WI |
| Charles Bloom      | MT | Raymond Sanford   | NY | _____              |    | John Schmitz      | TX | Jimmy Szajkovics  | WI |
| Jerald Cockrell    | MT | Cortland Woodward | NY | Bruce Allred       | SD | Edwin Shaw        | TX | Thomas White      | WI |
| Ralph Delloiacono  | MT | _____             |    | Jerry Ellingson    | SD | John White        | TX | Donald Wichelt    | WI |
| Michael Ferguson   | MT | Larry Clark       | OH | Irvin Lewis        | SD | James Wilson      | TX | _____             |    |
| Dennis Guentzel    | MT | Rex Damschroder   | OH | Jerome Mitchell    | SD | Roy Wright        | TX | Jon Meriwether    | WV |
| Timothy Powell     | MT | David Duntz       | OH | Lynn Riedesel      | SD | Gary Young        | TX | Bill Mullins      | WV |
| Michael Prichett   | MT | Leroy Harris      | OH | _____              |    | _____             |    | William Peters    | WV |
| Frank Stoltz       | MT | Albert Koning     | OH | Ronald Farwig      | TN | Irvin Anderson    | UT | Paul Reynolds     | WV |
| _____              |    | Steven Lutz       | OH | Charles Haynes     | TN | Kenneth Hepner    | UT | _____             |    |
| John Betts         | NC | David O'Maley     | OH | James Johnson      | TN | _____             |    | Daniel Grace      | WY |
| Walter Carnes      | NC | Paul Palmisciano  | OH | William Marrison   | TN | Ronald Brown      | VA | Kent Nelson       | WY |
| Douglas Deming     | NC | Andrew Porter     | OH | W. Pitts           | TN | Clarence Costello | VA | _____             |    |



## Charles Taylor Master Mechanic Award

The FAA's most prestigious award for aircraft mechanics is the Charles Taylor Master Mechanic Award and recognizes the lifetime accomplishments of senior mechanics. It is named in honor of the first aviation mechanic in powered flight, Charles Taylor, who served as the Wright brothers' mechanic and is credited with designing and building the engine for their first successful aircraft. The following master mechanics were recognized in 2016. For more about the award, go to [faasafety.gov/content/MasterMechanic](http://faasafety.gov/content/MasterMechanic).

