FAA Safety BRIEFING

May/June 2016

New Technologies

for Pilots, Planes, *and* 'Ports

Federal Aviation Administration

The May/June 2016 issue of *FAA Safety Briefing* focuses on the rapidly changing world of technology and the important role it plays in general aviation safety. Articles in this issue cover everything from unmanned aircraft to commercial space operations, to how the FAA helps champion the power of technology in making flying safer and more efficient. We also discuss some of the possible pitfalls of technology, including its ability to distract and disrupt our decision-making skills.

Cover photo by Maj. Robert Bowden, Civil Air Patrol

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You and UAS

It's not possible to produce a new technology-focused issue of *FAA Safety Briefing* without devoting some space to aviation's new kid on the block: Unmanned Aircraft Systems (UAS). So let's talk about UAS.

What's in a Name?

The media and many others call them "drones," but each word in the term UAS has meaning. First is the word "unmanned," which does not mean "un-piloted." Second is "aircraft." UAS meet the statutory definition of aircraft that operate in our complex National Airspace System (NAS). Third is "system." While they do not have a pilot on board, UAS consist of the person manipulating the flight controls, the aircraft, and communication and control components.

Airspace and Airmen

The FAA has a vital role in these areas.

This agency maintains the safest aviation system on the planet. UAS and manned aircraft will share some of the world's busiest, most complex airspace. For everyone's benefit, that integration has to be accomplished in a safe, efficient, and timely way. UAS are inherently different from manned aircraft in that "see and avoid" is normally the responsibility of pilots on board an aircraft. So we are taking an incremental approach, enabling as many UAS operations as we can right away while working toward a better understanding of broader UAS issues. We are developing rules — see below — but given how rapidly UAS technology is evolving, we must ensure that they are flexible enough to accommodate progress.

The FAA also plays a vital role in making sure that those who operate aircraft — manned or unmanned — have the proverbial "right stuff" in terms of the knowledge, risk management ability, and skill needed to operate safely with everyone else in the NAS. People like to debate whether the human part of an Unmanned Aircraft *System* is a "pilot" or an "operator," but perhaps we can all agree that anyone who operates an aircraft in the NAS is an "airman," and thus part of our diverse aviation community. So the FAA has work to do in this area, too.

Rules and Roles

If you own a UAS weighing more than 0.55 lbs (250 g), you should already know about the recent rule requiring you to register it. By the time you read this article, the FAA will be close to publishing a final rule that will establish the criteria for small UAS — those under 55 pounds — to participate in U.S. civil aviation for other than hobby or recreational use. As originally proposed in February 2015, the rule would allow routine use of small UAS in today's NAS, and it is intended to be flexible enough to accommodate future technological innovations.

Airman certification is an important part of safely integrating UAS into the existing aviation community. While many UAS owners already hold a traditional pilot certificate, UAS is bringing a new set of airmen to our shared airspace. To ensure that everyone understands how to play nice in the NAS, the rule proposes to require certain airman knowledge to be eligible for an airman certificate for UAS operations. My Flight Standards Service team is already doing the groundwork on UAS Airman Certification Standards (www.faa.gov/training_testing/testing/) to develop appropriate test questions.

By the time you read this column, the FAA will have also wrapped up an aviation rulemaking committee (ARC) with industry stakeholders on a proposed rule for "micro" UAS. The ARC's task was to develop recommendations for a flexible, performance-based regulatory framework allowing this category of UAS to be operated over people when meeting certain standards. As part of its strategy for UAS integration, the FAA is also looking at other UAS-related rule and policy updates to support aviation safety for all.

B4UFLY

There is a lot going on in the UAS area, so please visit the FAA website to get the full story, including information on the FAA's B4UFLY smartphone app for UAS operators.

UAS integration opens the door to a more diverse and dynamic aviation future for all aircraft. Regardless of which type aircraft you fly, you are an airman. Fly responsibly and respectfully, so we can all continue to enjoy the world's safest aviation system.
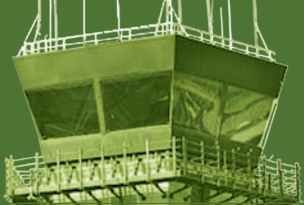

Learn More

For UAS information:
www.faa.gov/uas/

For ACS information:
www.faa.gov/training_testing/testing/

General Aviation Survey Needs Your Help

The 38th annual General Aviation and Part 135 Activity Survey (GA Survey) for reporting is now underway. As always, your participation is important. If you receive an invite to participate, please respond, even if you did not fly your aircraft in 2015. The GA Survey is the FAA's primary source of information about the size and activity of the general aviation and on-demand Part 135 fleet. Previous years' survey results can be found at http://1.usa.gov/24QSfh7.

Please be assured that your responses are kept confidential. The information collected will be used only for statistical purposes and will not be released in any form that would reveal an individual participant. Tetra Tech is an independent research firm that conducts the survey on behalf of the FAA. You can contact them with questions at 1-800-826-1797 or via email at infoaviationsurvey@tetratech.com.

Detecting Rogue UAS

Each month, the FAA receives more than 100 reports from pilots and others who spot what appears to be an unmanned aircraft (UAS) flying close to an airport or a manned airplane. It's become a serious safety concern for the agency, and a potential security issue for the Department of Homeland Security (DHS).

