

September/October 2021

FAA BRIEFING Safety

AIRPORTS and AIRSPACE



Federal Aviation
Administration

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Boats to
Satellites

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Forward with
Airport Grants



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of Transportation

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ABOUT THIS ISSUE ...



The September/October 2021 issue of *FAA Safety Briefing* focuses on airports and airspace, which are integral parts of the National Airspace System's (NAS) infrastructure. Articles in this issue explore the value of our nation's vast array of public-use airports and their importance to the communities they serve. We also highlight some critical "rules of the sky," explore nearly a century of evolution in the NAS, and review some best practices for communicating with air traffic control.

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FAA **BRIEFING** Safety

The FAA Safety Policy Voice of Non-commercial General Aviation

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RAMPING UP

Over the past 18 months, we have experienced all kinds of COVID-related events. The pandemic has given us plenty of opportunities to develop new habits and skills, and to exercise words like “unprecedented.” In far too many cases, though, it has deprived us of the ability to exercise other vocabularies and skills we once completed with ease. That list is long, but for purposes of this publication we will focus on the potential for lost proficiency in aviation activities.

If you are a regular reader of this magazine, you probably subscribe as well to some of the aviation community’s excellent publications. Across the board, there has been a lot of ink (real and electronic) invested in reminders on how to regain and maintain proficiency. The *FAA Safety Briefing* team has long contributed to these efforts. If you are looking for a one-stop-shop review of flying fundamentals, take a fresh look at the January/February 2018 “Back to Basics” issue, along with the “Challenge and Response” theme in this year’s January/February edition.

Competence and Confidence

Proficiency with flying skills is obviously important; after all, it’s the first item in the well-known Aviate-Navigate-Communicate trifecta. But the muscle memory involved in piloting an aircraft might sometimes be easier to restore than the mental muscles involved in navigating and communicating, both in the air and on the ground. That’s part of the rationale behind the *FAA Safety Briefing*’s March/April 2021 “Enhancing Surface Safety” theme. This current issue builds on that work with a review of subject matter related to airports,



airspace, and air traffic control (ATC) — to include a look at the elements comprising these fundamental parts of our nation’s aviation infrastructure. On the subject of airports, we’ll review some of the concepts you need to regain both competence and confidence to venture beyond the home ‘drome once again. Among other things, the team takes a look at some of the app-based resources that can contribute to safe operations around new or dimly remembered destinations. We also note the 75th anniversary of this country’s airport grant program, which helps support a crucial part of aviation infrastructure.

Venturing to different destinations involves navigating airspace in addition to the airports you visit. It’s important to remember that airspace configurations can change with each chart cycle, sometimes quite substantially. Don’t just assume you know the airspace you plan to traverse. Long before you head to the airport, sit down with a set of the most current charts and check carefully for any changes.

If you’re going places again via airplane, it’s likely that you’ll need to communicate with ATC. ATC phraseology might not have changed much in the

past 18 months. As we have previously observed, though, “Aviation-ese” really is a unique language with a distinctive grammar and vocabulary. Anyone who has studied a foreign language can attest to the fact that fluency fades fast when you don’t use it on a regular basis. There’s no substitute for real practice, which can include engaging with any of the many ATC simulation tools. To help you get started though, we will review the fundamentals of working with ATC. We think you will also enjoy the retrospective on how today’s national airspace system, or NAS, evolved from its humble origins to the world-class service it offers today.

On a personal note: This will be my last *Jumpseat* column, because I am retiring after 27 years of federal service. It has been a privilege to “meet” you in these pages to share our passion for aviation, and for aviation safety. I wish you all the very best — blue skies and tailwinds!

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Archived issues of *FAA Safety Briefing*
bit.ly/FAASB-Arc

AVIATION NEWS ROUNDUP



New Runway Safety Sim Released

A new animation to the Runway Safety Pilot Simulator stresses the importance of saying “unable” when pilots are not ready or able to accept a clearance from ATC.

14 CFR section 91.123 requires a pilot to follow all ATC clearances and instructions, but the final decision to act on ATC’s instruction rests with the pilot. If a pilot cannot safely comply with any of ATC’s instructions, the pilot should inform the controller immediately by using the word *unable*. Effective communication between controllers and pilots is essential when operating on airport movement areas.

Check out the animation library at RunwaySafetySimulator.com to learn more about this and other topics like eliminating distractions and avoiding runway confusion. The Runway Safety Pilot Simulator also contains three scenarios for both new and rusty pilots to practice taxiing on the airport movement areas, and to and from the runways, by listening to ATC instructions and selecting answers via decision-points.

New System to Track Space Launch and Reentry Vehicles in Near-Real Time

The FAA can now track a space launch or reentry vehicle in near-

real time as it travels through the National Airspace System (NAS). This new capability increases safety for all airspace users and assists the FAA in efficiently managing air traffic during space operations.

The Space Data Integrator (SDI) prototype automates the delivery of vehicle-related telemetry data to the FAA Air Traffic Control System Command Center. This vastly improves the FAA’s situational awareness of where the vehicle is as it travels to space or as it returns to Earth. In addition to existing tools, the FAA can also use SDI to manage air traffic more efficiently as a space operation progresses and address contingencies in the event of an anomaly during a mission.

Previously, the FAA had to close airspace for extended periods of time when a launch or reentry vehicle travels through the NAS. SDI allows the FAA to more dynamically manage airspace and minimize the impact on other airspace users.

In 2020, the FAA safely managed 45 space launches and reentries into the NAS, the most in the agency’s history. For 2021, that number could exceed 70. Go to bit.ly/AirspaceIntegration for more information.

SAFETY ENHANCEMENT TOPICS

Please visit bit.ly/GAFactSheets for more information on these and other topics.



SEPTEMBER

Service Bulletins and the Aircraft Owner —
Understanding the importance of complying with a manufacturer’s Service Instructions and Bulletins.



OCTOBER

Pilots and Medication —
Understanding how drugs can compromise a pilot’s ability to control the aircraft.



UAS by the Numbers as of August 2021

11.5M+: Airspace lookups using the new B4UFLY mobile app
238,571: Total remote pilots
733,159: Total LAANC airspace authorization requests received
514,094: Online recreational UAS registrations
351,244: Online part 107 registrations
868,838: Total UAS registrations, including 3,500 paper-based recreational and part 107 registrations.

All Recreational UAS Operators Required to Take Test



In June, the FAA announced the selection of 16 organizations as FAA-approved Test Administrators (TAs) of The Recreational UAS Safety Test (TRUST). TRUST meets the congressional requirement, under the FAA Reauthorization Act of 2018 (49 U.S.C. 44809), for recreational flyers to take and pass an aeronautical knowledge and safety test. It was developed with input from various segments of the drone community including manufacturers, educational institutions, organizations, and individuals.

All recreational flyers (including children) operating under the exception for limited recreational operations of unmanned aircraft (49 USC 44809) must take and pass the test. This also includes part 107 remote pilots who choose to operate under 49 USC 44809. The knowledge check questions are correctable to 100% and

the test is a “one and done” activity with no need for recurrent testing. Go to bit.ly/FAATRUST for more information on this free test.

New Air Force Commercial Space Agreement

The FAA and the Department of the Air Force signed an agreement aimed at eliminating red tape while protecting public safety during commercial space activities at ranges operated by the U.S. Space Force.

The agreement recognizes common safety standards for FAA-licensed launch and reentry activities that occur on, originate from, or return to Cape Canaveral Space Force Station in Florida and Vandenberg Space Force Base in California. It also removes duplicative processes and approvals for the U.S. commercial space sector.

Under the agreement, the FAA will accept the Space Force’s ground safety rules and other safety processes, analyses, and products as long as they satisfy FAA regulations. The Space Force will accept FAA licensing decisions and generally will not impose its own requirements for the flight portion of a launch or reentry.

In 2020, the FAA licensed 39 commercial space launches, the most in the agency’s history. Of those, 24 occurred at, and were supported by, these two U.S. Space Force ranges. For more on the agreement, see bit.ly/CommercialSpaceNews.

New Weather Cameras Coming Online

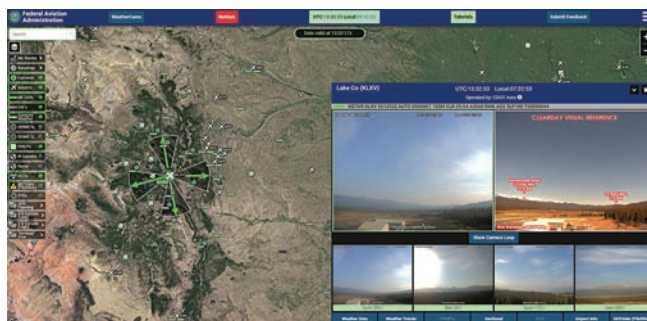
Ten new Colorado weather camera sites went live on the FAA Weather Camera website (weathercams.faa.gov) in June. Colorado now has 23 weather camera sites across the state. The Weather Camera (WCAM) program is working with state departments of trans-

portation (DOTs) to install cameras and integrate images onto the FAA weather camera website. The WCAM program shares the design and technology for operating the cameras with state DOTs who install, own, and maintain the camera systems under cost reimbursable agreements.

The Colorado DOT has cameras situated in some remote areas of the state, including mountain passes that rise above 11,000 feet, which puts the cameras in a good spot to view snow-pack conditions. Recently, the Colorado DOT installed cameras on many 13,000-foot mountain top weather stations where they were already monitoring weather conditions to aid pilots in navigating the passes.

The WCAM program is also working with helicopter medivac operators in several states to add cameras at hospital heliports that may lead to the development of special procedures to support these operations with weather cameras as part of the solution. The program plans to loan camera systems for one year to operators at three locations, one in Michigan and two in Mississippi, to conduct analysis of camera performance and create guidelines for other locations. Similar to the concept with state DOTs, after a one-year test period, the operators will purchase and maintain their own systems while the WCAM program will process, format, and publish images on the FAA weather camera website.

Visit weathercams.faa.gov to learn about new functionality, including a layer menu that allows for customization of icons displayed, keeping frequently used weather products at hand.



ON THIN AIR

Hypoxia (decreased oxygen reaching tissues) is an inherent risk for many in aviation, but there is training as well as regulatory requirements designed to mitigate it.

Pilots who operate pressurized aircraft capable of flight above FL250 are subject to the requirements of 14 CFR section 61.31(g). This regulation ensures that, with certain exceptions, pilots are trained to recognize hypoxia, decompression sickness, and the duration of consciousness at different altitudes. While the training is a one-time requirement, we encourage pilots to regularly reacquaint themselves with these subjects even if not mandated by their employer or insurance company. Note that the U.S. military requires that many of its pilots receive a full day of training, including a chamber ride, every five years in addition to initial training. We encourage pilots to consider at least some of the training covered under section 61.31(g), even if you're not subject to those requirements. Hypoxia can occur at altitudes well below FL250 and some pilots routinely fly unpressurized aircraft above FL250.

HYPOXIA IS AN INHERENT RISK IN AVIATION, BUT THERE ARE REGULATORY REQUIREMENTS DESIGNED TO MITIGATE IT.

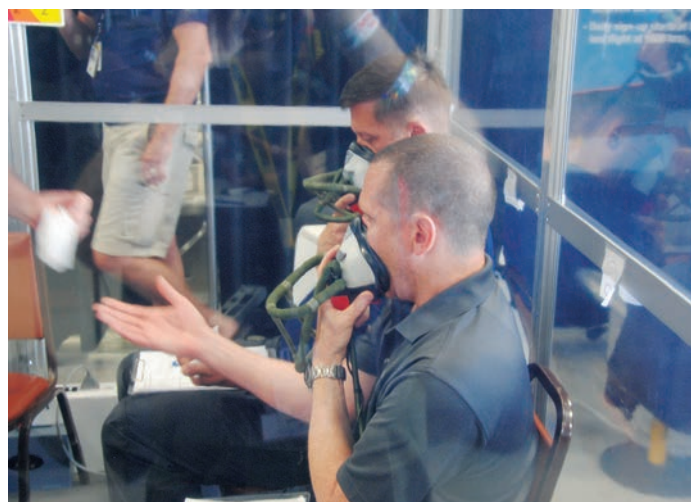
We also recommend hypoxia training for air traffic controllers. Many pilots have been helped by a controller who recognized that a pilot had hypoxia symptoms.

Some pilots believe that living at a higher altitude offers significant protection from hypoxia. This is partially

true. Without question, someone who lives at 9,000 feet will handle an excursion to 12,000 feet better than someone who lives at sea level. However, this benefit rapidly decreases and is subject to individual variability.

So what exactly are the applicable regulations? For the general aviation pilot, 14 CFR section 91.211 applies. While most of us are familiar with the need for oxygen above a cabin pressure altitude of 12,500 feet mean sea level (MSL) for flights over 30 minutes and all flights above 14,000 feet MSL, there are additional rules for pressurized aircraft. For commercial operations, 14 CFR sections 121.327, 121.329, 121.331, 121.333, and 135.89 apply. Note that 14 CFR section 121.333(c)(3) was changed, effective May 23, 2020, to comply with section 579 of the 2018 FAA Reauthorization Act.

Many FAA handbooks discuss hypoxia. In addition, the FAA offers a number of other hypoxia training tools, including an advisory circular (AC) 61-107B CHG 1, *Aircraft Operations at Altitudes Above 25,000 Feet Mean Sea Level or Mach Numbers Greater than .75*; videos ([e.g., bit.ly/FAATVHypoxia](https://www.faa.gov/air_traffic/flight_info/aeronav/FAATVHypoxia)); Aeromedical Safety Brochures; and an in-person, one-day course in Oklahoma City. The latter includes training in either the altitude chamber or the PROTE (portable reduced oxygen training enclosure). Both expose the participant to an oxygen level equivalent to FL250. In the altitude chamber, the atmospheric pressure is reduced, demonstrating attendant effects on the ears, sinuses,



etc. The pilot experiences both controlled (normal) ascent and a rapid decompression, but it can expose the participant to a small risk of decompression sickness. Contact the FAA physiology section at (405) 954-4837 for further details.