|                   |       |                      |       |                    |       |                        |       |                   |       |
|-------------------|-------|----------------------|-------|--------------------|-------|------------------------|-------|-------------------|-------|
| Charles Barclay   | AK    | Robert Buswell       | FL    | Ralph Rosenbrock   | IL    | Herbert Pryor          | NC    | Stephen Cline     | SC    |
| Merle Frank       | AK    | Ronald Castagna      | FL    | _____              | _____ | Jack Sullivan          | NC    | Jesse Garrison    | SC    |
| John Pratt        | AK    | Edward Cladwell      | FL    | James Borgo        | IN    | _____                  | _____ | William Kendall   | SC    |
| _____             | _____ | Salvatore DeVincenzo | FL    | Ralph Coats        | IN    | Virgil Olson           | ND    | Lewis Richards    | SC    |
| Garry Bosso       | AL    | Robert Donovan       | FL    | James Hinds        | IN    | _____                  | _____ | William Shook     | SC    |
| George Colbow     | AL    | David Goett          | FL    | Stephen McMurray   | IN    | George Czarnecki       | NE    | _____             | _____ |
| Johnny Hardy      | AL    | Alberto Jenó         | FL    | Paul Swick         | IN    | Joseph Huffman         | NE    | Cuthbert Benjamin | TN    |
| _____             | _____ | Clair Klinger        | FL    | _____              | _____ | Bernard Michael        | NE    | _____             | _____ |
| Curtis Weedman    | AR    | Robert Kopec         | FL    | Norman Andrews     | KS    | _____                  | _____ | Chip Alison       | TX    |
| _____             | _____ | Charles Moore        | FL    | Willard Van Wormer | KS    | Carl Roseman           | NV    | Paul Andreas      | TX    |
| James Kelly       | AZ    | Kent Richards        | FL    | _____              | _____ | _____                  | _____ | Robert Bennett    | TX    |
| Gary Towner       | AZ    | Manfred Scheffler    | FL    | Ronnie Carroll     | KY    | William Angeloro       | NY    | Andrew Bush       | TX    |
| _____             | _____ | Francisco Valdes     | FL    | William Ladd       | KY    | Peter Borneman         | NY    | Stephen Gorham    | TX    |
| Larry Anduha      | CA    | _____                | _____ | _____              | _____ | Paul Casella           | NY    | Terry High        | TX    |
| Steven Buckley    | CA    | Thomas Allen         | GA    | James Elenbaas     | LA    | Nelson Faso            | NY    | William Jones     | TX    |
| Cataldo Catalano  | CA    | Arthur Arace         | GA    | Leonard Farrar     | LA    | Raymond Gould          | NY    | Thanh Pham        | TX    |
| Walter Clark      | CA    | Lee Davenport        | GA    | Robert Hardwick    | LA    | Thomas Noviello        | NY    | Richard Ries      | TX    |
| Richard Conrad    | CA    | Luis Diaz            | GA    | _____              | _____ | _____                  | _____ | Johnny Tate       | TX    |
| James Edwards     | CA    | John Fish            | GA    | Bruce Pratt        | MA    | Donald Albrecht        | OH    | Leroy Willits     | TX    |
| William Eyre      | CA    | Norman Funk          | GA    | Dennis Staffier    | MA    | Raymond Armstrong      | OH    | _____             | _____ |
| James Ferrando    | CA    | David Ishihara       | GA    | _____              | _____ | Robert Mervar          | OH    | Thomas Kellett    | VA    |
| Peter Friedman    | CA    | Robert Johns         | GA    | Frank Del Gandio   | MD    | Bryan Sherby           | OH    | Brooks Smith      | VA    |
| Raymond Hanna     | CA    | Joseph Lino          | GA    | Joseph Rutherford  | MD    | Gary Westfall          | OH    | _____             | _____ |
| Robert Jerauld    | CA    | Robert Parker        | GA    | _____              | _____ | _____                  | _____ | Charles Freehling | VI    |
| Richard Jorgenson | CA    | Wayne Parks          | GA    | Paul Welke         | MI    | William Brown          | OK    | _____             | _____ |
| Ganord Morrise    | CA    | James Rothgeb        | GA    | _____              | _____ | Joseph Diciolla        | OK    | Alvin Bennett     | WA    |
| Ronald Moy        | CA    | John Stevens         | GA    | Roger Poore        | MN    | _____                  | _____ | George Clark      | WA    |
| Rodney Philbrick  | CA    | James Strickland     | GA    | _____              | _____ | Larry Beck             | OR    | Edward Earhart    | WA    |
| Curtis Richard    | CA    | _____                | _____ | Robert Arata       | MO    | _____                  | _____ | Rodney Hiesterman | WA    |
| _____             | _____ | Harold Ansai         | HI    | Lawrence Johnson   | MO    | James Doebler          | PA    | John Mashino      | WA    |
| Edward Dent       | CO    | Myron Kekaula        | HI    | Jimmy Johnson      | MO    | Thomas Hirsch          | PA    | Alan Mindrebo     | WA    |
| Joseph Kilbourne  | CO    | Raymond Yoshioka     | HI    | _____              | _____ | Thomas Lanza           | PA    | _____             | _____ |
| _____             | _____ | _____                | _____ | James Hopper       | MS    | William Latour         | PA    | Timothy Anderson  | WI    |
| Joseph Butler     | CT    | Donald Brigham       | IL    | John Jewell        | MS    | Bernard Lutz           | PA    | Bruce Botterman   | WI    |
| _____             | _____ | Donald Farrer        | IL    | Raymond Ladd       | MS    | Frederick Rippey       | PA    | Duane Hahn        | WI    |
| Gregory Gaden     | DE    | Leroy Liske          | IL    | _____              | _____ | _____                  | _____ | Dennis Maguire    | WI    |
| _____             | _____ | Robert Mukenschnabl  | IL    | Billy Carter       | NC    | Jose Delgado-Colmenero | PR    | _____             | _____ |
| Antonio Aulet     | FL    | Robert Powell        | IL    | Charles Childress  | NC    | _____                  | _____ | Donald Judy       | WV    |
| Wilfred Baez      | FL    | Steven Rader         | IL    | John Denton        | NC    | _____                  | _____ | _____             | _____ |