In addition to the FAA's ongoing outreach and education efforts, an additional step toward a solution is to detect and identify these "rogue drones" and their operators. Recently, the FAA partnered with DHS and CACI International to explore how the company's prototype detection technology may help detect UAS in the vicinity of airports. The main goal of the partnership is to safely explore procedures and processes for deploying and operating detection technologies in and around commercial airports.

CACI's proof-of-concept system employs radio frequency sensors at strategic locations around an airport in high, prominent locations. When the sensors detect frequencies unmanned aircraft typically use, it triangulates the signals and determines the location of both the UAS and the operator.

From January 25 to February 2, the CACI system was evaluated at Atlantic City International Airport (ACY), the first UAS detection research in a commercial airport environment. A total of 141 operations were executed over five days — 72 with a UAS on the ground and 69 with different small UAS in flight. In the coming months, engineers from the FAA, DHS, CACI and the University of Maryland will work together to compile the data for a final report by August 2016.

These research efforts also may contribute to keeping the skies safe from "bad actors" who want to use unmanned aircraft for malicious purposes. To that end, the agency signed a Memorandum of Understanding with DHS to collaborate on the safe integration of UAS into the U.S. aviation system.

New Student Pilot Application Requirements

The FAA issued a new rule that requires student pilots to apply for, obtain, and carry a plastic pilot certificate to exercise the privileges of the pilot certificate. Additionally, it modifies the process by which student pilots apply for a certificate; they must now apply in person at a Flight Standards District Office, through a Designated Pilot Examiner, with an airman certification representative associated with a part 141 pilot school, or with a CFI. Student pilots who currently have a paper student pilot certificate may continue to use it, or can request a plastic replacement for $2. The plastic certificates will not expire, which will give the student unlimited time to complete training without having to apply for another student pilot certificate. For more information on the rule, which became effective April 1, 2016, go to https://federalregister.gov/a/2016-00199.

NTSB Safety Alert for Fly-In Events

The National Transportation Safety Board (NTSB) issued aviation safety alert SA-053 (http://go.usa.gov/cHqgC) earlier this year, highlighting aviation safety issues pilots may face arriving at major fly-in events. Pilots planning on flying in to any of these events, like EAA's AirVenture in Oshkosh, Wisc., are encouraged to review the alert.

Major fly-in events pose unique challenges including high-density traffic, special flight and communication procedures, a rapidly changing environment, and changes to air traffic control separation standards. The safety alert provides pilots guidance for dealing with the challenges of major fly-in events and stresses the need for them to review FAA Notices to Airmen (NOTAMs) at www.faa.gov/air_traffic/publications/notices/.

"Events like these are a great way to celebrate the joy of aviation," said John DeLisi, Director of the Office of Aviation Safety at the NTSB. "A little extra planning will help ensure a safe arrival."

SA-053, along with other NTSB safety alerts can be found online at ntsb.gov/safety/safety-alerts/Pages/default.aspx.

Be Aware of Major TFRs

The Temporary Flight Restriction (TFR) over Super Bowl 50 showed us what it looked like to be intercepted by military and law enforcement aircraft. Go to https://youtu.be/eNEkBc_EEqw to watch an F-15 intercept a Civil Air Patrol Cessna during a training flight.

Photo by Maj. Noel Luneau, Civil Air Patrol

An F-15 intercepts a CAP Cessna during a TFR enforcement training flight.

Even with all that warning beforehand, four errant GA aircraft violated the Super Bowl TFR. Some upcoming major events that will generate TFRs are the Republican National Convention, July 18 through 21 in Cleveland, and the Democratic National Convention, July 25 through 28 in Philadelphia. There will also be approximately 5,000 sporting events with accompanying TFRs in 2016.

An easy way to see those TFRs is to have ADS-B In on your aircraft or go to http://tfr.faa.gov.

If you need a refresher on what to do if you are intercepted, download our fact sheet at http://1.usa.gov/1EJ3n4i.

Free Flight Services for GA Pilots

With summertime here and flying season upon us, the need to have current updated information at your fingertips is essential to the safety of your flight.

Safety Enhancement Topics

May: Spatial Disorientation Both Instrument and VFR pilots are subject to spatial disorientation and optical illusions that may cause loss of aircraft control.

June: Engine Maintenance and Performance Monitoring Learn more about the pitfalls of inadequate engine maintenance as well as how flight data monitoring can help forecast system/component problems.

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

The FAA Flight Service Direct User Access Terminal Services (DUATS) II web portal providers, CSC DUATS and Lockheed Martin, provide pilot weather briefings, tailored to your route of flight and offer assistance with flight planning during adverse conditions. Plain language and interpretation tools are available to help describe weather conditions. We know the importance of recorded briefings. We know this is a critical issue to pilots. So, rest assured, by using either of the DUATS II providers, your briefings are legal and recorded. You can also request an email of the briefing to take along on your flight.

In addition, electronic flight plan filing is available with easy to use drop down menus. Pilots can also register for electronic visual flight rules (VFR) flight plan activation, VFR flight plan closures, enhanced search and rescue, along with adverse conditions alerting services. By registering for adverse conditions alerting service, you can receive crucial information including current weather conditions, advisories, Notices to Airmen, Temporary Flight Restrictions, and airport closures via text or email. Each DUATS II provider has different options to help you make easier and safer flight decisions. You can find out additional information by registering at www.1800.wxbrief.com or www.duats.com.