A newer, alternative method of demonstrating hypoxia is to have the participant breathe air that has a lower percentage of oxygen. A quick internet search will show a number of commercial providers who offer this training. The FAA version, PROTE, is offered both in Oklahoma City as well as at events like AirVenture and Sun 'n Fun. Since our demand typically exceeds our availability, we are now exploring the possibility of purchasing an additional PROTE system. In the meantime, fly safe and use oxygen before you think you might need it.

Dr. Susan Northrup received a bachelor's degree in chemistry and a medical degree from The Ohio State University, as well as a master's degree in public health from the University of Texas. She is double board certified by the American Board of Preventive Medicine in Aerospace Medicine and Occupational Medicine. She is a retired U.S. Air Force colonel and a former regional medical director for Delta Air Lines. She is also an active, private pilot.



HYPOXIA

The scenery is often spectacular when flying close to the ground, but there are many advantages gained by flying at higher altitudes. Communication improves, as does navigation (other than GPS). Convective activity often decreases. Flight visibility (if out of the clouds) and true airspeed both benefit from higher altitudes. But these benefits come at a cost.

As one ascends, the ambient pressure decreases. On average, it decreases one inch Hg for every 1,000 feet up to 18,000 feet. The rate of decrease is not linear, although close. From sea level (at 29.92 inches Hg on a standard day), pressure decreases by half to about 14.9 inches Hg at 18,000 feet. As pressure decreases, gas expands. That includes the gas in your intestinal tract, sinuses, and ears.

This is not an issue if the pressure can be relieved. If blocked, though, incapacitating pain can result. We therefore recommend not flying with a cold or congestion, even if you're asymptomatic on medications. Gas introduced from medical procedures, even dental work, will also expand and might not have an escape route. I highly encourage discussing these issues with your treating physician (or, even better, your AME) before getting into an aircraft (personal or commercial).

In addition to pressure, the amount of available oxygen also decreases when you ascend. Even though the percentage of oxygen in the atmosphere is nearly constant at 21%, the amount of pressure is less, resulting in one half the amount of oxygen at 18,000 feet than at sea level. This is typically not a problem for someone young and fit, but most risk factors for decompression sickness (DCS) also



increase the risk of hypoxia (below). Use of supplemental oxygen is highly recommended above 5,000 feet, especially at night. 14 CFR section 91.211 outlines the legal requirements, but these are minima. Note also that the nasal cannula, preferred by many pilots, is inadequate for the higher altitudes. See Oxygen Equipment at [bit.ly/OXYEquip](https://www.faa.gov/regulations/policies/procedures/operations/bit.ly/OXYEquip) (PDF).

REMEMBER THAT HYPOXIA IMPAIRS YOUR ABILITY TO RECOGNIZE THAT YOU ARE IMPAIRED.

Oxygen is carried in the blood primarily on the hemoglobin molecule (98%) with some directly absorbed into the blood (as it is in water). Each hemoglobin molecule carries four oxygen molecules, each progressively bound more tightly. The whole dissociation curve is non-linear and can shift from more tightly bound to less tightly. Factors that favor the latter include increased carbon dioxide, acidity, an increase in 2,3 DPG (an organic compound involved in O₂ movement), and heat. Of interest, these factors increase with exercise, which makes sense as that's when O₂ demand is highest.

Factors that adversely affect the oxygen carrying capacity of blood include: smoking, anemia (even though the pulse oximeter can

remain normal), abnormal hemoglobin (sickle cell disease, thalassemia), etc. Prolonged sitting can also lead to impaired oxygen delivery (stagnant hypoxia).

For those pilots who SCUBA dive or snorkel, we recommend no flying after SCUBA for at least 24 hours, whether there was a mandated decompression stop or not. The risk of DCS increases with the depth, bottom time, and number of dives. Other risk factors include age, fitness, obesity, smoking, sleep loss, dehydration, alcohol and other drugs, some heart defects, cold water diving, and lung disease. Flying at low altitude or in a pressurized cabin does not eliminate the risk. I personally have seen divers develop DCS after driving over a 3,200-foot pass following several dives at sea level. When diving, consider safety stops even when not mandatory, stay hydrated, and maximize the surface interval. Note that skin diving, while safer than SCUBA, is not risk free. Repetitive deep dives while holding your breath can increase nitrogen build up in blood and tissues; DCS can result.

Remember that hypoxia impairs your ability to recognize that you are impaired. The best defense, other than supplemental oxygen, is to know your personal symptoms. In this issue's Aeromedical Advisory, Dr. Northrup addresses some of the available training.

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

Look! Listen FOCUS

LIVES
ARE AT
STAKE!



- **IT CAN HAPPEN TO YOU:** When you're approaching an airport that has a set of parallel offset runways, you may accidentally land on a different runway than you were originally cleared for.
- **THE FIX:** During pre-flight, remind yourself of possible landmarks that will help you clearly identify the runways. Have your passengers help pinpoint the correct runway!



Federal Aviation
Administration

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



From SHRIMP BOATS *to* SATELLITES

By Tom Hoffmann

The Evolution of the National Airspace System

It's a sweltering summer afternoon in 1929 at St. Louis Lambert Field. Peering out from under the shade of a beach umbrella perched alongside the airport tarmac, mechanic and barnstormer pilot Archie League carefully scans the sky. While manning his makeshift control tower — a *wheelbarrow* — League patiently waits to direct aircraft to and fro with a pair of signal flags at the ready. It is hard to imagine, but in the late 1920s this crude operation represented the extent of air traffic control services.

League's efforts as a pioneer air traffic controller, while venerable, stand in stark contrast to how air traffic control (ATC) keeps aircraft safely separated today. More than 90 years later, today's National Airspace System (NAS) is among the most complex in the world, supporting roughly 5,000 aircraft traversing the skies at any given moment during peak periods (pre-pandemic) and more than 19,000 airports across the nation. At the heart of those operations are the 14,000-plus air traffic controllers who work in concert with a vast network of navigational equipment to keep our skies safer than they have ever been. That is no small accomplishment given the numerous changes the aviation industry has experienced over the last century. As we continue to embrace the safety-enhancing benefits of the FAA's Next Generation Air Transportation System initiative, there is much we can learn from previous generations whose innovative thinking enabled them to adapt to changing environments and affect safe change in the NAS.



Pioneer air traffic controller Archie League.

Can You Hear Me Now?

According to early airspace pioneer Glen Gilbert, air traffic control has one basic objective: to prevent a collision between two aircraft. That simple creed became increasingly difficult to uphold with the voluntary “see and be seen” policies in place during aviation’s early 1930s boom. Gilbert was among the first to emphasize the need for not only a more structured system, but also one that mandated participation to remain effective. One of the limiting factors at this stage was radio technology, which, as its popularity grew, eventually phased out the bonfires, signal flags, and light gun signals previously used as communication tools. Direct radio links also proved useful as they would later replace the cumbersome relay of one-way telephone and radio calls among the pilot, dispatcher, and controller.

Further complicating the early days of ATC was the lack of engineering support from the U.S. Department of Commerce. This meant controllers had to be inventors as well as guardians of the sky. Early home-grown ideas that helped controllers perform their jobs included telephone recording equipment, flight sequencing boards, and small wooden markers dubbed “shrimp boats” that were pushed around an airspace map every 15 minutes to keep track of aircraft positions.

Since the science of airspace management was literally starting from scratch, there was also a pressing need for system planning contributions. Earl Ward, regarded by many as the father of air traffic control, is credited with many of those innovations. Ward conceived the idea of establishing a system of Air Traffic Control Centers. The first three were located in Newark, Cleveland, and Chicago. These centers, along with the procedures Gilbert helped develop for the industry’s first ATC manual, provided the building blocks for what was becoming a globally recognized air traffic management system.

In the years that followed, aviation continued to grow, spurred by World War II efforts to build more airports and produce bigger, faster, and more advanced aircraft. While some may have questioned the ability of U.S. airspace to accommodate the anticipated gridlock of private, commercial, and military users, Gilbert maintained that an ATC system should not discriminate but permit access to *all* categories of airspace users. He dispelled the notion of what were considered “incurable limiting factors” in his book *Air Traffic Control: The Uncrowded Sky*. “It is the system that is crowded, not the skies,” said Gilbert. “In other words, our objective must be to learn how to effectively utilize the virtually unlimited capacity of our Uncrowded Sky.”

The advent of radar technology helped do just that, and by the early 1950s, aircraft movements were now visible on electronic scopes. Aided later by computers, ATC was soon able to follow those blips on more sophisticated three-dimensional tracks. In the following decades, airspace safety

made tremendous strides with enhancements in the areas of automation, weather, navigation, avionics equipment, and more. These improvements became effective tools in handling the growing volume and diversity of traffic and provided both ATC and pilots greater situational awareness, a key ingredient to a safe NAS.

Gilbert maintained that an ATC system should not discriminate but permit access to *all* categories of airspace users.

Recalculating ...

Gilbert had the right idea when he predicted the final challenges for a future generation of effective air traffic management would be the need to factor in the complete picture of all its individual elements. That means considering everything from the framework of regulations and procedures to the end-user pilots and controllers. Based on principles of integration and collaboration, the FAA’s satellite-based NextGen transition takes a more holistic approach to airspace safety and represents an entirely new and forward-looking way of doing business.

In 2021, the impact of NextGen is clearly visible with NAS users who regularly reap its many benefits. Setting the stage for today’s capabilities were accomplishments focused on the Automatic Dependent Surveillance-Broadcast (ADS-B) system. One of six transformational NextGen technologies, ADS-B transmits the location of aircraft to controllers and other ADS-B equipped aircraft with a faster update rate than radar. Aircraft equipped with ADS-B In avionics can receive traffic information, enhancing pilot situational awareness. Aircraft able to receive signals on 978 MHz can also receive weather and aeronautical information in the cockpit. Pilots flying in properly equipped aircraft in ADS-B coverage areas can also see the location of surrounding aircraft that are equipped with ADS-B or transponders in a 15-mile radius, 3,500





feet above or below their current altitude. The nationwide infrastructure for ADS-B was completed in 2014. This means that the nation's airspace system now has satellite-based coverage wherever radar coverage exists — as well as in some areas that lack radar coverage, such as certain low-altitude airspace, the Gulf of Mexico, and Alaska. Real-time ADS-B is also the preferred method of surveillance for air traffic control in the NAS.

We are now one and a half years beyond the ADS-B Out equipage mandate for those operating in designated airspace and, as of July 1, 2021, over 146,000 U.S. aircraft have been properly equipped. You can read more about the benefits and capabilities of ADS-B at www.faa.gov/go/equipadsb.

Another critical component of NextGen is Data Communications, or Data Comm, which is a digital communications platform that uses electronic messages between pilots and controllers. Digitally delivered clearances have already improved accuracy by eliminating misheard communications and confused call-signs, and reducing radio congestion. Data Comm is currently operational at 62 control towers and three Air Route Traffic Control Centers in the United States, with more on the way.

The NextGen initiative is nearing completion. While there is still some way to go to realize its full potential, the growing frequency of NextGen success stories is a sure sign that it has made a lasting impact on the safety of the NAS.

Sharing the Skies

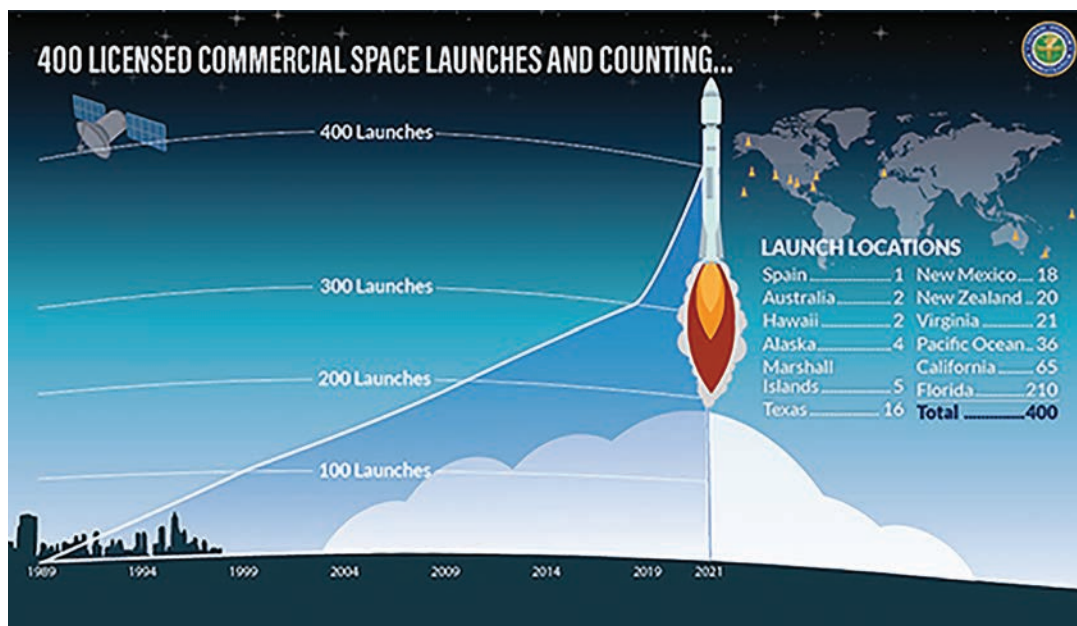
Despite recent uncertainties on COVID 19-related slow-downs and their long-term impact on the economy, the FAA's latest Aerospace Forecast projects that operations at FAA and contract towers will grow, albeit modestly, at 0.9% per year over the next 20 years, with commercial and business aviation as the primary drivers. In addition to this regular growth, NAS users are also learning to share the skies with new entrants. Developing at breakneck speeds are the many commercial applications of Unmanned Aircraft Systems (UAS) or drones, ranging in size from a small bird to a medium-size airliner.