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## How to Avoid ADS-B Installation Errors

### 3 Techniques to Correctly Set Up the ADS-B System

For most GA aircraft, it doesn't take much to install an Automatic Dependent Surveillance-Broadcast (ADS-B) system. It can be relatively quick and easy and, depending on the aircraft's current communications stack and placement of the ADS-B system, it doesn't have to take a lot of time. The real trick is in the ADS-B setup.

Correct ADS-B system setup requires the installed ADS-B system to *accurately identify the aircraft* to air traffic control (ATC) and other aircraft in the airspace. This aircraft identification data entry task is the responsibility of the avionics installer during the installation of the ADS-B system. Once the repair shop releases the aircraft, in most cases, the owner cannot make changes to, or reconfigure, the system setup.

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. Incorrect settings typically result in a failure (red flag) within an aircraft's ADS-B performance report."

The key, says Marks, is to verify the data configured in the avionics following installation. He notes that most ADS-B equipment manufacturers include checkout tools that an installer can download and run to view the configuration summary page.

Here are the three most important techniques to set up the ADS-B system properly.

#### First — Verify the Emitter Category Code

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.

The emitter category has eight entries in the most common set, Set A. Most GA aircraft are in category 1 for light aircraft (less than 15,500 lbs. maximum takeoff weight), or category 2 for small aircraft (between 15,500 lbs. and 75,000 lbs. maximum takeoff weight). See FAA Advisory Circular 20-165B, section 3.2.3.4, for more details.

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. "A high number of configuration failures have resulted from light aircraft configured as small aircraft, resulting in a non-compliant avionics set-up," says Marks.

#### Second — Verify the Flight Identification

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

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**The majority of ADS-B compliance failures result from improper configuration of the equipment.**

FLT ID errors are most often the result of configuration mistakes. No FLT ID entry 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.

#### Third — 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 assigned ICAO code.

Checking for the presence of an ICAO code during a ground check is not sufficient. Test equipment will verify that an ICAO code is present in the transmission. However, it does not verify that the correct ICAO code is being transmitted.

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 generally no way for 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. "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.

The ADS-B system ground check verifies what is being broadcast by the equipment. Some avionics installation shops have tools on hand to test transponder modes.

After the owner completes a test flight in airspace with ADS-B coverage, the owner and installer should do a post-flight check using the FAA's Public ADS-B Performance Report Request (PAPR) service. Visit the FAA's ADS-B website at <http://go.usa.gov/x9mDG> to generate a performance report. The PAPR service sends an email with all the configuration and

performance details of the ADS-B Out equipment installed on the aircraft. Any configuration errors will show up in red highlight. See the feature article, "Getting it Right," in this issue for more detailed information on PAPR reports.

The integrity and accuracy of the ADS-B equipment itself is the responsibility of the manufacturer. However, it is your job, as the avionics installer, to make sure that the ADS-B system is set up correctly. 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>

Check out the FAA's Public ADS-B Performance Report User Guide at <http://go.usa.gov/x9m5f>

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## Mitigating Mid-air

### *How ADS-B Can 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, which is rapidly improving 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), pilots 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) last November 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](http://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 accident. 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.