Expanding the Safe Integration of UAS

FAA established an aviation rulemaking committee with industry stakeholders to develop recommendations for a regulatory framework that would allow certain UAS to be operated over people who are not directly involved in the operation of the aircraft. The FAA is taking this action to provide a more flexible, performance-based approach for these operations than what was considered for Micro UAS. At press time, the committee was expected to issue its final report April 1. Check www.faa.gov/uas/ for any updates.

Airport / Facility Directory Renamed

Beginning March 31, 2016, the familiar green Airport / Facility Directory will have a new name: Chart Supplement U.S. The Airport/Facility Directory title will still refer to the front section of the book where the airports, NAVAIDs, and weather devices are listed. The new Chart Supplement title will refer to the entire volume. To view or download the Chart Supplements, go to http://go.usa.gov/c7W4H.

Always Looking to the Future

In the pages of this issue you will read about some of the things FAA is doing to prepare for the future or to make the technology we have more useful than it is today. One of the FAA facilities leading the way forward is the William J. Hughes Technical Center near Atlantic City, NJ. But the Tech Center is hardly the only FAA facility spearheading technological breakthroughs. The Office of Aerospace Medicine's own Civil Aerospace Medical Institute (CAMI), located in Oklahoma City, works tirelessly on research that will help bring FAA and aviation into the next generation.

What is CAMI?

You've probably already heard of CAMI even if you don't realize it. When an Aviation Medical Examiner (AME) discusses having to call or defer to Oklahoma City, he or she is talking about CAMI. But medical certification work is only part of what CAMI does. CAMI works on educational materials that help train AMEs so that they understand the latest FAA guidance. Additionally, CAMI produces training materials for airmen and hosts free classes. If you had a chance to experience hypoxia at the FAA Safety Center in AirVenture last year, you can thank the Airman Education team from CAMI for making it possible. Our Airman Education teams produce videos and pamphlets on various topics of interest to pilots.

CAMI also provides toxicological testing for all aircraft accidents. Improvements made in this area have allowed us to have a much better idea of what potentially impairing substances are showing up in accident pilots. They have also allowed us to increase the number of drugs we screen for in fatal accident toxicology tests. This information provides better insight into the health of accident pilots.

In addition to "medical" testing and research, CAMI conducts research in Human Factors. Some focuses on pilots, but CAMI also examines Air Traffic Controller performance in our ATC Training and Performance Laboratory, where scientists can measure the performance of individuals or groups of controllers. This helps FAA measure the efficacy of controller training and improve screening processes. CAMI's ATC simulators allow us to test how the introduction of new technology impacts controller workload.

CAMI uses a number of simulators to evaluate technology like Heads Up Displays (HUD), Helmet Mounted Displays (HMD), and flight envelope protection systems, to name a few. We also use electroencephalography (EEG) to measure brain activity and performance within our ATC and flight simulators. Most recently, CAMI has introduced Unmanned Aircraft simulation, including an Unmanned Aircraft System control station simulator.

Another research tool is our Biodynamics Impact Test Track, otherwise known as the "crash test" simulator. Combined with our Anthropomorphic Test Devices — our very smart version of a crash test dummy — this facility evaluates crash survivability and aircraft seat performance, among many other factors.

A Look Behind the Curtain

Our Aeromedical Research Division is working on several new projects. These include incorporating gene expression markers for hypoxia and fatigue into accident investigation analysis, the challenges of advanced robotic prosthetics in FAA aeromedical certification, and a number of cabin safety issues. The Human Factors Research Division is looking at Angle of Attack display requirements, laser eye protection for pilots, and problem solving/decision making and procedures for unexpected events in GA, including loss of control. And that list is only the beginning.

CAMI produces training materials for airmen and hosts free classes.

CAMI helps to guide the Office of Aerospace Medicine in decision-making for how we handle medical conditions and medications. It also plays a key role in explaining those changes to our AMEs across the country so that they are better able to keep you in the air. In summary, CAMI is an absolutely critical component in the development and future of aerospace research.

James Fraser received a B.A., M.D., and M.P.H. from the University of Oklahoma. He completed a thirty year Navy career and retired as a Captain (O6) in January 2004. He is certified in the specialties of Preventive Medicine (Aerospace Medicine) and Family Practice. He is a Fellow of the Aerospace Medical Association and the American Academy of Family Practice.

Editor's Note: The following questions are from different people but are under the same general category. The answer for Q1 also applies to Q2.

Q1. I have been diagnosed with spinal stenosis. Can I still fly? I have been doing so for more than 50 years.

Q2. My post-surgery stenosis comes and goes, and cyclobenzaprine seems to give me some relief. Is this medication completely disqualifying until it is out of my system (rule of 5 says that 8 hours between doses means 40 hours after taking it), or is it the case that if I feel okay within that 40 hours, I'm probably okay to fly, just like driving? The stenosis does not interfere with normal activities, it just hurts.

A1/2. Spinal stenosis is not a disqualifying diagnosis; however, pain, muscle weakness, and sensory changes associated with spinal stenosis can become a safety issue. You should discuss these with your AME if you develop them. We are in the process of reviewing some of our wait times on medications in view of new information from our laboratories at the Civil Aerospace Medical Institute (CAMI). Indications are that we will be able to shorten some wait times. However, I need to caution you that there is convincing evidence that, at least with diphenhydramine (Benadryl), individuals demonstrate significant impairment even when they report feeling "fine." Therefore you should stick to the published wait times rather than just deciding that you feel "OK." Driving and flying just aren't the same.