With the newly published Remote Identification and Operations Over People rules, the FAA has taken a giant leap towards expanding NAS integration efforts and allowing for more routine operations for certain small UAS, all without compromising safety. This includes operations that are beyond visual line of sight (BVLOS). A newly formed UAS BVLOS Aviation Rulemaking Committee (bit.ly/3yUDGgg) is further exploring this concept and aims to provide recommendations for performance-based regulatory requirements to normalize safe, scalable, economically viable, and environmentally advantageous UAS BVLOS operations that are not under direct air traffic control. A first report is expected by early 2022.

Whether using bonfires, shrimp boats, or high-tech satellites, the FAA's mission has always focused on providing the safest, most efficient aerospace system in the world.

Taking NAS Operations to New Heights

Another rapidly expanding area is *literally* out of this world. The FAA's Office of Commercial Space Transportation, which licenses and regulates U.S. commercial space launch and reentry activity, recently recorded its 400th commercially licensed launch and is forecasting the number of commercial space operations to meet or exceed 50 in 2021. It's possible that number could reach 100 or more per year in the not-too-distant future once space tourism really takes off. So far, the FAA has also issued licenses for 12 commercial spaceports located in six states, with six additional spaceports in the process of obtaining a safety approval. To bolster support in this arena, the U.S. Department of Transportation (DOT) recently renewed a charter with the Commercial Space Transportation Advisory Committee (COMSTAC) to extend to June 2023. This 22-member committee provides valuable input to DOT and the FAA on space operations, including expert advice on safety and technology. Read more on COMSTAC here: bit.ly/COMSTAC.



Another exciting chapter in the evolution of the NAS involves the growing advancement of Unmanned Aircraft System Traffic Management (UTM) as well as Advanced and Urban Air Mobility (AAM/UAM). The latter is a developing ecosystem of transportation that envisions the use of highly automated aircraft that transport passengers and cargo in urban and suburban areas, and includes longer range operations for both commercial and recreational purposes. The cornerstone for the type of situational awareness required for these operations to be safely performed is UTM. You can read more about these game-changing concepts in our May/June 2021 “Sharing the Skies Safely” issue or at bit.ly/UTMMgmt. NextGen’s open and collaborative approach towards problem-solving is designed to effectively factor in these and other challenges that might arise during the next phase of airspace evolution.

You Are Cleared for the Approach

To say the nation’s airspace has witnessed a tremendous amount of change over the last century would be quite

an understatement. Whether using bonfires, shrimp boats, or high-tech satellites, the FAA’s mission has always focused on providing the safest, most efficient aerospace system in the world. Even in the early days of airspace development, we can see the great deal of planning, coordination, and outside-the-box thinking needed to overcome challenges and maintain safety in the NAS. Those same principles are alive and well today and are among the key tenets

of NextGen, a model of safety and efficiency that promises access to all categories of users. That’s something the founding fathers of ATC would surely be proud of today. ▶

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

LEARN MORE

FAA National Airspace System
faa.gov/air_traffic/nas

FAA NextGen Website
faa.gov/nextgen

Advisory Circular 20-172, *Airworthiness Approval for ADS-B In Systems and Applications*
bit.ly/AC20-172

Information Sheet on Archie League, the First Air Traffic Controller
bit.ly/ArchieLeague

(Don't) Drop the Mic!

By Jennifer Caron

Take Our Quiz to Sound Like a Pro on the Radio

Two mics, one goal. Clear communication between pilots and controllers creates the shared situational awareness that's needed to keep you and your fellow flyers safe on the ground and in the air. But for some, talking to air traffic control elicits full-on panic and fear. A famous quote by comedian Jerry Seinfeld sums it up nicely — “People’s number one fear is public speaking. Number two is death. *Death* is number *two*? Does that sound right?!”

If you haven't mastered the language of aviation, then yes, it can be downright nerve-wracking when you key the mic! But remember — air traffic control (ATC) is working to separate and sequence aircraft to keep everyone safe. Together, you and ATC are a team sharing the same mind-set when it comes to safety. That's why it's important to learn the correct lingo, know and understand what certain words or phrases mean, and *practice, practice, practice* the proper phraseology you need to use when talking to ATC.

So how can you learn to “speak ATC?” For starters, take our quiz. You'll not only find the answers below, but you'll also get helpful tips and no-nonsense input from air traffic controllers, plus free, or low-cost resources you can use to learn, stay sharp, calm nerves, and practice your way into long-term success.

Scenario 1: Rollin' Off the Runway



“Cessna 1234 Oscar, Metro Ground, Runway 21 Intersection Golf, taxi via Taxiway Kilo and Taxiway Victor. Expect a delay at the runway for traffic.”



“Cessna 1234 Oscar, will taxi to Runway 21 at Intersection Golf via Taxiway Kilo and Taxiway Victor. We will expect a delay.”

Pilot expects to use the delay for final preparations before takeoff when suddenly ATC is back.



“Cessna 1234 Oscar, Metro Tower, Runway 21 at Intersection Golf cleared for takeoff, traffic is on a four mile final.”

Feeling rushed, the pilot accepts the clearance, even though he's not prepared to takeoff. He starts the departure roll in the wrong direction, veering off the runway onto the grass.

What should the pilot have said to ATC?



“Cessna 1234 Oscar, Roger”



“Cessna 1234 Oscar, Unable”



“Cessna 1234 Oscar, Wilco”



“Cessna 1234 Oscar, Wasn't Expecting That!”

Answer: The answer here is: *Cessna 1234 Oscar, Unable*. Remember, the final decision to act on ATC's instructions rests with you.

You don't have to accept the clearance. If you need more time, or if you're *unable* to comply, just say “unable.” When in doubt, ask for clarification. Don't feel rushed or distracted and **remember to always use your call sign**. Controllers are prepared at all times to repeat, clarify, or give alternate instructions to help you. Watch this FAA video of a real-life event where saying “unable” could have prevented the incident: RunwaySafetySimulator.com.



Scenario 2: Roger That Affirmative



"Cessna 5432 India, do you have the airport in sight?"

If you can see the airport, how should you respond to ATC?



"Cessna 5432 India, Yes"



"Cessna 5432 India, Roger"



"Cessna 5432 India, Affirmative"



"Cessna 5432 India, Wilco"

Answer: Yes or No is not proper aviation phraseology. The correct terms are "Affirmative" for Yes, or "Negative" for No. "Wilco" is short for "I heard your message and I will comply." "Roger" means "received and understood." **Never use Roger to answer a yes or no question. The correct answer to this question is: Cessna 5432 India, Affirmative.**

"Pilots tend to mix up 'roger' and 'affirmative' quite a bit," says Sarah Patten, Air Traffic Control Specialist at FAA Potomac TRACON. "If I'm trying to get a definite answer to a question (for example, do you have the airport in sight?), and they answer 'Roger,' that's basically the same as saying 'ok,' or 'I heard the question,' which doesn't make any sense," Patten explains.

Using "Roger," the conversation would go like this:



"Cessna 5432 India, do you have the airport in sight?"



"Cessna 5432 India, I heard the question."

"That clearly doesn't give me much of an answer," she continues, "or much confidence that they're going to wind up in the right place. Then I have to go back and ask the question again to make sure we're all on the same page."

One controller on Reddit wrote that when he hears a pilot say "Roger" as an answer to his yes or no question, he always radios

back — "Is that an Affirmative Roger, or a Negative Roger?" **Always answer yes or no questions with Affirmative or Negative.**

Bonus Question:



"Cessna 5432 India, traffic one o'clock, two miles, eastbound."



What's your reply?

In this example, ATC's transmission is not a yes or no question, it's a traffic advisory. You should state whether you have the traffic in sight or "looking," and include the aircraft's position or identifier. **Your reply should be: Cessna 5432 India, traffic one o'clock, in sight. Or Cessna 5432 India, looking for traffic.** (See Scenario 3 for more on this topic.)



Scenario 3: Oh Say Can You See the Traffic?



"Cessna 5432 Oscar, traffic three o'clock, four miles, east-bound 3,000, Embraer jet inbound for Runway two-niner, report the traffic in sight."



"Cessna 5432 Oscar, looking for the traffic."



"Cessna 5432 Oscar, additional traffic nine o'clock, three miles, turning northeast bound is a Marchetti climbing out at 2,000 feet."



"Cessna 5432 Oscar, I have the traffic in sight, he's not a factor."



"Cessna 5432 Oscar, how is the traffic not a factor?! He's turning inbound and descending out of 2,700."

Which traffic did the pilot have in sight? The Embraer jet at three o'clock or the Marchetti at nine o'clock? Instead of saying "Looking for the traffic," or "I have the traffic in sight," what should the pilot have said to ATC?

Answer: The pilot should specify which traffic he has in sight by including either the aircraft identifier (Embraer or Marchetti) or the aircraft's position (three o'clock or nine o'clock) in the transmission to ATC.

Shared situational awareness is key. Brevity is important, but controllers must know that you've heard the traffic advisory and that you completely understand the traffic picture.

"Any time you're flying in or out of a VFR airport, it's likely the controller will give you a traffic call on more than one aircraft," says Peter Sachs, a former controller currently working in the FAA's UAS Integration Office. "If a controller gives you two traffic calls and you say, 'traffic in sight,' does that mean you see both aircraft, or just one?" he asks. At Class D towers, controllers may issue general instructions to avoid traffic ("turn north"), but they can't issue radar vectors. "That doesn't mean you should ignore those calls just because you think you have the complete traffic picture," Sachs explains.

"It can be especially frustrating to make a traffic call for someone and get no response," says Patten. "I have no way of knowing if they heard what I said and are busy looking out the window, or if they didn't hear me at all. If a pilot is looking for traffic and doesn't have it in sight yet, that's helpful to know — 'Cessna 5432 Oscar looking for traffic' works well in that situation," she explains. "Also, a pilot telling me that they 'have the traffic on TCAS' (or 'ADS-B,' or 'the fish finder,' or any number of other things I've heard pilots call it) doesn't help me as a controller. If you don't tell me that you have the traffic in sight, I'm going to keep giving you traffic advisories until you actually see the other aircraft," she adds.

Consider the midair collision in Colorado this past May. The accident is still under investigation, but some information suggests that a misunderstanding of the traffic picture may have been a factor. The controller advised the Cirrus pilot of Metroliner traffic and he replied, "Have traffic in sight." The Metroliner was also issued an advisory to which he replied, "We're looking."

Do not ignore traffic calls or provide an ambiguous read-back. **Make it a best practice to reply back to ATC using the aircraft's identifier or position.**

For example:



"Cessna 5432 Oscar, additional traffic, four miles to your north is a Metroliner for the parallel."



"Cessna 5432 Oscar, Metroliner traffic in sight."



"Cessna 5432 Oscar, traffic nine o'clock, Delta Airbus A320."



"Cessna 5432 Oscar, traffic nine o'clock, in sight."

Scenario 4: Stand By Me



"Metro Tower, this is Cessna 1234 India, holding short of Runway 21, ready for departure."



"Cessna 1234 India, Metro Tower, Stand By."



"Cleared for takeoff Runway 21, Cessna 1234 India."

Clearly, the pilot did not have clearance to proceed. But what does "Stand By" actually mean?



Clearance to Proceed



Line Up and Wait



Hold Short



Wait

Answer: "Stand By" means *wait*. Monitor the frequency, we will re-establish contact. It does not deliver clearance. It is simply a way of saying, "I will get back to you soon," or "I'm too busy to answer you right now, but I will be right back." If ATC seems to have forgotten you, **never assume you have clearance to proceed**. When there is a break in transmissions, call again.

"If I say 'Stand By' to a pilot, I usually have something else that needs my attention before I'm able to add another airplane to whatever I've got going on," explains Patten. "Sometimes, whatever I'm dealing with that has me instructing a pilot to stand by may be going on behind the scenes. I may be coordinating something with another sector or facility, I may be trying to fix or find someone's flight plan, or I may be giving a relief briefing. There may be a moment or two of silence on a frequency after I tell someone to stand by, but it doesn't mean there isn't anything going on. I usually just need a minute or two to get something else settled before I have enough time to properly handle a new request," says Patten. She explains that a big part of being a controller is knowing your operational priorities (and your limits). Using "Stand By" helps keep things under control.



Scenario 5: I'm Listening



"Metro Ground, Cessna 2345 Oscar, FBO west parking with Information Echo, ready to taxi."



"Cessna 2345 Oscar, Metro Ground, Stand By."



"Standing by, Cessna 2345 Oscar."



"Cessna 2345 Oscar, Metro Ground, Go Ahead."



"Taxiing to Runway 21, Cessna 2345 Oscar."

True or False. Was the pilot cleared to proceed?

Answer: False. The pilot was not cleared to proceed. The phrase "Go Ahead" is only used as an instruction to proceed with your request or transmission. It is not used for any other purpose and does **not** deliver clearance to proceed.

"Go Ahead," says Patten, is one I find myself using quite a bit, and it means exactly what was mentioned: go ahead with your transmission, NOT go ahead and do whatever you want!"

Did you get all the questions right? Before you check out the resources below, make a point to contact your local FAA Safety Team (FAASTeam) Rep to see if there are any scheduled tower tours, or if one could be set up. You can meet some controllers (I promise they won't bite) and see how it all works. That's a great way to learn the right lingo and help push the fear out of push-to-talk.