Examples of ADS-B’s life-saving potential are not hard to find. One noteworthy account involved *AOPA Pilot* magazine editor-in-chief Tom Haines, whose close call in a *Bonanza* was detailed in an informational video and flyer produced by the FAA’s NextGen office. Haines was on an instrument proficiency flight with an instructor when an approaching Cessna 172 triggered an attention-grabbing ADS-B conflict alert — “traffic, 12 o’clock.” The Cessna, which was headed straight for them, was immediately seen and avoided thanks to the warning.

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 focused 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, be sure to review AC 90-48D for tips on how to flex those Mark Ones and keep your visual acuity in tip top shape.

#### Learn More

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

<http://go.usa.gov/x96NU>

##### **NextGen for General Aviation flyer – July 2016**

<http://go.usa.gov/x96NE>

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

[www.faa.gov/gslac/ALC/libview\\_normal.aspx?id=6851](http://www.faa.gov/gslac/ALC/libview_normal.aspx?id=6851)

##### **FAA Video: ADS-B and General Aviation**

<https://youtu.be/saEdkbq0ZT8>

## Opening the Door to ADS-B

Before the dawn of this decade, helicopter pilots flying under instrument flight rules (IFR) in the Gulf of Mexico had to fly their aircraft only in certain areas or “grid blocks” to ensure safe separation. Large parts of the Gulf lacked radar, so pilots needed to ensure there was plenty of space between helicopters, which made flying less efficient.

In 2010, the FAA Rotorcraft Directorate standards staff and the FAA Air Traffic Organization helped guide the installation of the satellite-based Automatic Dependent Surveillance-Broadcast (ADS-B) system in helicopters, at ground stations along the coast, and on oil platforms. With ADS-B technology in place, air traffic controllers could accurately monitor helicopter flights to ensure they remained separated from one another as they traveled to and from oil platforms in the Gulf.

Helicopter operators that serve off-shore oil, and gas producers in the Gulf, now fly more safely and efficiently because they no longer have to fly under IFR in a grid. The cost of flying under ADS-B in the Gulf, in fact, is little more than flying under visual flight rules (VFR), which does not require flying in grids.

The success of ADS-B technology in the Gulf helps support the FAA’s mandate to have ADS-B technology installed in most U.S. aircraft by January 1, 2020.

ADS-B’s satellite-based technology can provide three-dimensional information (latitude, longitude, altitude) about a helicopter’s position. It also can provide information about an aircraft’s direction, size, and type with real-time images to the cockpit. ADS-B allows aircraft to safely fly closer together, and air traffic controllers can plan arrivals and departures further in advance. These efficiencies will help lower the operating cost of the National Airspace System. 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. This is an advantage over radar which looks out, not down, and has a limited ability to track low flying aircraft, such as helicopters. Despite the limitations, radar will continue to be used as a back-up system for ADS-B, said George Schwab, a Rotorcraft Directorate aerospace engineer helping to coordinate ADS-B installation.

To help manufacturers and operators meet the January 1, 2020, deadline, the FAA’s Rotorcraft Direc-

torate has taken some steps to make installation easier. They include:

- **Allowing Field Approvals:** Field Inspectors from the FAA’s Flight Standards can now approve the ADS-B installation. This allows more flexibility and less red tape. The caveat is that this field approval is only good for the particular aircraft being looked at; a field inspector is not authorized to approve installing ADS-B into an entire fleet of helicopters.
- **Streamlining approvals:** The Rotorcraft Directorate has delegated oversight of most ADS-B installations to aircraft certification offices (ACOs) located throughout the country. This approach helps prevent bottlenecks. “This recognizes the ACOs as now being familiar and competent enough with the new technology, and to not require Directorate involvement in each and every project,” Schwab said.
- **Allowing people to install ADS-B technology through the part 23 Approved Model List (AML) Supplemental Type Certificate (STC) policy (FAA Advisory Circular 23-22).** This policy provides more flexibility with how and where ADS-B technology can be installed. Applicants seeking this approval will still need to provide adequate installation instructions that ensure the equipment performs its intended functions safely and complies with federal regulations. But applicants are not required to comply with a specific “type design,” which details the exact locations to mount devices, antennas, route wire and cables, etc.
- **Installing ADS-B technology can cost between \$3,000 and \$30,000,** Schwab estimates. Pilots and operators who want this technology installed can often work through their local avionics shop to get a field approval for what is not already covered by a STC, an FAA-approved document that covers changes in an aircraft’s design, Schwab said. The shops can help locate the nearest field inspector.