Q3. I've recently had a five level spinal fusion surgery with a nominal three month recovery to some level of functionality. Also, I'm a high time general aviation ATP/CFII, but for obvious reasons, the first flight post-surgery will be with a CFI.

In order to fly safely, I believe I will need to:

- be able to get in and out, reach all the controls, look all around, etc. (Physical therapy should address these issues.)
- have basic flying skills intact after some months off. (This is the least of the concerns, given extensive experience and high skill levels.)
- make sure that, post-surgery, I will have enough energy for each flight. (I'll assess this based on ability to perform daily activities and by endurance when walking.)
- and the real question — make sure that I am neurologically recovered from the inflammatory response to surgery, as well as anesthesia and drugs. (Only when my driving is as easy and confident as it was pre-surgery will I get back into the airplane.)

Does this plan cover everything, or is there something else I should check? And I renewed my medical right before surgery to minimize paperwork.

A3. This is an excellent plan. I would repeat that the ability to drive a car does not necessarily mean you are safe to fly, but as you say, is one reasonable indicator. You need to be sure you are no longer taking any medications that are potentially impairing such as pain medications or muscle relaxants. Do not underrate pain as a significant distractor. More than just reaching the controls, you need to be sure that you have the muscle strength to perform emergency procedures should that become necessary.

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

Prescriptive to Performance-Based:

FAA Proposes New Part 23 Rule

JENNIFER KILEO

The FAA proposed one of the most extensive revisions to its regulations in history on March 14, with the publication of the Part 23 Notice of Public Rulemaking (NPRM) available at https://federalregister.gov/a/2016-05493.

The proposed revision addresses general aviation (GA) airworthiness standards for normal, utility, acrobatic, and commuter category airplanes with a maximum seating capacity of 19 passengers and a maximum takeoff weight of 19,000 pounds.

Aiming to streamline the approval of new technologies in type-certificated airplanes, the proposal establishes a new performance-based regulatory structure utilizing consensus-based industry standards as the methods of compliance. The proposal also includes new certification standards that address flight in icing conditions and loss of control accidents, the leading cause of GA accidents.

The current part 23 airworthiness standards are largely prescriptive, meaning that they describe detailed design requirements, and are based on airplane designs from the 1950s and 1960s. As a result of this prescriptive framework, the FAA often requires manufacturers to provide onerous documentation in order to incorporate new technology. These requirements act as barriers to certification and innovation of technologies that could enhance safety, and they are costly to the FAA and industry.

"We took a 'clean slate' approach to part 23... to see how we could encourage innovation while maintaining and improving the level of safety that the system we have in place has been able to achieve," said Associate Administrator for Aviation Safety Peggy Gilligan.

The Part 23 Rulemaking Team, which included representatives from the Aircraft Certification Service (AIR), the Flight Standards Service, and the Offices of Rulemaking, Aviation Policy & Plans, and Chief Counsel, worked tirelessly to introduce performance- and risk-based standards to balance the need for acceptable levels of safety across the broad range of part 23 airplanes.

The team's task was not easy. They reviewed and challenged recommendations from a 2008 Part 23 Certification Process Study, a 2010 Part 23 Regulatory Review, and the Part 23 Reorganization Aviation Rulemaking Committee, which provided input from industry and international regulatory stakeholders in support of globally harmonized small airplane regulations. The team also sought to satisfy congressional mandates outlined in the bipartisan Small Airplane Revitalization Act of 2013 and the FAA Modernization and Reform Act of 2012 to streamline the approval of safety advancements.

"This streamlines a manufacturer's ability to incorporate safety-enhancing technologies into aircraft as quickly as possible while increasing safety and flexibility for future innovation in GA airplanes," said Part 23 Reorganization Program Manager Lowell Foster.

For more on the benefits of the proposed rule, check out the following video: https://youtu.be/Ft2Rw21e7SY. The comment period is 60 days from publication in the *Federal Register* and closes on May 13, 2016. ✈

Jennifer Kileo is a communications specialist with the Aircraft Certification Service Small Airplane Directorate in Kansas City, KS. Since joining the FAA in 2002, Jennifer has held positions in the FAA's Offices of International Affairs and Rulemaking.

Photo courtesy of Garmin

The FAA hopes these changes will help manufacturers introduce new technologies like advanced cockpits that can provide better information more clearly to pilots.

SABRINA WOODS

Welcome to

THE WILLIAM J. HUGHES TECHNICAL CENTER!

The Happiest Place in Aviation Tech

Photo by Tom Hoffmann

What do retrofitted aircraft, crushable concrete, experimental fuels, virtual reality, portable radar control centers, fire suppressing foam, and brain scanners have in common? Well, not much actually — except for that fact that these are just a *few* of the wonderful observational studies, experiments, and research projects going on at the William J. Hughes Technical Center located near Atlantic City, New Jersey. As the FAA's center for aviation research and development, the men and women of the Tech Center dedicate their lives to making sure that any and everything that comes in contact with the National Airspace System (NAS) has been analyzed, tested, and vetted to ensure it is the safest and most efficient product it can be.