Resources

1. **Online** controller-to-pilot platforms and software programs that you can use to train at home: vatsim.net, redbirdflight.com, pilotedge.net.
2. **Free** — liveatc.net, Pilot/Controller Glossary (bit.ly/FAAglossary), FAA Safety Team Course: Radio Communications Phraseology and Techniques (bit.ly/CommsPhraseology), "How to Become an Air Traffic Controller" on the FAA's The Air Up There podcast (faa.gov/podcasts). ▶

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Content Disclaimer: Products and services mentioned in this article do not constitute official endorsement on behalf of the FAA.

LEARN MORE

Check out more *FAA Safety Briefing* articles on this topic at bit.ly/FAASB-Arc:

- How to Talk Like a Pilot — Jan/Feb 2018
- Do You Suffer from Push-to-Talk Phobia? — Nov/Dec 2017
- No-Go on the Radio — May/June 2020

PILOTS

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The Advantages of Adventuring

Using Airport Visits to Advance Skills (and Pilot Stories!)

By Susan K. Parson

One of the aeronautical experience requirements for an instrument rating is to log at least 50 hours of cross-country flight time as pilot-in-command (PIC). I initially chafed because I just wanted to get on with my flight training. I also found the prospect of accumulating 50 cross-country hours a bit daunting. To make it manageable, I took a sectional chart, drew circles with 50 and 100 nautical mile radii, and made a list of airports that landed (so to speak) in the zone.

Once I got started, I realized that many educational and proficiency benefits accrue from flying to unfamiliar airports. Though I had flown to a few during training for my private pilot certificate, most were new territory. The same was true when I participated in Virginia's Aviation Ambassadors Program (bit.ly/VAAviationAmbassadors), which incentivizes visits to the state's public-use airports.

Here are just a few of the great lessons learned from my quest.



Photo courtesy of the City of Chandler, Ariz.



Plans

Flight planning apps weren't a thing yet, so I did a lot of manual flight planning. The exercise of drawing and measuring the course line, calculating performance, evaluating weather/NOTAMs, and consulting the Airport/Facility Directory (now called the Chart Supplement) for the target airport's vital statistics solidified fundamental flight planning skills. Flying to unfamiliar airports sharpened both the competence and my confidence in pilotage, dead reckoning, and course intercepts and tracking.

Another great lesson was the experience of changing the plan for weather or operational issues that can arise. For example:

- A trip to a smaller airport on a typical summer day in the mid-Atlantic region gave me a whole new appreciation for the challenge of spotting an unfamiliar airport in thick haze. I also learned what 3-to-5-mile visibility really looks like.
- On a flight to an airport in Class C airspace, the controller abruptly canceled my landing clearance and gave me a vector to allow an airliner to zoom past. I then needed to use those ground school lessons in wake turbulence avoidance, make a last-minute runway change, and taxi through a concrete maze very different from the single-runway simplicity of my home airport.
- A scenic airport in mountainous terrain reinforced lessons about density altitude. Because its runway was also shorter than the one at home base, that airport also provided a good reminder of how important practical performance calculations are to safe operations.

People (and Pets)

One of the best benefits of venturing to different airports is meeting airport people. Like airplanes and airports, airplane people come in many shapes and sizes. The one thing they typically have in common is an outsized enthusiasm for aviation, airplanes, and fellow aviators. Friendly faces prevailed at even the bigger airports, but what fun to meet so many people whose idea of weekend fun includes hanging out at the local airport. These kind souls offer both encouragement and education on local flying conditions and quirks. I especially remember a small airport whose charmingly eccentric operator offered lunch (complete with homemade ice cream) that she served with a side of hangar flying stories to all weekend visitors.

Airport pets are special too. I've only met a couple of airport cats, but I've lost count of the number of airport dogs who offered a welcome waggin' to itinerant pilots.

Many educational and proficiency benefits accrue from flying to unfamiliar airports.

Places

No two airports are truly the same. Larger airports with commercial service are an amazing and meticulously organized maze of pavement with multi-colored lights and signs. Smaller airports can have some of everything, which is why it pays to do some research before you launch. During the Virginia Aviation Ambassador trips, my flying companions and I experienced everything from bowl-like



runways with a noticeable dip to short mountain-top strips to ski-slope runways with unidirectional takeoff and landing requirements.

Airport amenities are a pleasure as well. Though few GA airports could compete with the range of merchandise in mall-like major airports, you will find a wide range of pilot shops and, better yet, aviation-themed restaurants that contribute to an airport's unique character. A few airports also host aviation history museums.

Airports are a great place for aviation enthusiasts to see a wide variety of aircraft types.

Planes

For those who participate in the sport of plane-spotting, what better way to feed the habit than to visit new airports? Even without a museum on site, airports are a great place for aviation enthusiasts to see a wide variety of aircraft types. I've stumbled upon warbirds, an astonishing variety of experimental/amateur-built planes and, best of all, old friends. I was delighted, for instance, to see the C150 that my flying club once owned on the ramp at its new home base in Delaware. I've sighted several of the humble but beloved birds I flew in primary training days at airports around the mid-Atlantic. Also, since learning the significance of the late

1990s-vintage C172 Skyhawks with the "ES" tail number (see "*The Legacy of Echo Sierra*" in the January/February 2010 issue of *FAA Aviation News*: bit.ly/FAASB-Arc), I have enjoyed looking for them.

Practicing Scenario-Based Training

The bottom line: visiting airports offers aviation educational and enjoyment opportunities with the added benefit of supporting our country's general aviation (GA) airport infrastructure. If your state has a formal airport visitation program, sign up. You can also use aviation community programs (e.g., AOPA's Pilot Passport) to expand your horizons and engage in friendly competition with like-minded pilots.

If you are an instructor or flight school operator, an airport visitation program, whether formal or DIY, is a great way to put scenario-based training into practice. Those in states with an airport visitation program could enhance the training experience by using it for both dual and solo cross-country flights. It also offers an incentive for structured "post-graduate" flying, both for proficiency and for earning higher certificates and ratings. Your local GA airports will appreciate your support, and there is no limit to how much you can learn and enjoy in the process. ▶

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

NEW WAYS TO PREFLIGHT YOUR DESTINATION

We didn't have to use stone tablets and chisels when I was first learning to fly in the late 1990s, nor did I have to use hamster wheels or, worse, bicycle-style pedaling for propulsion. Even so, I sometimes feel like a fossil when I think about tools and techniques that now seem so quaint — even downright primitive. At the cross-country stage of training, for example, part of the drill was to get the flight school's dog-eared copy of the Airport/Facility Directory (now called the Chart Supplement) and look up the airport(s) to be visited on a dual or solo cross-country flight. Step two was to use paper and pencil to create a kneeboard-sized sketch of the runway configuration, using the edges to note things like frequencies and FBO information. Instructors also expected us to depict any obstacles on the approach path. I specifically remember that part because I had an ongoing informal competition with a fellow student whose hand-hacked airport diagrams were miniature works of art.

The work involved in creating these DIY airport sketches did have

THE FAA'S FROM THE FLIGHT DECK VIDEO SERIES PROVIDES ACTUAL RUNWAY APPROACH AND AIRPORT TAXIWAY FOOTAGE, COMBINED WITH DIAGRAMS AND VISUAL GRAPHICS TO IDENTIFY SAFETY-SENSITIVE ITEMS.

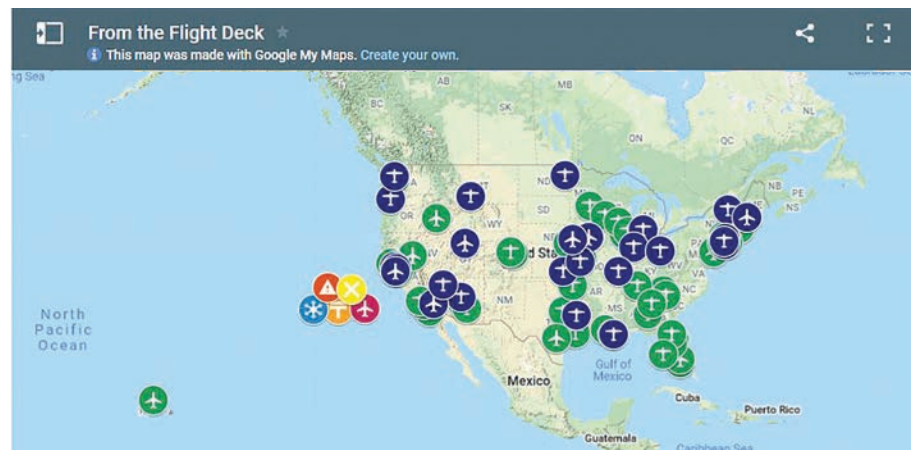
its benefits. Having to find, decipher, and depict safety-critical pieces of data helped embed this information more deeply in my sometimes-befuddled brain. Today, however, there are much better ways to make preflight visits through and to the airspace and airports that you intend to use. Even if you don't subscribe to any of the amazingly capable apps that abound these days, you can use Google Earth to skim over the terrain and explore your departure and destination airports. The app I use enables you to "pre-fly" a trip through the waypoints you load, and it offers three-dimensional airport depictions. Having been a map- and chart-geek for most of my life, I can

happily spend hours using this online magic just to explore.

For the finishing touches, though, nothing beats seeing an actual flight to the place you plan to go. You can find plenty of such videos on YouTube, but the FAA has taken a more intentional approach through its growing series of From the Flight Deck videos (faa.gov/go/FromTheFlightDeck). This video series provides pilots with actual runway approach and airport taxiway footage captured with cockpit mounted cameras, combined with diagrams and visual graphics to clearly identify hot spots and other safety-sensitive items. The blue circles denote videos in development and clicking brings up a dialog box with the projected video release date.

Airports circled in green have a video already; just click on the circle for the name of the airport and a link to the actual video. The ones I've watched are around seven minutes long, but of course you can watch them as many times as you like. I especially like the way that the charted area appears in the upper left corner of the "real life" video footage, so you can simultaneously see both views and hear the explanation. It's a terrific, cost-free way to know before you go, so you can operate anywhere with competence and confidence.

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



An interactive map shows the locations of current (green) and future (blue) From the Flight Deck safety videos — faa.gov/go/FromTheFlightDeck.

LEARN MORE

From the Flight Deck
faa.gov/airports/runway_safety/videos

MISSION POSSIBLE

Advocating for GA in the TFR Process

By James Williams



Deep in the FAA sits an organization tasked with a mission. At first glance that mission might sound impossible. But the FAA's System Operations Security Directorate (SOS) is tasked with balancing the needs of various airspace users within the National Airspace System (NAS). SOS is your advocate for airspace restrictions and governs how they are made and implemented.

As you fly in the NAS, the common constraints you will encounter, often with limited notice, are Temporary Flight Restrictions (TFRs), especially those established by the FAA for security or emergency operations purposes. While TFRs, like most system constraints, are not exactly popular with pilots, it is important to understand that the FAA only uses this tool when needed to meet overriding requirements, including aviation safety demands. The agency consistently works to mitigate the impact of TFRs on pilots and the broader aviation community.

SOS is your advocate for airspace restrictions — how they are made and implemented.

How the Airspace Gets Made

SOS is the primary FAA office responsible for air traffic management-related security and disaster response operations. As part of that mission, the SOS often acts as an intermediary between agencies responsible for national security and the general aviation community. Balancing the needs of airspace users, such as the Department of Defense and the Department of Homeland Security, with the need

to maximize open access to publicly navigable airspace, is a critical consideration when SOS personnel evaluate TFR requests from these external agencies.

How SOS handles national security driven TFRs, including those implemented for presidential travel, provides a good look into the FAA's continuous work to ensure that TFRs are only used when really needed, and executed in a way that lessens their effect on operators and others in the aviation community.

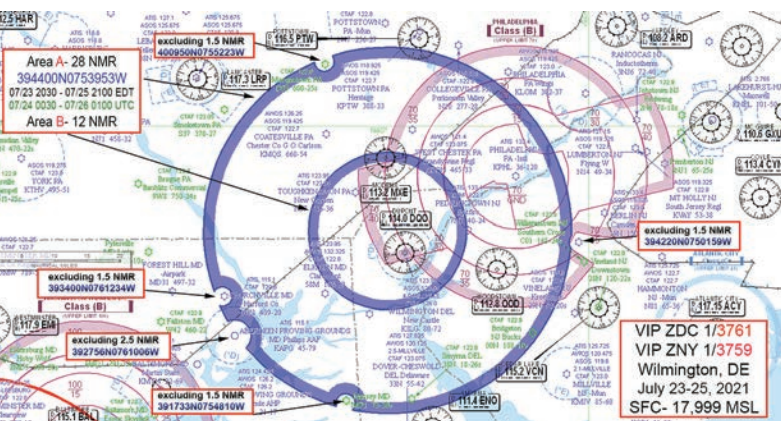
SOS receives requests for security-related TFRs to cover parades, sporting events, large concerts, and other outdoor events on a regular basis. The FAA is required by law and regulation to establish national security TFRs in collaboration with the Department of Defense or other federal security and intelligence entities. SOS staff partner with representatives from all branches of the military and the federal law enforcement community to thoroughly address and vet each request that is received. All TFRs are designed and approved based upon a stringent evaluation by SOS and security partners, taking into consideration statutory and regulatory mandates, security risks, and impacts on the aviation community.