The United States already has the world’s safest and most sophisticated air transportation system. The goal — always the case in the FAA — is to continue the march forward toward even safer skies.



## Why Limit the ADS-B Out Rebate?

Why limit the \$500.00 rebate for ADS-B [Out] equipped single engine aircraft only? Why not some twins, and limited to aircraft based on weight?

— JC

*Thanks for your question, JC. The FAA collaborated with the aviation industry to identify the aircraft owners who are most likely to delay their decision to equip with ADS-B Out because of cost concerns. The Equip 2020 team identified owners of fixed-wing, single-engine piston aircraft as those most likely to have cost concerns. The FAA's objective is to incentivize this large population of aircraft owners to equip as soon as possible.*

## Show Me the ADS-B Out Money

Money for the Rebate comes from what FAA account?

— Dave

*Hi Dave, thank you for your question. The funding for the rebate program comes from money used to support the ADS-B Out program. For more information on this question, and for answers to many other ADS-B Out questions, visit the FAA's Frequently Asked Questions page at [www.faa.gov/nextgen/equipadsb/rebate/faq/](http://www.faa.gov/nextgen/equipadsb/rebate/faq/).*

## AGL Ceilings for Model Aircraft

In your FAA Safety Briefing article 'Safety in Numbers,' you stated that the 400 foot AGL altitude limitation applies to hobbyists as well as part 107 operations. This is NOT true! The 400 foot altitude limit is recommended and not a requirement of Section 336. Model aircraft may be flown consistently with Section 336 and Agency guidance at altitudes above 400 feet when following a community-based organization's safety guidelines.

— John

*Thanks for the feedback, John. You are correct. In the article "Safety in Numbers," the statement that both part 107 operations and Model Aircraft operations conducted under Section 336 and part 101 are limited to a 400-foot AGL ceiling is technically inaccurate. Model Aircraft may be flown consistently within Section 336 and part 101 at altitudes above 400 AGL when they meet all of the applicable requirements in part 101, including following a community-based organization's (CBO) safety guidelines that allow altitudes exceeding 400 AGL. However, a Model*

*Aircraft must not be operated in such a way as to endanger the safety of the national airspace system.*

## Facebook Comment of the Month



I like the FAA loosening up their language like this. I think we need to add don't be a "buttinski" somewhere in the FAR —

Great article and issue to cover.

— Philip

*Thanks for the thumbs up, Philip, on the "Breaking Bad" article from our Nov/Dec issue. The article sheds light on what to do when you see a fellow airman doing something a pilot shouldn't do.*

FAA Safety Briefing welcomes comments. We may edit letters for style and/or length. If we have more than one letter on a topic, we select a representative letter to publish. Because of 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 District Office or air traffic facility. Send letters to: Editor, FAA Safety Briefing, AFS-850, 55 M Street, SE, Washington, DC 20003-3522, or e-mail [SafetyBriefing@faa.gov](mailto:SafetyBriefing@faa.gov).



**Let us hear from you — comments, suggestions, and questions: email [SafetyBriefing@faa.gov](mailto: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](https://www.facebook.com/FAA).**

## In the Next Issue ...



## ADS-B PIREP

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

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

### Trigger Points

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

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

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

Because it was clear that we needed a new transponder, we confined our ADS-B options to transponder-based solutions and, after more duly diligent research both on equipment options and installation facilities, we selected a device that would enable non-certified ADS-B In weather and traffic data for everyone in the club with a tablet and a ForeFlight subscription.