Tom Hoffmann, the managing editor for *FAA Safety Briefing*, and I had the opportunity to run (and I do mean run) around the Tech Center for a day in what turned out to be a head-on-a-swivel, drinking from the fire hose tour of some of the coolest stuff supporting our NAS. This 5,000 acre virtual theme park for aviation techies (complete with campus maps!) has its own powerplant test cells, flight deck simulators, aircraft fire training sites, a drop test facility, and experimental aircraft of all shapes and sizes. It was enough to make my inner geek swoon with unabashed glee. Moreover, it was very apparent that every person we had a chance to talk to was a consummate professional with immense pride in what they do.

Off and Running

First up, we got the chance to talk with the people who run the research and development (R&D) flight program. The group currently maintains and operates six "flying laboratories" to include a Piper *Navajo*, two Convair 580s, and a Sikorsky S-76. They are the "end of the line" before projects enter the NAS. The R&D team is one-of-a-kind in the fact that its members interface with almost every other department at the Tech Center, throughout the FAA, and even with industry in some cases.

Armando Gaetano is the manager of the flight program and he says that being the last line of defense before a project hits the NAS is a rewarding and exciting experience. "You would be surprised — we see long vetted, extensively tested programs that will still have one or two kinks by the time it gets to us. These are the things you want to find now rather than later."

Currently, this highly motivated team made up of test pilots, engineers, and aviation maintenance technicians are putting Automatic Dependent Surveillance-Broadcast In and Out systems through the paces and providing valuable data back to the project administrators. They are also helping to bring the Aviation Safety Information Analysis and Sharing (ASIAS) program to rotorcraft. To read more about what ASIAS program manager Cliff Johnson and his team have been experimenting with, check out this edition's "Vertically Speaking."

Off the Rails

The R&D team has also been helping the fuels group test the leading candidates for a 100LL replacement. Coincidentally, the fuels department is where Tom and I were headed next.

The fuels laboratory understands that one of the biggest questions in the GA community is "when are we going to get a new fuel?" Dave Atwood and Ken Knopp oversee an amazingly diligent and meticulous team determined to find a suitable, sustainable fuel, and to ensure as smooth a transition as possible for the GA fleet. Their timeline is aggressive — the goal is to complete testing by 2018.

The team has whittled 17 submissions from nine companies down to two candidates from two companies. Shell and Swift Fuel are now providing larger quantities of their fuels for the three test cells to tackle. Among the characteristics the fuel team looks for is how well the fuel suppresses detonation, the shelf and service life, how compatible it is with other aircraft components, and overall sustainability. Within their own facility the team is able to test the fuels at ground level and at an altitude of up to 20,000'. Not an easy task!

Although we were learning a lot, our well-organized tour was starting to go off the proverbial rails a bit. There was just too much information, too much to see, and too many buttons to push!

Virtually Magnificent

What an amazing difference a few crafty engineers in a relatively small working space can make! Al Rehmann, supervisor for the Tech Center's Flight Deck Simulation Facility, showed us simulator after simulator — to include a Cessna 172 — each dedicated to ferreting out one aspect or another of enhanced flight information transfer and management. One of the key projects Al's team has worked on is the Weather Technology in the Cockpit (WTIC) program. This program is near and dear to GA and

is the impetus for all of the advancements in meteorological information presentation — such as the standardization of colors and symbology.

Back to those crafty engineers — the team is responsible for building up each of their simulators to meet the requirements of the project. In just the short week between my visit and the writing of this article, a Redbird Advanced Aviation Training Device has had its out-of-the-window visuals completely revamped and enhanced; all handcrafted in house by team members. The savings are astronomical.

The men and women of the Tech Center dedicate their lives to making sure that any and everything that comes in contact with the National Airspace System (NAS) has been analyzed, tested, and vetted to ensure it is the safest and most efficient product it can be.

"The thing about this place," chuckles Al, "is that people arrive here and never want to leave. The work is interesting and challenging." We totally agree, hence the "we got off schedule" part. After a dizzying (but ridiculously cool) moment in an Airbus 321 mock-up, we were off again — this time to check in with the air traffic control interface and human factors team.

This incredible group afforded us the opportunity to "play" with some of their snazziest tools to include an Oculus virtual reality (VR) headset and a human simulation software program (Jack™) designed to predict ergonomic and layout issues with new control facilities. The Oculus wearer can walk through the VR scene and gather data on line-of-sight, natural lighting vs. sun glare issues, sound control and mitigation, Americans with Disabilities Act compliance, ergonomic design, man-machine

Photo by Tom Hoffmann

The FAA's Piper Navajo has been instrumental in testing candidate fuels for 100LL replacement as well as ADS-B signal integrity.

Flight deck simulators and Oculus headsets are just some of the virtual reality tools used at the Tech Center.

interface and so much more!

I will never, ever tease my *Second Life* loving friends again. Ever.

Finishing Strong

In an attempt to get the day back on course, we sprinted off to a round-table discussion with some of the team leads for various programs. Among the many programs Tech Center personnel are responsible for is ongoing research on Angle of Attack indicators and wing stall prevention, bird strike mitigation for rotorcraft, lithium battery and thermal runaway research, and projects using unmanned aircraft as a testing platform.

Whew! And the most outstanding part of all of this is that these professionals take special care to ensure the protection of intellectual property. Meaning that if someone from the FAA or industry comes and wants to put an idea through the ringer, the Tech Center provides that support while remaining objective and ensuring non-disclosure of the results.