Everyone's NAS

One of SOS's core principles is to maximize free airspace access. This fundamental consideration is taken into account with every security TFR request. SOS routinely works with interagency partners to adjust TFRs as a means to ensure minimal impact to the aviation community. SOS staff works with the requesting agency to include only the essential needs for dates, times, and airspace. At times,

Photo courtesy of U.S. Air Force Senior Airman Taylor Crul.





interagency requests do not meet the defined, credible security threat criteria for issuing a given type of TFR. In these cases, SOS queries the requester. If credible threat information has not been received, the TFR is not approved. If there is a credible security threat, SOS issues a TFR and works with the requester to determine a timeframe when normal airspace operations can safely and securely resume. While personnel from the Department of Defense, Department of Homeland Security, and the Department of Justice have significant input into vetting a TFR, the FAA retains the ultimate decision-making authority.

SOS is not limited to advocating on behalf of aircraft activity at large airports. In discussions with security partners, the FAA also advocates for other operations with a legitimate need to access airspace restricted by a TFR. For example, SOS may seek access for agricultural operations, community-based model aircraft organizations, or last-minute medical evacuation flights.

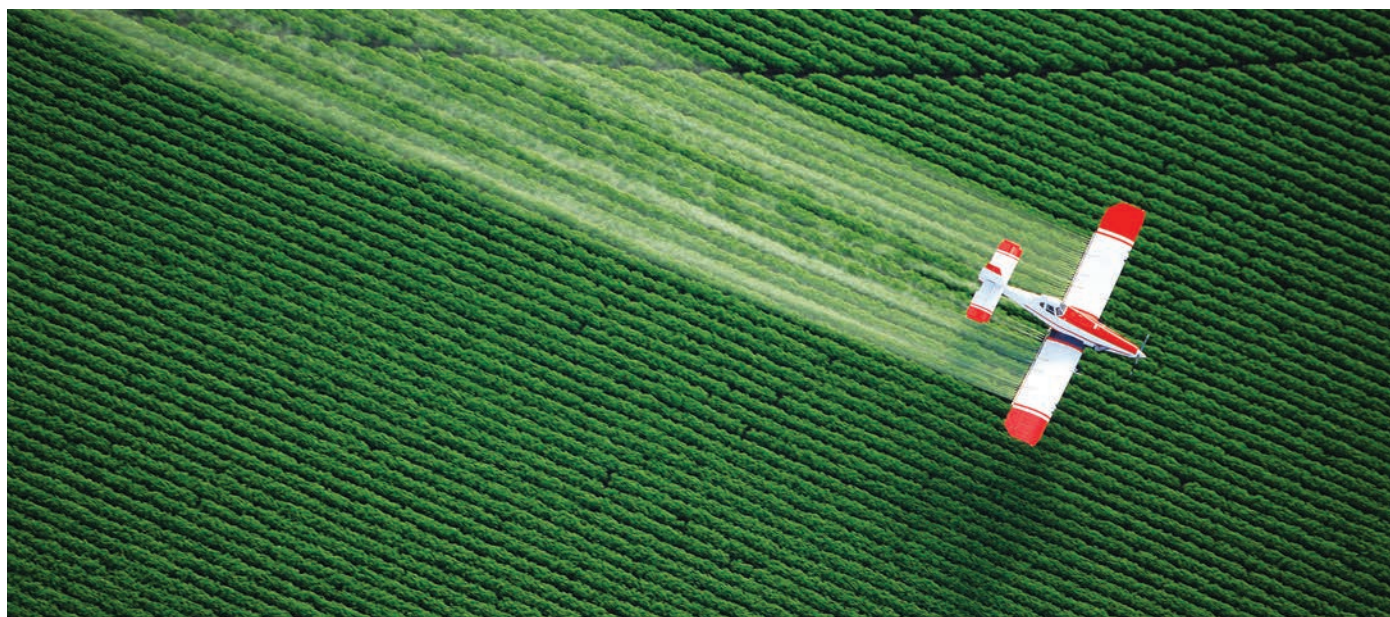
Maintaining the security of the NAS also requires notifying pilots of TFRs on a timely basis. Once a TFR has been

published, SOS works very closely with pilot organizations to ensure the information is properly disseminated through a Notice to Airmen (NOTAM) and, in many cases, advisories distributed via the FAA's Safety Program Airmen Notification System (SPANS) to the widest audience possible (see www.faa.gov/spans to register or log in). "It is our intent to provide notification to pilots of flight restrictions well in advance to prevent any accidental incursions," says Gary Miller, the Director of SOS. "Such incursions require security partners to dedicate valuable time and resources to intercept unintentional TFR violators that could be used to mitigate a legitimate threat," he adds. As an added layer to increase public awareness, SOS routinely works with the FAA's Public Affairs office to communicate anticipated TFRs using the news media.

SOS routinely works with interagency partners to adjust TFRs as a means to ensure that a minimal amount of impact is felt by the aviation community.

SOS's mission isn't impossible but it is challenging. Many different stakeholders can have conflicting demands on the NAS. "Finding an appropriate balancing point that allows user access while protecting the security interests of our partners is not only SOS's challenge, but also its mission," says Miller. It's a mission they gladly accept. ▶

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



—ADS-B—

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AIRPORT GRANTS

1946-2021

How Federal Airport Grants Provide the Lifeblood for U.S. Airport Safety and Infrastructure

By Tom Hoffmann

With the stroke of a pen by President Harry S. Truman on May 13, 1946, the Federal Airport Act became law, establishing the first program to provide federal investment for airport infrastructure and development of the nation's civil airports. First up to receive a grant was Twin Falls, Idaho, where a new airport was constructed for about \$647,000, of which \$384,000 were federal funds. Over the following 75 years, the government has distributed \$96 billion, (yes, with a “b”) through grant programs to fund more than 82,300 airport projects. These grants have helped promote safety, security, efficiency, environmental stewardship, and infrastructure improvements at airports big and small across the nation.

Background

Airport grant programs have existed in three forms, beginning in 1946 with the Federal-Aid Airport Program, then the more comprehensive Airport Development Aid Program in 1970, and most recently, the Airport Improvement Program (AIP), which was established in 1982. These programs evolved over time to keep up with the pace of the air travel industry and have expanded in both scope and size. For example, the AIP has been amended several times, most recently with the passage of the FAA Modernization and Reform Act of 2012. This update greatly increased the financial support for AIP grants and directed funds to be drawn from the Airport and Airway Trust fund, which is supported by user fees, fuel taxes, and other similar revenue sources. (For more details on the history of AIP, go to bit.ly/AIPHISTORY (PDF).)

“These grants represent the legacy and vital role of airport infrastructure grant programs in helping the air transportation system operate safely,” said FAA Administrator Steve Dickson in an agency press release. “Investing in our nation’s infrastructure through AIP grants is a cornerstone of our commitment to safety.”

Project Management

That safety commitment is evident with the wide range of projects and enhancements AIP grants have covered over the years. Some of the more common requests include extend-

Photo courtesy of the Magic Valley Regional Airport.



The Twin Falls Idaho Airport terminal building, circa 1948.



ing, repositioning, and/or rehabilitating runways, taxiways, and apron areas, installing airport surface lights and signage, and acquiring or upgrading emergency response equipment. However, AIP grants also cover a multitude of projects in some less obvious areas, like airfield drainage, erosion control, planning and environmental studies, airport access and service roads, perimeter fencing, obstruction hazard mitigation, snow removal equipment, and much more. At certain smaller airports, AIP grants may also be used to construct certain revenue-generating facilities like fuel farms or hangars to help airports be more self-sufficient. There are also options for projects that aid the environment, like zero or low-emission vehicles/equipment and charging stations, wildlife hazard assessments, geo-thermal heating and cooling systems, and solar power arrays (provided they meet strict requirements for any solar glare issues).

AIP funds can also be used for certain aircraft noise mitigation measures such as noise monitoring systems, compatibility studies, land acquisition, and noise mitigation testing and controls (e.g., insulation, window treatments) for homes, schools, and other buildings that fall within a certain day-night average sound level, or DNL. You can read more about DNL and the FAA's latest efforts to address aircraft noise in the Jul/Aug 2021 issue of this magazine.

Who's Eligible?



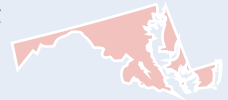
Heat map indicating AIP funding amounts by location (bit.ly/AIPfunding).

Now that we know a bit more about the types of projects that are eligible for AIP grants, it's time to look at whether your local airport is eligible to get its less-than-smooth runways repaved or maybe a new LED approach lighting system installed. Let's break it down.

Request to Build, Granted!

Here are some recent airport projects that have received AIP grants:

- **Frederick Municipal Airport in Frederick, Md. — Over \$4.8 million** to extend Runway 05/23 to meet the operational needs of the airport. Additionally, this project relocates the parallel taxiway to meet federal design standards for separation between runways and taxiways.



- **Newtok Airport in Newtok, Alaska — Over \$21.1 million** for construction of a new replacement airport in Newtok, Alaska. The project is critical to the airport and to the village of Newtok, which is home to an Alaska Native community of 374 residents. The airport and the community will relocate to higher ground due to erosion of the ground surrounding the airport and village.



- **Valdosta Regional, Valdosta, Ga. — Approximately \$5.7 million** to rehabilitate 8,000 feet of Runway 17/35 maintaining the structural integrity of the pavement and minimizing foreign object debris. Additionally, this project enhances safety by removing vegetation obstructions from Runway 35's approach and departure paths.



- **Willow Run, Detroit, Mich. — Over \$15.8 million** for shifting and reconfiguring the existing runway. This project will create jobs and continue to improve the safety and efficiency of the airport, which is important for cargo companies that support the auto industry.



The FAA works closely with more than 3,300 individual airports, related aviation organizations, and airport agencies to develop these critical airport infrastructure projects. To be AIP eligible, an airport must first be considered public-use, that is, an airport (including a heliport or seaplane base) that is open to the public *and* meets the following criteria:

- Publicly owned; or
- Privately owned but designated by the FAA as a reliever; or
- Privately owned but having scheduled service and at least 2,500 annual enplanements.

AIP grant eligibility is also dependent on an airport being included in the National Plan of Integrated Airport Systems (NPIAS). The NPIAS, which is prepared and published every two years (bit.ly/NPIASairports), identifies public-use airports that are important to public transporta-

tion and contribute to the needs of civil aviation, national defense, and the postal service. In addition, an AIP grant recipient must be legally, financially, and otherwise able to carry out the assurances and obligations contained in the project application and grant agreement.

We're paving the way forward to a brighter future, one runway, taxiway, and airfield at a time.

Don't Take It For Granted

Because the demand for AIP funds exceeds the availability, the FAA bases distribution of these funds on present national priorities and objectives. AIP funds are typically first apportioned into major entitlement categories such as primary, cargo, and general aviation. Remaining funds are allotted to a discretionary fund.

The FAA's Office of Airports (ARP) is responsible for administering the AIP, including ARP staff in FAA headquarters' regional offices, and district offices. The headquarters staff ensures that AIP administration follows the statutory requirements and oversees the effective use of AIP funds throughout the United States. The regional and district offices provide technical, financial, planning, environmental, and administrative support to NPIAS airports.

Projects identified to receive AIP funds are carefully scrutinized to ensure that they are eligible and justified for AIP participation based on their ability to enhance safety, improve security, satisfy aeronautical demand, and address environmental concerns. Projects are prioritized and must also meet selection criteria that is established by Congress and further refined in FAA policy.

This criteria also establishes how much of a project cost is covered. For large and medium primary hub airports, the grant covers 75 percent of eligible costs, while grants for small primary, reliever, and general aviation airports cover a range of 90-95% of eligible costs.

Grants To The Rescue!

To help support a network of more than 3,300 eligible airports, Congress allocates nearly \$3.2 billion each year to AIP, along with approximately \$1 billion in Supplemental Discretionary funding. Moreover, a series of additional economic relief programs were established to help airports contend with the COVID-19 public health emergency. They include the Coronavirus Aid, Relief, and Economic Security (CARES) Act, the Coronavirus Response and Relief Supplemental Appropriations (CRRSA) Act, and most recently, the Airports Rescue Plan Act of 2021 (ARPA). Together, these programs are providing nearly \$20 billion in relief funding to airports affected by the pandemic. Also of note is the fact that both CARES and ARPA are providing funds at a

100% federal share, which allows critical safety and capacity projects to continue as planned regardless of an airport sponsors' current financial circumstances.

Under Obligation

When an airport receives federal assistance, the airport sponsor or owner must accept certain obligations and conditions that help ensure the safety and usability of their facilities. Some examples of obligations may include the proper maintenance and operation of airport facilities, the use of airport revenue, and protecting approach areas from development. The FAA encourages airport owners to review each agreement and conveyance document to ensure that they understand their obligations. These obligations help protect the federal government's investments in local transportation infrastructure and are a major reason why we have such a robust network of airports across the country.

75 Years and Counting

"Airports are powerful engines of economic growth and possibilities for local communities across the United States, and support millions of jobs," said FAA Deputy Associate Administrator for Airports Winsome Lenfert in a recent video message. She added that for the last 75 years, grants have allowed airports across the country to receive funding for forward-looking infrastructure investments and safety projects that have "yielded the safest and most efficient air transportation system in the world." Also important is the ability for these investments to promote environmental sustainability and improve access to diverse communities that depend on airports for transportation as well as receiving goods and services.

We're paving the way forward to a brighter future, one runway, taxiway, and airfield at a time. ►

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

LEARN MORE

AIP Overview page

faa.gov/airports/aip/overview

AIP 2021 Grant Map

faa.gov/airports/aip/2021_aip_grants/map

Annual AIP Report of Accomplishments and Grant Histories

faa.gov/airports/aip/grant_histories

Contact Info for FAA Airport Regional Offices

faa.gov/airports/news_information/contact_info/regional

Airport Rescue Grants Video

youtu.be/FNyrUVDjnR4

Making It Count

How Aircraft Transponder Signals Take the Guesswork Out of Counting Non-Towered Airport Operations

By Jennifer Caron

“Many of the things you can count, don’t count. Many of the things you can’t count, really count.”