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

### Targets ... Lots of Targets

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

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

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

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



## Jim Marks

*ADS-B Focus Team Lead, Avionics Branch*



Aviation Safety Inspector Jim Marks hoped to earn his wings after high school. His interest in aviation grew from helicopter “war stories” from his father, who served in the U.S. Army during Vietnam. His father, after returning from the war, would drive Jim over an hour

from their home just to watch aircraft takeoff and land at Dobbins Air Force Base in Marietta, Ga.

After high school, an Army recruiter in Carrollton, Ga., had other ideas for Jim. He recommended that Jim enlist to become a helicopter mechanic and, once he reached his first duty station, to apply for Army flight school. So that’s exactly what Jim did. He was later accepted to flight school but chose not to attend as the nuts and bolts of aviation stuck to him like 100 mile an hour tape on a rotor blade.

“I passed on the opportunity to attend flight school to further pursue my career in maintenance,” explains Jim. “I knew that if I became a pilot, I would have to give up something that I enjoyed very much, so I chose a path where I could enjoy both flying and maintenance and went on to become a flight engineer, flight engineer instructor, and technical inspector during my eight and a half years of service with the Army.”

During his final year in the Army, Jim earned his FAA Airframe & Powerplant certificates. After the military, he worked at the Delta Air Lines Technical Operations Center in Atlanta for the next 17 years.

“One of my last positions with Delta was as a regulatory compliance evaluator,” he notes. “It was during this time that I became interested in working for the FAA. In 2006, I was hired as a consultant to support the FAA’s Aviation Weather Program. And a year later, I was hired by the Flight Technologies and Procedures Division under the FAA’s Flight Standards Service to support the Automatic Dependent Surveillance–Broadcast (ADS-B) program.”

Jim now works in the FAA’s Aircraft Maintenance Division, which is responsible for ensuring the airworthiness of civil aircraft. He is the ADS-B Focus Team lead for Flight Standards. The team supports ADS-B Out mandate equipage along with the continued airworthiness of related avionics.

Jim was instrumental in deployment of the ADS-B Performance Monitor, a tool that allows the agency’s Flight Standards Service to provide regulatory oversight of the rule and data to support equipage reporting and the general aviation ADS-B Out rebate program.

He was also responsible for the launch of the Public ADS-B Performance Report (PAPR) service, which is an automated tool to assist aircraft owners, operators, and avionics shops with validation of the performance of ADS-B Out equipment installed on aircraft. During an FAA/industry event in 2014, he was asked how an aircraft owner could obtain a report on their ADS-B avionics performance. This question was answered through the establishment of an email service two months later to process requests for ADS-B performance reports from the public. In mid-2016, the PAPR service became available through a web-based portal (<http://bit.ly/2jwAy3t>) enabling reports to be provided to the public on-demand any time.

“The ADS-B airspace rule requires a specified level of performance from your avionics, so simply installing the equipment won’t ensure you’re in compliance of the regulations once the mandate becomes effective,” explains Jim. “If you already have ADS-B installed, check your system’s performance often through the FAA’s PAPR service and correct any identified problems. You should have the same level of confidence in your ADS-B system performing properly as any other flight critical equipment.”

An air traffic control system based on ADS-B relies on each aircraft to report its position and other information accurately in order to maintain safety.

If you have questions about ADS-B, ask. Jim is actively engaged in the aviation community through ADS-B outreach events around the country. If you attend Sun ‘n Fun, EAA AirVenture, NBAA, an AOPA fly-in, or any other industry event in the near future, you will most likely see Jim there. He’s there to talk to you about ADS-B.