Afterwards, we were delivered into the hands of the NextGen Integration and Evaluation Capability (NIEC) facility. The NIEC is the FAA's research

platform to explore, integrate, and evaluate NexGen concepts. They do this through high-fidelity, real-time simulation. The team carefully integrates legacy systems with future technologies to see how these systems will interact in the NAS. They use a variety of UAS to determine if new technology or procedures are safe enough before advancing to manned aircraft. In the NIEC, every single aspect of the NAS can be reproduced and integrated all in one area, and all within line-of-sight of each other and the program manager. These are things that just can't happen in the real world. Currently, the lab is testing out the operational concerns GA and commercial aircraft have in regards to see/detect and avoid with UAS.

Housed next to the NIEC was the Surveillance and Broadcast Services (SBS) program office. This team is the one responsible for monitoring the health of all SBS systems to include Traffic Information Service – Broadcast (TIS-B), Flight Information System – Broadcast (FIS-B), and of course, Automatic Dependent Surveillance – Broadcast (ADS-B) systems. Currently, there are over 645 ground stations with efforts to expand into Mexico and out onto oil rigs, and plans to incorporate space-based ADS-B all on-going.

Tammy Willson and Stuart Searight showed us a dazzling array of everything the SBS team is tracking in the *entire* national airspace. Literally hundreds of tiny airplanes symbolizing ADS-B Out equipped aircraft, and little Dorito-like (yes, the chip) symbols representing radar tracked aircraft dotted an electronic map of North America.

"We make sure the ADS-B system functions as intended and are continuing to develop ADS-B In to increase safety and efficiency in the NAS," says Stuart, the branch manager for the SBS lab.

Both facilities were awe-inspiring and totally worthy of a day trip unto themselves. Upon entering, Tom and I knew there was no way we would ever get back on our tour schedule so we simply resigned ourselves to having to return some day. It wasn't a tough decision!

The entire experience was incredible and there just wasn't enough time (or enough space in this article) to see and interact with everything the Tech Center has going on. It truly is the nation's premier air transportation system laboratory and it is my great honor to present to you just a fraction of the work that they do. ✈

Sabrina Woods is an associate editor for FAA Safety Briefing. *She spent 12 years as an aircraft maintenance officer and an aviation mishap investigator in the Air Force.*

SUSAN PARSON

eLogbook Logistics:

Considerations for Moving from Paper Log to Digital Login

When I enrolled as a flight student in the summer of 1991, my newly-assigned flight instructor handed me a small, gray-zippered bag filled with items that now seem like archeological artifacts. There was a thick and heavy textbook, albeit one with glossy pages and full-color photos to illustrate things like piston engine parts. There was a clear plastic plotter that looked like a souped-up version of my high school geometry class protractor. There was an odd and, at the time, utterly inscrutable circular slide rule that was pretentiously and improbably known as the "E6B Flight Computer." There were crisp new copies of the sectional and terminal area charts for my home airspace. And there was a little rectangular book of pristine green pages that sported a sturdy black cover and bright gold lettering proclaiming itself to be a Pilot Logbook.

The advent of the Internet, portable electronics devices, and the app-for-everything age has rendered pretty much everything in that once-treasured gray bag obsolete. I quickly and enthusiastically moved from textbooks to eBooks, and I eagerly embraced the convenience of online flight planning and digital charts — especially after they began to include the magic blue dot denoting geo-referenced positioning.

But whither the paper logbook? Whether you are just starting out as a pilot in training or are a longtime pilot contemplating the convenience of electronic record keeping, there are a number of factors to consider. Let's take a look.

Legalities

We'll start with the proverbial fine print of the legalities. A review of 14 CFR section 61.51, Pilot Logbooks, shows that FAA regulations focus on *what* the pilot must "document and record," either to meet the requirements for a certificate, rating, or flight review, or to meet the regulatory requirements for flight experience. The logbook entries portion (14 CFR section 61.51(b)) lists the specific information to be recorded for this purpose.

With respect to *how*, though, the regulations say only that the pilot must document and record information "in a manner acceptable to the Administrator." Since there is no statement or regulation that deems electronic documents and records *un*acceptable for this purpose, it is perfectly legal to maintain the required information in almost any format you choose. Though most pilots do use standardized formats for both paper and electronic logbooks, you are free to use almost anything — a spiral notebook, an Excel spreadsheet, or whatever else you choose as your preferred means of documenting required flight time.

That's the easy part. For many, the vexing question is how to handle endorsements. The suggested wording for endorsements is in Appendix 1 of Advi-

sory Circular (AC) 61-65F, *Certification: Pilots and Flight and Ground Instructors*, which also specifies that the endorsement should be legible and include such things as the instructor's signature and instructor certificate number and expiration date along with the date of signature. My paper logbooks are full of instructor endorsements and signatures, and over the years I have put pen to paper to make and sign endorsements in many a pilot's paper logbook. I have not yet sought to add an instructor's endorsement to my own electronic logbook (more on that shortly), nor have I been asked to provide a signed endorsement in another pilot's electronic logbook. I know that day is coming, though, so I did some research on how the agency views this topic.