— Albert Einstein

“I always feel like the runway is *just* long enough to keep me alive,” one pilot comments on Reddit. Small taxiways, rough, bumpy runways, and insufficient signage are some of the frustrations pilots have expressed over the less than ideal conditions they’ve encountered, and would like to see improved, at some of the nation’s general aviation (GA) airports.

When it comes to a funding decision on airport investments, there are many elements involved. According to the National Plan of Integrated Airport Systems (NPIAS), airport capital development needs are driven by current and forecasted traffic, use and age of facilities, and changing aircraft technology, to name a few.

But one important part of the decision puzzle is the total number of aircraft operations that happen at the airport. Aircraft operations counts are a key element in the overall criteria used to inform decisions on aviation systems and airport master planning, particularly for environmental studies and aviation forecasts, as well as airport design and funding. To borrow from Einstein’s quote above, *Accuracy Really Counts!* Accurate and complete numbers inform the decisions that will rehabilitate those runways and taxiways, add that airfield signage, and smooth out that rough and bumpy surface.

So what are aircraft operations counts, and who’s doing the counting?

The ATCs of 1-2-3s

Aircraft operations are defined in Title 14 Code of Federal Regulations (14 CFR) section 170.3 as the airborne movement of aircraft in controlled or non-controlled airport terminal areas. There are two types of operations: local and itinerant. Local operations are aircraft in the local traffic pattern, or in local practice areas, either within sight or at a 20-mile radius of the airport, and that includes touch-and-go landings. Itinerant operations take into account all the other non-local operations.

At airports with air traffic control (ATC), controllers track and record aircraft activity. With dedicated processes and personnel in place to count aircraft operations, it’s more likely that the data collected is both accurate and complete. However, the vast majority of airports in the U.S. do not have ATC personnel to count aircraft activity. So who’s counting the aircraft at those small, non-towered GA airfields, which often lack an on-site manager or fixed-base operator to take the count?

Current counting methods for non-towered airports varies in both accuracy and reliability.

Let Me Count the Ways

When I first learned that aircraft operations counts take place at non-towered airports, I immediately pictured some random guy sitting just off the flight line in a green lawn



Pole-mounted Version II device installed at Terre Haute Regional Airport (KHUF) for data collection at a towered airport.



Stand-alone Version II device installed at Indianapolis Executive Airport (KTYQ) for data collection at a non-towered airport.

chair, binoculars slung around his sunburned neck, punching a hand-held counter for every takeoff and landing he could see. Obviously, that's not really how it's done, but that image is not too far off the mark.

Current counting methods for airports without ATC varies in both accuracy and reliability. The number and type of operations is often determined by the "best guess" of the airport manager, or based on prior-year counts estimated to the current date. The data is not standardized and the results are hodgepodge at best, making it difficult to compare data from one airport to another or to use the counts for high-confidence decision making.

Insufficient knowledge about aircraft activity at non-towered airports continues to be a concern for aviation agencies at both state and federal levels. A study by the Airport Cooperative Research Program found that many state aviation agencies, and some airports and planning organizations, have developed aircraft traffic counting programs to track airport activity, but with mixed results.

The FAA provides guidance on documenting aeronautical activity, including the number of operations by aircraft, in Advisory Circular 150/5000-17, *Critical Aircraft and Regular Use Determination*. Sources include aircraft landing fee reports, reliable aircraft logs recording aircraft make and model, data from commercial flight trackers, and completed instrument flight rules (IFR) flight plan data entered in the FAA's Traffic Flow Management System Counts (TFMSC) database.

"I can't say there's one predominant way airports do their traffic counts," says Michael Lawrance, Senior Aviation Planning Specialist in the FAA's Airports Planning and Environmental Division. "The use of TFMSC is a usual go-to source, but that only gets you aircraft that flew to your airport IFR, which typically accounts for about 25% of total operations." Kent Duffy, FAA Operations Research Analyst notes that "the TFMSC data is often sufficient to understand the need for a longer runway since the major-

ity of business jets and large turboprops fly under IFR the majority of the time. However, the total operations data is still needed for aviation forecasts and the environmental studies needed to extend a runway."

Other methods include counting traffic year-round, sampling traffic seasonally to estimate annual operations, multiplying a pre-determined number of operations per based aircraft by the total aircraft based at the airport, performing regression analysis, and asking the airport manager — often the most used, and least accurate way to collect traffic counts. So can you picture the guy in the lawn chair now?

"Some airports supplement their data with fuel sales logs, FBO records, flight school activity, 'conversations with the airport manager,' or comparisons of other airports in the region," Lawrance explains. Other methods such as automatic acoustic counters, video devices, and pneumatic counters are not long-term solutions due to their expense and the impracticality of deploying these devices on a large scale. However, beyond the IFR data captured by TFMSC, many of these methods vary in both reliability and accuracy, resulting in low-confidence data.

"While many of those methods are fine for local planning purposes, they are not accurate enough for us to use in project justifications, primarily capacity-related projects," Lawrance explains. Relevant capacity projects that necessitate accurate total operations counts include new Federal Contract Towers or secondary runways to reduce congestion.

You Can Count On It

Research and innovation answers the call. PEGASAS looked at using signal strength obtained from aircraft transponders to accurately register operations counts. This technique is both innovative and economical, since it would re-purpose shelf-stable technology to address the need.

In 2016, Purdue University developed a transponder signal-counting technology to register operations with extended Mode S aircraft transponder signals. These signals

are received with a 1090 MHz software-defined radio platform and contain global positioning system (GPS)-derived aircraft position information.

Mode S data captured includes unique ID, GPS latitude and longitude, elevation, and signal strength. This data is used to calibrate a model that has altitude and signal strength as inputs to estimate arrival and departure operations.

In 2017, the FAA tasked Purdue University under PEGASAS, the Partnership to Enhance General Aviation Safety, Accessibility, and Sustainability, an FAA Center of Excellence with a national network of researchers, educators, and industry leaders, to further evaluate an accurate, cost-effective means of conducting operations counts at non-towered airports using Mode S. The collaborative FAA/PEGASAS research team includes Jonathan Torres in the FAA's Airport Safety Technology Research and Development division at the William J. Hughes Technical Center, and university leads Darcy Bullock and John Mott at Purdue University.

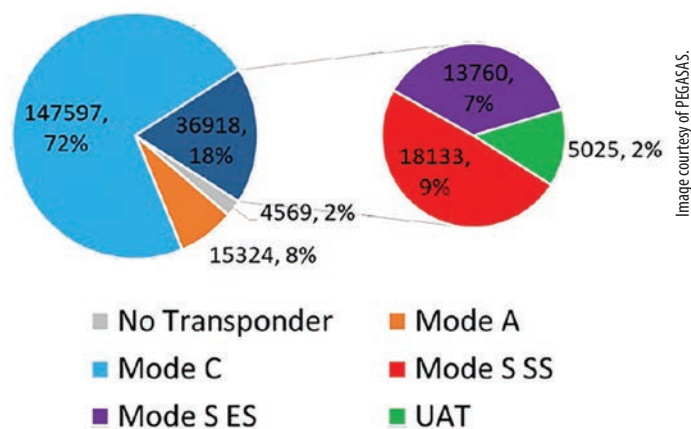
The FAA required that most domestic aircraft operating in rule airspace be equipped with either Mode S, 1090 Extended Squitter, or Universal Access Transceiver (UAT) ADS-B transponders by January 1, 2020. The majority of GA aircraft are now equipped with ADS-B. However, there is a substantive share of GA aircraft that don't operate in rule airspace that still have only Mode C transponders. Not a problem since this novel, data-capturing technology uses an inexpensive ground-based radio receiver to monitor both Mode S and Mode C data and can easily obtain signals in a passive manner with no adverse impacts on aircraft communication or sensitive equipment.

To test and validate the transponder signal concept, the PEGASAS research team developed two versions of a signal counting device that monitors aircraft transponder data to count aircraft operations. Devices were deployed at four GA airports in Indiana, two towered and two non-towered. Version I devices (an experimental transponder signal receiver and processing system) were installed at the two towered airports: Purdue University Airport (KLAF), and Terre Haute Regional Airport (KHUF). Version II devices (a pre-production prototype of the transponder signal-counting technology) were installed at both towered airports and at two non-towered airports: Indianapolis Executive Airport (KTYQ), and Warsaw Municipal Airport (KASW).

These devices collected over 150 million transponder records to produce regular operations counts over different time periods, from 8 to 180 days. The operations counts calculated from these records were compared with those obtained from the FAA Air Traffic Activity Data System (ATADS) database, which contains official operations data reported by air traffic control towers at airports.

The accuracy of operations counts from the Version I devices ranged from -10.2% to 7.6%, as compared to

the ATADS counts. The differences between ATADS and estimated operations counts from Version II ranged from -3.1% to 3.0%. The test results suggest that the new method of counting operations counts based on transponder signal data is more accurate than most of the other methods currently in use at non-towered airports. Overall test results indicate that the transponder signal-counting technology is an accurate and cost-effective way to count non-towered airport operations.



The majority of GA aircraft are now equipped with ADS-B. However, there is a substantive share of GA aircraft that don't operate in rule airspace that still have only Mode C transponders. This project uses an inexpensive ground-based radio receiver to monitor both Mode S and Mode C data.

The Final Countdown

It's a winning concept, and generates cost-effective, accurate, and detailed operations counts. A transportation data services company called Quality Counts has already bought the license for this novel technology and has a product.

Looking ahead, the data collection continues. Further research involves refining the overall process to ensure the greatest possible accuracy in the count registration, including a means to gather more data, such as aircraft type. This information can provide additional insight to airport managers about the fleet mix of aircraft operating at their airports.

Set your clocks and stay tuned for updates on this exciting new technology. ▶

Jennifer Caron is FAA Safety Briefing's copy editor and quality assurance lead. She is a certified technical writer-editor in the FAA's Flight Standards Service.

LEARN MORE

See Here to Learn More About PEGASAS

bit.ly/FAASB-Arc — FAA Safety Briefing — May/June 2018



COMING SOON: MORE AIRSPACE FOR DRONE OPERATIONS

Drone pilots will have even more options than before when they seek permission to fly in controlled airspace this fall. The Low Altitude Authorization and Notification Capability, or LAANC, is getting a big enhancement that will enable drone pilots to operate in even more low-level airspace than before — and to know that they're doing it safely.

THIS FALL, DRONE PILOTS WILL HAVE EVEN MORE OPTIONS THAN BEFORE WHEN THEY SEEK PERMISSION TO FLY IN CONTROLLED AIRSPACE.

Currently, the FAA divides the airspace around nearly 750 Class B, C, D, and E airports into grids that are each about one square mile. Each grid cell has a maximum safe UAS (unmanned aircraft system, or drone) operating altitude, on which FAA air traffic facility staff, controllers, and managers collaborate to determine. This is the highest altitude that is deemed safe for UAS to operate within each cell with an automatic approval through LAANC. These altitudes can range from zero (no flights allowed without further coordination, such as in areas above and immediately adjacent to airports) to 400 feet above ground level (AGL). The grouping of these grid cells comprises the UAS Facility Map, or UASFM, for a volume of controlled airspace. “The FAA is calling the enhancement ‘Quad Grid,’ explains LAANC Project Lead, Victoria Gallagher.

At present, drone operations can't be automatically authorized in some cells away from airports, especially

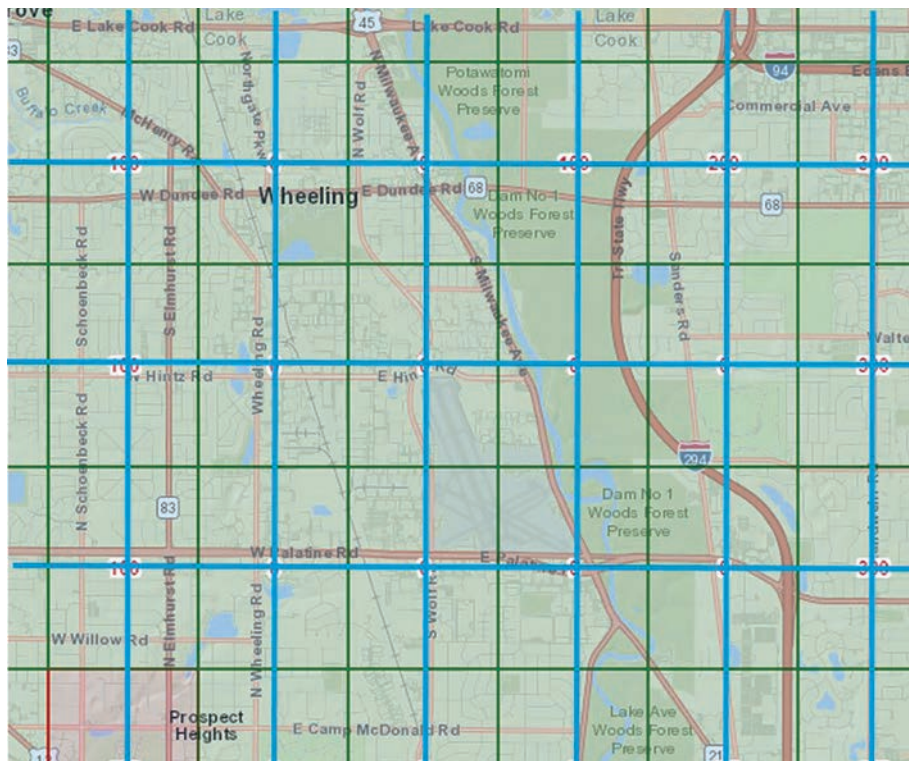


Figure 1: Current one square mile UAS Facility Map cells around Chicago Executive Airport (KPWK) are shown in green. With Quad Grids, represented by the additional blue lines, cells will be much smaller than before.

where hospital heliports are located, or where approach and departure paths clip one corner of a cell. That effectively locks out drone pilots from an entire square mile, when generally only a smaller area needs to be protected for crewed flights.