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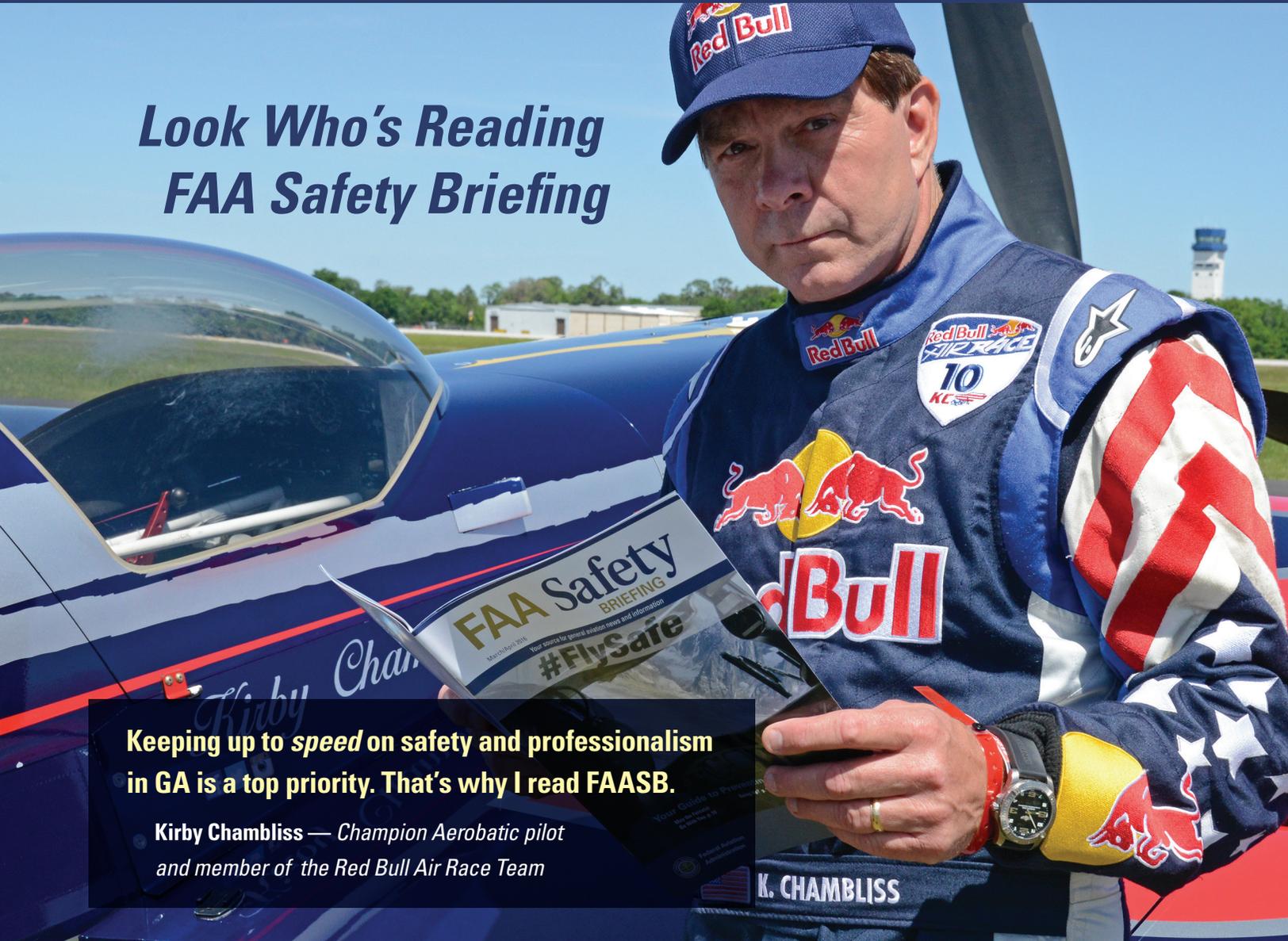


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in GA is a top priority. That's why I read FAASB.**

*Kirby Chambliss — Champion Aerobatic pilot  
and member of the Red Bull Air Race Team*

K. CHAMBLISS