The go-to document is AC 120-78, *Acceptance and Use of Electronic Signatures, Electronic Record-keeping Systems, and Electronic Manuals*. AC 120-78 provides guidance on the acceptance and use of electronic signatures to satisfy certain operational and maintenance requirements. It specifies that the term "electronic signature" refers to either electronic signatures or digital signatures, with the specific electronic signature used contingent on the end user's preference and the system application. An electronic signature may take any of the following forms:

- A digital signature
- A digitized image of a paper signature
- A typed notation
- An electronic code
- Any other unique form of individual identification that can be used as a means of authenticating a record, record entry, or document

While this article focuses on pilot use of electronic logbooks, let me note that the material in AC 120-78 is just as applicable to maintenance records. Whether for pilots or for planes, the FAA's main concerns with respect to electronic signatures are accuracy, security, "non-repudiation," and traceability. An electronic signature must be accurate, and it should be provided in a way that makes it difficult for anyone to duplicate or change it. It should prevent the person signing from denying that he or she affixed a signature to a specific record, record entry, or document, and it should provide "positive traceability" to the individual who signed a record, record entry, or any other document.

Early electronic logbooks may have lacked some or all of the necessary capability, but a quick review of several more recent logbook apps shows that most now have the means to capture an appropriate electronic signature. A precise description of ways and means is beyond the scope of this article, so suffice it to say that you should carefully review (and follow) the particulars for the specific logbook app you are using.

Modalities

Apart from the ability to capture and maintain any necessary electronic signatures, there are several characteristics to evaluate in the course of selecting an electronic logbook app. Because data entry can require a significant investment of your time, it is worth the effort to review and find the best electronic logbook app for your specific needs before you even think about the first entry. Here are a few of the elements to consider.

Functionality: Electronic logbook apps today offer everything from basic spreadsheet-style recording to highly customizable capability. Logging for personal purposes might drive a simpler selection. If you are just starting out in aviation, and especially if you intend to pursue a professional flying career, you will probably want to select a more sophisticated electronic logbook app. In addition to the ability to capture and record electronic endorsements and signatures, you will want an app that allows you to easily enter and sort the data you need to document. Having many times painfully picked my way through row after row of paper entries to pull the data needed for a particular Form 8710 Application for Airman Certificate or Rating, I can tell you that almost any electronic sorting functionality beats the manual method that a paper logbook condemns you to by default. Still, some apps sort better than others.

Backup: You will definitely want to ensure that your precious logbook data is thoroughly backed up. Control freak that I am, I use several methods. First, I continue to keep a paper logbook, both for backup and for sentimental purposes (more on that below). Second, I make use of my electronic logbook app's cloud storage features. Third, I keep yet another full copy of my logbook data in my own cloud storage account. Overkill? Perhaps. But in view of how long it took me to accumulate those hours in the first place and to convert the paper entries to an electronic format later on, I am quite happy to have multiple backups in place.

Security: Most electronic logbook apps allow you to set a password for added security on your account. It's not a bad idea to protect this important information, so be sure your app has the capability and then make use of it.

Portability: Does the app allow you to import and export data without the documentary equivalent of aerobatic maneuvering? Most electronic logbook apps enable use of "CSV" (comma spaced values) and/or Microsoft Excel formats as a means of importing or exporting existing electronic data. Don't even think about using an electronic logbook that does not allow you to export your data into one of these formats. That said, please don't assume that having a CSV or MS Excel file from one electronic logbook makes it easy to import that data into another electronic logbook app later on. I speak from experience: At the time of this writing, I am just starting the painful task of trying to import the CSV data from one electronic logbook app to another.

Practicalities

The practical benefits of an electronic logbook are obvious. Especially if stored in the cloud with syncing capability, the data from your electronic logbook is securely backed up and accessible to you almost anytime or anywhere. As I mentioned already, an enormous benefit is the ability to sort your logbook data and generate virtually any kind of report for insurance or other purposes. Need to know how many hours you have in a specific tail number? Check. Number of approaches in IMC? Check. Remind me when my next flight review, medical, or IPC is due? Check. You're all set.

The catch is that unless you were fortunate enough to have started your flying days with an electronic logbook, you somehow have to convert all those pen-and-paper entries into a digital format before you can enjoy the benefits of electronic record-keeping. I know it can be overwhelming. When I first made the switch, I spent time every night for several weeks painstakingly digitizing about 15 years' worth of logbook entries. Tedious it was, but the benefits are well worth the cost — and it was often fun to take a trip down memory lane by reliving some of the flights immortalized by logbook data entries.

There are various ways to proceed if you aren't up for doing it all yourself. You can hire a service to do it for you. From what I've determined, it is not cheap (somewhere around $200 for 500 entries), but your time may be valuable enough to make it worthwhile. Another option is to total the existing entries in your paper logbook and make one large summary entry to get your electronic records going. I am seriously considering a variation on this method to transfer my current electronic logbook data to the new app. While the summary entry method will not allow you to sort with the level of detail you might want, this problem will dissipate over time as your electronic logbook entries grow. Also remember that for insurance and most other reporting purposes, you rarely need to go back more than 12 months anyway.

Sentimentalities

Even an acknowledged techno-geek like me has to admit that there is something special about paper logbooks. A pilot's paper logbook has an unmistakable look and feel, and I always found great satisfaction as well in the visible accumulation of entries. The length and style of some "remarks" entries can also provide Proustian involuntary memory triggers that let you relive aspects of a particularly good (or bad) flight. However convenient they are, digital entries in an electronic logbook aren't quite the same — which is why I chose to continue making pen-and-ink entries in a paper logbook along with every electronic entry to my cloud-based logbook.