Once Quad Grids go into effect in the fall of 2021, each of those previous grid cells will be split into fourths, making the new Quad Grid cells about ¼-mile on each edge. This holds the potential to safely open up airspace for drone operations in hundreds of locations across the United States by allowing UAS flights in some of the newly subdivided cells.

Because each LAANC UAS Service Supplier (USS) visualizes airspace differently, UAS pilots may not immedi-

ately recognize the four-fold increase in the number of UASFM grid cells, but under the hood, that's what will drive the difference in how airspace authorizations appear.

Since its inception in 2017, the LAANC system has worked well for the FAA and many commercial drone pilots who operate under part 107, as well as recreational pilots flying under Title 49 of the U.S. Code, Section 44809. In fact, the FAA's approved LAANC service providers have now processed more than 700,000 authorizations, the vast majority of which happen automatically and in a matter of seconds. But UAS operators have been asking for more flexibility, and that's where Quad Grids come in. “A square cell that is a mile on each edge

doesn't naturally fit well with airspace boundaries, which are often circular," Gallagher notes.

The Quad Grid upgrade also gives air traffic control facilities more flexibility and precision when determining the maximum altitudes to set for each UASFM cell in their airspace. The current grid works well for airports with east-west and north-south runways, but facilities must be overly conservative to protect airspace underneath the approach and departure paths for diagonal runways. Once the new Quad Grids go into effect, facilities will have the option to be a bit more precise, based on their local traffic patterns. This could mean allowing UAS operations at 50 or 100 feet AGL, for example, adjacent to approach paths, if the facility determines doing so is safe.

"This has the potential to open up literally hundreds of square miles of airspace to drone pilots across the National Airspace System (NAS), without impacting the safety of operations for crewed aircraft," says Gallagher. Drone pilots would still be required to follow all other FAA regulations, such as registering their aircraft, flying within visual line of sight, and giving way to crewed aircraft.

Quad Grids are just one of many initiatives underway in the FAA to enable the safe integration of UAS into the NAS. Earlier this year, new rules went into effect that are making it easier for qualified UAS pilots to safely fly at night, or over people. The FAA has also started an Aviation Rulemaking Committee (ARC) focused on beyond visual line of sight operations. The ARC comprises about 90 representatives from across industry, local governments, tribal bodies, and others that will recommend changes to FAA rules and regulations with an eye toward further enabling the safe integration of advanced UAS operations.

The FAA is also looking at how to leverage its years of historical surveillance data to analyze airspace usage by crewed aircraft. Visualizations

could help identify areas of uncontrolled airspace with frequent crewed aircraft activities, where UAS pilots would continue to need additional collision avoidance mitigation measures. The initiatives could also help in identifying times of day when crewed aircraft operations are less likely to occur. That opens the door to exciting

new possibilities of dynamic airspace management, by enabling further UAS access in complex airspace, without limiting general aviation operations or increasing collision risk.

Peter Sachs is a UTM implementation program manager in the FAA's UAS Integration Office and previously worked as an air traffic controller at San Francisco Tower (KSFO) and Chicago Executive Tower (KPWK).

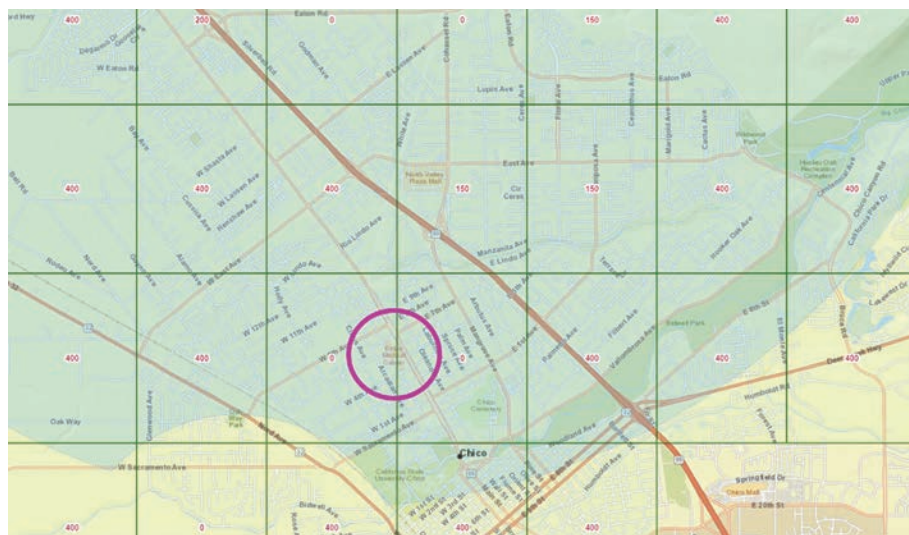


Figure 2: Consider the Class D airspace near Chico, CA. The UASFM altitude limit in two grid cells in the southern edge of this airspace is zero due to a hospital that falls within both grids. Following the transition to Quad Grids, many of the resulting eight cells will have a much higher altitude limit. Therefore, more of the Class D airspace would be available for automatic approvals. The FAA has planned an assessment to collect metrics and assess benefits in areas such as this one following the transition to Quad Grids.

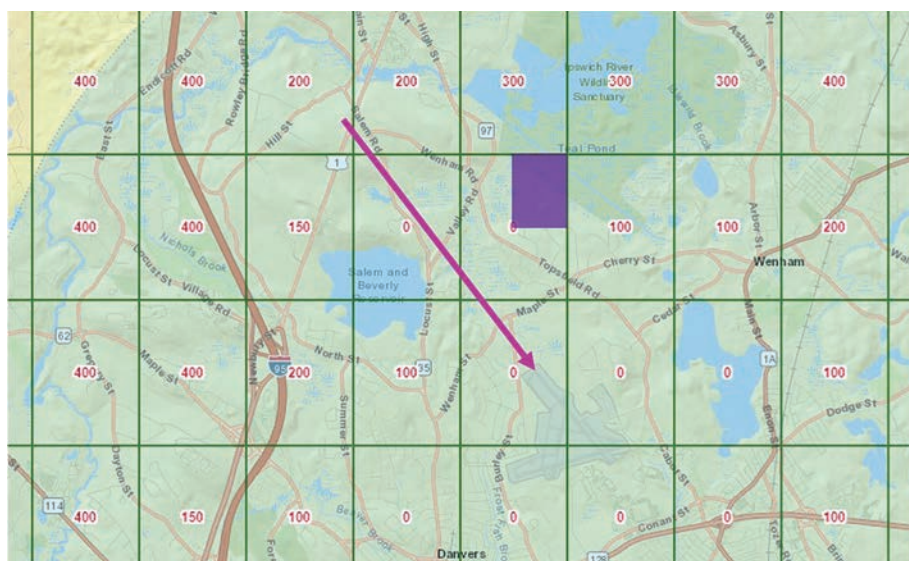


Figure 3: Current UASFM assignments around Beverly Regional Airport (KBVY). The final approach for Runway 16, depicted with the pink arrow, clips the corner of one cell with a "0," indicating no automatic approvals. With Quad Grids, each facility would have the option to adjust altitudes in new, smaller cells (for example, the one shaded purple) that are farther from high-traffic areas.



ADS-B ON NON-ELECTRIC AIRCRAFT? WE ANSWER YOUR TOP QUESTIONS

The FAA frequently receives questions from pilots and aircraft owners who are curious about ADS-B Out installs on non-electric aircraft, including balloons, gliders, and ultralights. Here are your top questions and answers.

1. My aircraft has a battery to power the radio and transponder. Is that considered an electrical system? **No.**

The requirement to install ADS-B Out applies to aircraft certified with an engine-driven electrical system, or one that has it subsequently installed. Simply having batteries or an electric starter would not mean that your aircraft has an electrical system; therefore, it is not required to have ADS-B Out. For example, if you have a generator or alternator attached to the engine to charge a battery, then you have an engine-driven electrical system. If you just have a battery or an electric starter, then you don't.

But what if my aircraft is subsequently installed with a battery? The answer here is also No. See AC 90-114B, Section 3.2 (a link is in Learn More).

2. My aircraft has a battery which means I am not required to equip with ADS-B Out, so does that mean I can fly in any airspace I want? **No.**

You must remain (1) Outside any Class B or Class C airspace area; and (2) Below the altitude of the ceiling of a Class B or Class C airspace area designated for an airport, or 10,000 feet mean sea level (MSL), whichever is lower. See "Do I Need to Equip" at bit.ly/WhoNeedsADSB, and 14 CFR 91.225 at bit.ly/equip2020 for more.

3. Can I install a battery-powered ADS-B Out system? **Yes.**



You can install a compliant, battery-powered ADS-B system, but it must be permanently installed. Portable ADS-B Out equipment (also known as "suitcase" units), including system components and antennas, do not comply. See AC 90-114B, Section 4.3.2 for more.

4. What if I have an experimental airworthiness certificate, do I have to install ADS-B Out? **No.**

The requirement to have ADS-B Out does not depend on the airworthiness certificate, but it does determine whether or not it needs to be certified. See bit.ly/ADSBOutInstalls (PDF). Aircraft with a type certificate require certified ADS-B equipment. Experimental aircraft may use non-certified ADS-B equipment. You can install equipment per manufacturer instructions.

5. What are the configuration requirements for the ADS-B Out system, and how do I know it's working?

Your avionics shop and manufacturer can help and advise you on available options and costs associated with any required upgrades. See AC 20-165B (a link is in Learn More). The best way to check your ADS-B is to run a Public ADS-B Performance Report (PAPR) report. It's online, free, with results in 15 minutes: bit.ly/PAPRequest.

6. I am not required to equip with ADS-B Out, but are there any benefits to installing a system anyway? **Yes.**

See and "B" Seen. ADS-B Out allows other aircraft who have ADS-B In, including those with collision avoidance systems, to see and avoid you, significantly reducing the risk of mid-air collisions. Your chances of a successful search and rescue mission also increases. You are also visible to UAS (drones) operating above 400 feet above ground level.

Situational Awareness. Equipping with both ADS-B Out and ADS-B In gives you traffic information (TIS-B), and flight information (FIS-B), and with 978MHz you get subscription free weather and text-based advisories such as NOTAMs and TFRs. *ADS-B In is not required.*

Jim Kenney and Paul VonHoene are aviation safety inspectors in the FAA's Flight Standards Flight Operations Branch. Matt Haskin is an aerospace engineer in Aircraft Information Systems at the FAA.

LEARN MORE

AC 90-114B, Automatic Dependent Surveillance-Broadcast Operations
bit.ly/ADSBOps (PDF)

AC 20-165B, Airworthiness Approval of ADS-B Out Systems
bit.ly/ADSBOutAirworthy (PDF)

AVOIDING THE HOTTEST “HOT SPOTS”

You’ve completed a challenging flight, maybe one that involves some bad weather. The approach was a success. The landing was among your best. But those visions of a perfect flight went up in smoke when you blundered into a runway “hot spot,” which is what the FAA calls areas that carry an increased risk of runway incursions. Hot spots may include the intersection of two runways, the intersection of a runway and a taxiway, or parallel runways/taxiways that could lead to a wrong surface event.

Exploring Real “Hot Spots”

A good example of an airport that presents multiple challenges for surface operations is Flying Cloud Airport (KFCM) in Minneapolis. FCM has six identified hot spots where pilots can get disoriented at night or with low visibility. Two of these caution pilots about the potential for confusing the closely positioned Runways 28L/28R and 10L/10R on approach. The other four indicate areas on the ramp and taxiways that are in precariously close proximity to Runway 28R/10L.

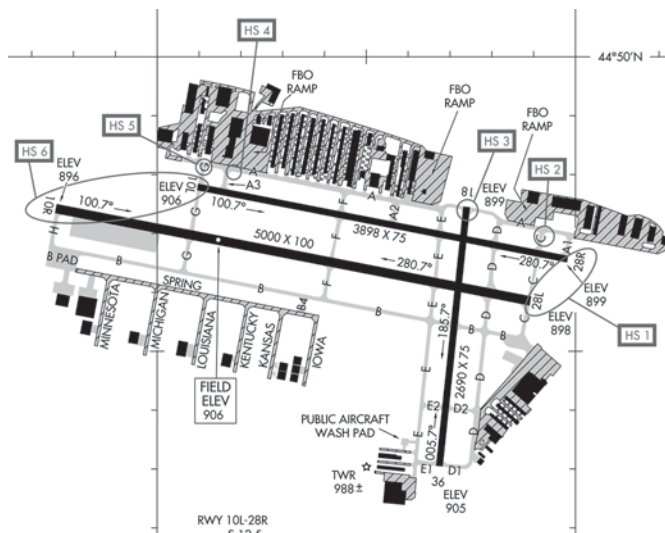
Runway safety risks aren’t limited to large-scale, multi-runway airports. They also exist at smaller, single-runway landing fields. At Houston’s Sugar Land Regional Airport (KSGR) for example, you’ll find a hot spot at the intersection of Taxiway E and Taxiways A and A3 where the short distance from Runway 17/35 increases the likelihood of conflict between aircraft.

Bottom line: always review the airport chart and hot spot information before taxiing for departure and before landing. Both of these resources can be found here: bit.ly/RunwaySafetyDiagrams.

Don’t Get Burned

Here are some self-briefing questions that will help you avoid being scalded by contact with a runway hot spot:

- What taxiways will I be using?
 - Will I be crossing any runways?
 - Are there any tricky intersections I should know about?
 - Are there any known areas of confusion I should know about?
 - Could weather or low lighting be a factor in maintaining awareness of my location?
- To answer these questions, use all available tools to plan your taxi route. These include Automated Terminal Information Service (ATIS), Notices to Airmen (NOTAM), and the FAA’s From the Flight Deck video series (faa.gov/go/FromTheFlightDeck) which provides helpful flight deck views of hot spot areas at more than 50 airport locations. It’s a good idea to be on the lookout for airport construction notices too. Recent increases in federal assistance for airports mean increased likelihood of projects that could temporarily close taxiways, runways, or parking areas and cause you to alter your normal routing. You can see the list of airport construction notices here: bit.ly/ArptConstNotice. Most electronic flight bag apps offer these notices in a list or integrate them into a moving-map display. The FAA also has a short demo video outlining steps needed to view construction notice diagrams for a given airport (youtu.be/a91Q-XKA-tA).



Flying Cloud Airport has six identified hot spots.

If you become disoriented or unsure of your position while taxiing, make sure you are clear of any runway and stop. Advise ATC and, if necessary, request progressive taxi instructions. Don’t be afraid to ask for help, and don’t be afraid of saying “unable” when you are not ready or able to accept an ATC clearance. A recently added animation on the FAA’s Runway Safety Simulator (runwaysafetysimulator.com) showcases a scenario where saying “unable” could have prevented a wrong-direction departure.

Remember that every airport is unique and presents its own set of runway safety challenges. So stay alert and stay alive!

Tom Hoffmann is the managing editor of *FAA Safety Briefing* magazine. He is a commercial pilot and holds an Airframe and Powerplant mechanic certificate.

LEARN MORE

Runway Safety Town Hall, June 16, 2021
youtu.be/wpLPTZsijfk



NEW GUIDELINES FOR HELIPORT PLANNING, DESIGN, AND CONSTRUCTION

Pilots, mechanics, and owners and operators of helicopter infrastructures — heliports and helistops — may want to be on the lookout in December for a revised FAA Advisory Circular (AC) that outlines recommended standards and guidelines for the planning, design, and construction of helicopter infrastructure.

This development comes at a time when helicopter infrastructure (heliports) and vertiports — landing spaces for vertical takeoff and landing (VTOL) aircraft — may increase in numbers, traffic volume, and importance nationwide as people and businesses look for faster and more efficient ways to get around.

HELIPORTS THAT FOLLOWED FAA GUIDELINES HAD SIGNIFICANTLY FEWER ACCIDENTS THAN THOSE THAT DID NOT.

Many ideas have emerged in recent years where helicopters can take passengers from downtown New York City to area airports. Other ideas would call for all-electric or hybrid-electric lithium battery or hydrogen-fuel-cell-powered VTOL that can serve as urban air taxis or alternatives to more traditional transportation options.

Historically, the FAA has taken an advisory role when it comes to standards for private-use heliports, which make up the vast majority of heliports. A similar advisory approach is expected for vertiports.

On December 16, 2020, the FAA Office of Airport Safety and Standards released a draft update to the Heliport Design Advisory Circular (AC)

for industry comment. The AC outlines recommended standards and guidelines for the planning, design, and construction of heliports. According to the FAA Airport Design and Construction Branch, the final updated AC is expected later this year. An AC for vertiport design is under consideration while an interim vertiport design engineering brief is under development.

The final Heliport Design AC, to be released by the FAA Office of Airport Safety and Standards, provides recommended standards “for establishing an acceptable level of safety, performance, and operation for heliports.” It also is intended to “assist engineers, architects, and city planners to design, locate, and build a suitable heliport.” The sweeping document covers everything from the design elements that make up a heliport to structural and safety recommendations.

Researchers from the FAA Technical Center, in collaboration with other researchers from industry stakeholders, published a white paper in May finding that heliports that followed FAA guidelines had significantly fewer accidents than those that did not.

The researchers looked at 185 helicopter infrastructure accidents from 1965 through 2013, and discovered that 166 accidents (about 90%) could be attributed to improper infrastructure (airport, helideck, heliport, helistop) design and/or operations. In some cases, fences were too close and too high at take-off and landing areas, wires were installed near heliports



without regard to their impact on the heliport’s airspace, or the heliports were built in places that had “incompatible” airspace.

For several years, the FAA heliport design AC has stated that their design standards assume there will never be more than one helicopter within a heliport’s final approach and takeoff area (FATO) and its associated safety area. However, the researchers found main rotor blade strikes between two helicopters either both turning, but more often one shut down and the other turning, or some area of the fuselage coming in contact with the main or tail rotor blades, usually involving parked helicopters or some other hazardous condition, according to one of the paper’s authors from the FAA Technical Center.

The FAA is focused on continually improving design, construction, and operation guidelines for heliports and on educating pilots about heliport safety. The FAA’s top priority is the safety of pilots and those who work with and around them.

Gene Trainor works as the communications specialist/executive technical editor for the FAA Compliance & Airworthiness Division.



Check out our GA Safety Facebook page at [Facebook.com/groups/GASafety](https://www.facebook.com/groups/GASafety)

If you're not a member, we encourage you to join the group of nearly 15,000 participants in the GA community who share safety principles and best practices, participate in positive and safe engagement with the FAA Safety Team (FAASTeam), and post relevant GA content that makes the National Airspace System safer.



From Our Twitter Channels — Stand By or Hold Short?

"Stand by" used to mean pilot or controller was too busy to answer, no response was expected or required. Now, tower controllers use it as shorthand for "hold short Rwy XX." A runway incursion waiting to happen. Plus, pilots are responding "Standing by," ... forehead slap.

— John

"Stand by" is an approved phraseology for Air Traffic Control (ATC) and pilots. It **should never** be used by ATC as a replacement to hold short of a runway. It is simply a way of saying, "I will get back to you soon," or "I'm too busy to answer you right now, but I will be right back." "Stand by" should be treated the same as "Roger."

Air Charter Chatter

Illegal air charter operations pose serious safety hazards. Can you spot an illegal air charter? Pop Quiz! Your team finally made it to the big game. You're a commercial pilot and you own a six-seater Piper Saratoga, so why not fly down with five of your closest friends to all enjoy the game live and in person. Question: Can you share the operating expenses for the flight? In our online poll, 83% said "Yes." Do you know the right answer?

To find out and learn more about air charter safety, watch this recorded webinar at bit.ly/FAAAirCharterWorkshop, and check out the FAA's info page at: faa.gov/go/safeaircharter. Then test your knowledge at bit.ly/ALC-697, and you can earn Advanced WINGS credit!

Aircraft Mufflers — The Hidden Danger You Need to Know

I was flying eastward across the Appalachian mountains. The airplane was flying beautifully and all was well. By the time I got to the airport, I had a splitting headache. I was so exhausted that I just set the parking brake and slept in the airplane. I got out and slept in my car for another couple hours. The next day, I told a friend of mine who happened to be a volunteer EMT. He immediately recognized the symptoms as hypoxia. That's when

the alarm bells went off. CHECK THE MUFFLER AND HEAT EXCHANGER. Sure enough, it was not in good shape. If I had not been in good physical shape at the time, I might not be here writing this.

— Jake

Hi Jake — Thank you for your email and for taking the time to share your experience. You make a great point about checking the muffler and heat exchanger. That's why we wanted to get the word out there to pilots and mechanics about the hidden dangers in the exhaust system at bit.ly/AircraftMufflers. Just taking a look inside can head off a potential incident or worse, a loss of life. It's a good thing that your EMT friend spotted the symptoms. We're very happy to hear that everything turned out ok!

What's The Buzz On Drones?

Take a look at the main points of the new Remote Identification and Operations Over People rules for drones at bit.ly/NewDroneRules.



For more stories and news, check out our new blog "Cleared for Takeoff" at medium.com/FAA.

Let us hear from you! Send your comments, suggestions, and questions to SafetyBriefing@faa.gov. You can also reach us on Twitter @FAASafetyBrief or on Facebook at facebook.com/FAA.

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



NO PLACE LIKE 'DROME

"There's no place like home."

— Dorothy in the 1939 classic film,
The Wizard of Oz.

Those who fly probably feel most at home in the sky, preferably in the pointy end of whatever plane we happen to occupy. But the aerodrome* might be a close second.

That is certainly true for me. My earliest memory is flying from Piedmont Triad International Airport (KGSO) in Greensboro to Newark Liberty International Airport (KEWR) on a B-727 "WhisperJet" when I was three years old. I loved the jet, but flying was a rare, special occasion mode of transportation in the mid-1960s. So, for many years the next best thing was Sunday afternoon visits to the airport. I'm not sure how my younger siblings felt — I never thought to inquire — but nothing was more exciting to me than hearing my parents announce a trip to GSO. Once there, we would make our way to the outdoor observation deck and watch the airliners come and go. Even then I was fascinated not only by the airplanes, but also by the well-organized and fast-paced ballet of the people who serviced arriving and departing aircraft.

In those early days of the Jet Age, the mere idea of airports easily conjured a magical mixture of adventure, possibility, and even romance. You'll find all three in Arthur Hailey's 1968 book, *Airport*, which I devoured in my youth. I own all the *Airport* movies inspired by that novel, and I occasionally treat myself to an airport movie marathon on Friday nights (FWIW, the original still gets my vote for being the best of the bunch). From time to time, I also reread the 1968 novel, if only to marvel at how much



TWA Hotel at New York's JFK Airport.

the aviation world has changed since then. Who today can imagine a commercial passenger service airport that doesn't require a security clearance?

If you share any of my fascination for — and appreciation of — the role that airports have played over the years, you might enjoy Alastair Gordon's quizzically-titled *Naked Airport: A Cultural History of the World's Most Revolutionary Structure*. First published in 2004, it opens with pictures and the story of a 1964 visit to New York's newly renamed John F. Kennedy airport: "the flashy stained-glass entry to American Airlines, the flying-saucer roof of Pan Am" and then the swooping modern "birdlike structure" of the TWA terminal. As you may know, the TWA terminal still exists as a boutique hotel offering a unique 1960s throwback experience. As the prologue to Gordon's book notes, "The airport is at once a place, a system, a cultural artifact that brings us face-to-face with the advantages as well as the frustrations of modernity. (...) Its history has been a recurrent cycle of anticipation and disappointment, success and failure, innovation

and obsolescence. This book traces that history through mutations of technology, design, and marketing — showing how the airport was gradually shaped into a new kind of human environment."

From the largest air carrier megahub to the smallest GA aerodrome, each airport is a precious piece of our national aviation infrastructure. May we never fail to appreciate each one!

**As defined by the International Civil Aviation Organization (ICAO), an aerodrome is "a defined area on land or water (including any buildings, installations, and equipment) intended to be used either wholly or in part for the arrival, departure, and surface movement of aircraft." Though it is commonly and almost universally used in the United States, the term "airport" may imply a facility that has satisfied certain certification criteria or regulatory requirements. All airports are aerodromes, but not all aerodromes are airports.*

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PETER SACHS

UTM Implementation Program Manager, FAA Unmanned Aircraft Systems Integration Office



Remember those little plastic headphones that connected to the armrest of an airliner? Peter Sachs does, because United Airlines' *Channel 9* sucked him into aviation while he tagged along on his dad's business trips.

"What a thrill!" he explained. "I learned to spot other aircraft out the window based on traffic calls, laugh at the jokes and ride reports, and keep track of our landing and takeoff sequence. At San Francisco International Airport (KSFO) — our home airport — I was in awe listening to controllers and pilots manage the mind bogglingly complex dance of big, loud jets. I tried to imagine myself doing it. A long and winding path eventually got me there."

Before becoming an air traffic controller in 2010, Peter earned private pilot and flight instructor certificates in college. An airline career wasn't of interest, so he opted for a "steady" career in print journalism. He reported from places like Cairo, Chicago, and Washington, D.C., but then the Great Recession hit.

"My first air traffic facility was Chicago Executive Tower (KPWK) — an ideal place for someone like me who

thought himself a hotshot — to get put in his place trying to sequence business jets and *Skyhawks* or run simultaneous patterns on intersecting runways," he said. "I eventually got good at it, but not without a lot of go-arounds first."

Two years later, he got a call for duty at

SFO, full circle to where his aviation journey began.

In 2013, Peter and his colleagues watched as Asiana Airlines Flight 214 cartwheeled down the runway and crashed. This tragic event motivated Peter to learn more about aviation safety. He got involved with the Standard Terminal Automation Replacement System (STARS) radar transition and electronic flight strips for controllers. In 2017 he was detailed to work quality assurance, identifying and fixing systemic safety problems at SFO.



But with a new son and no alternative to front-line shiftwork, Peter joined Airbus to work on Unmanned Aircraft System (UAS) Traffic Management (UTM). He leveraged his controller experience into UTM service architecture, applying safety culture concepts and contributing to development of UTM standards.

In 2020, Peter returned to the FAA to work on the strategic implementation of UTM. He works with a team that focuses on how to safely enable widespread and scalable deployment of complex UAS operations. A key challenge is determining effective ways to mitigate collision risk between UAS and traditional aircraft.

"The policies we put forward now, even for localized UAS operations, set a precedent, and we know that we need to ensure the safety of the NAS above all else," he explains. "Working through how to do that with technology, big data analytics, and applying the same layered mitigation strategies used for every VFR and IFR flight today is the challenge we greet every day."

Peter is also actively working to put "aviation safety culture" front and center for the drone community. He urges traditional pilots to take a drone pilot friend or colleague out flying to show them what it's like from a traditional cockpit — and then watch them fly their drone.

"This kind of cross-pollination and education within pilot communities can be a lot more effective at improving everyone's safety mindset than an FAA enforcement campaign."

Paul Ciano is an associate editor and the social media lead for *FAA Safety Briefing*. He is a U.S. Air Force veteran, and an auxiliary airman with Civil Air Patrol.



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