That said, the growing multimedia capability of apps — including electronic logbooks — can make these documents far more colorful and memorable than even the most carefully written remarks section in a paper logbook. Some offer the ability to add pictures or short videos, and even to export data to something like a Google Earth map. Sentimentality and documentary value are clearly in the eye of the beholder and, however much I like some of my historical paper entries, I look forward to experimenting with some of the ways that new logbook technologies will enable the storage of all the new flying memories I intend to make.

If you have particular tricks or techniques you'd like to share in connection with electronic logbooks, multimedia or otherwise, let us know. We'll share in the next issue's Forum as well as on our Facebook and Twitter (@FAASafetyBrief) feeds. Happy logging!

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

Learn More

Advisory Circular 120-78, Acceptance and Use of Electronic Signatures, Electronic Recordkeeping Systems, and Electronic Manuals
http://1.usa.gov/1USX6Kr

Battling the Attraction of DISTRACTION

SUSAN PARSON

Photo by Adrian Eichhorn

A while back — in the January/February 2014 issue of this magazine, to be precise — I offered a confessional piece called "The Lost Art of Paying Attention." I wrote about how painfully easy it is to succumb to the subtle tyranny of technology. Our glorious glowing gadgets tempt us to shirk not only our see-and-avoid responsibilities, but also a vast swath of the flight management work. They lull us away from the discipline of critical thinking and true situational awareness, a term that implies far more than a position check on the moving map.

And, as Sabrina Woods wrote in "Surprise!" (FAA Safety Briefing – March/April 2016), the cockpit is becoming quite a busy place as more and more technological upgrades become available. Dazzling electronic and LCD flight deck arrays are replacing traditional analog gauges. Electronic flight bags (EFB) can tell you almost everything you want to know with the swipe of a finger. ADS-B In and Out monitor traffic. Once you've hit that desired altitude and cruise speed, an autopilot can take over, leaving you to sit back, relax, and observe the progress of your flight. Everything is perfect … until suddenly *nothing* makes sense.

No pilot is immune from the potentially fatal attraction of distraction, especially when it comes to dealing with technology. New technologies are the focus of this issue, but you can also be distracted by the vagaries of older gadgets, or by the quirks of a "FrankenPlane" aircraft with new avionics stitched in beside the original equipment. So we thought that some of the cautions offered before bear repeating.

> **No pilot is immune from the potentially fatal attraction of distraction, especially when it comes to dealing with technology.**

Manage the Machines

Technology and automation applied to an actively-managed flight can magnify its safety and efficiency, but when applied to a non-managed flight, they can very efficiently get you into very big trouble. Regardless of how good they are, today's avionics and handheld devices do not have sufficient intelligence to do more than exactly what we command them to do. If we issue the wrong commands because of inattention or incomplete understanding of the technology, the flight will potentially go off track in every possible way.

Know Your Equipment

You need to know the equipment cold. When I teach the use of GPS moving map navigators, I stress the importance of knowing how to precisely navigate both the mechanical structure (aka the "knobology") and the library structure — that is, how to efficiently find and display the information you need for any given phase of flight. You need to know its normal and abnormal operations, so you can avoid those pesky and potentially dangerous "what's it doing" situations. You need to know its limitations — what the technology can do for you and, equally important, what functions are simply beyond its capability.

Set the Tripwires

As Kenny Rogers sang in "The Gambler," you need to "know when to hold `em, and know when to fold `em." If you find yourself baffled, confused, or in any way uncertain about what the technology is doing, it's time to turn it off and reorient yourself. That certainly applies to the autopilot, but it also includes panel-mount, hand-held, or tablet-based

navigators if you don't understand where they are taking you — or if you have any doubts as to the safety of the suggested course. Never forget that the magenta line can guide you direct to anywhere ... including direct through regulatory obstacles (e.g., restricted/prohibited/controlled airspace), man-made obstacles, or natural ones such as terrain.

Stay Focused

If you are lucky enough to have a good autopilot, it's great to have "George" tend to the basic flying chores while you — at least in theory — focus on more important things like positional awareness and, more broadly, overall situational awareness (e.g., status of weather, fuel, engine indications). The challenge, of course, is to actually direct that freed-up mental and physical capacity to those more important positional and situation awareness considerations. That means overcoming the very human tendency to lapse into "fat, dumb, and happy" complacency that could cause you to miss something like an abnormal indication on an engine gauge. Find ways to keep yourself continuously in the loop. For example:

- Use callouts to maintain positional awareness (e.g., "crossing WITTO intersection, next waypoint is MITER intersection").
- Announce changes to heading, altitude, and frequency.

- Record those changes in an abbreviated navigation log. The act of speaking and writing bolsters your awareness.
- Announce any change to navigation source (e.g., "switching from GPS to VLOC") and autopilot modes. I encourage pilots to read each item on the autopilot status display aloud every time there is a change stating which modes are armed and which modes are engaged.

Today's technology provides the foundation for an unprecedented level of situational awareness. We just have to use it for that purpose, and pay attention in order to repel the all-too-human attraction to technological distractions that could detract from flight safety. 🛩

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TOM HOFFMANN

MANDATE MYTH-BUSTING

Separating Fact from Fiction

for ADS-B 2020 Equipage Requirements

Part 1 of 2

As of the publication date of this issue, there will only be 44 months remaining before the FAA's ADS-Out equipage deadline set for January 1, 2020. And yet, as this deadline fast approaches, there are still many aircraft owners who are unsure, undecided, or just confused about what equipment they may or may not need to comply.

To help shed light on some common ADS-B misconceptions, the *FAA Safety Briefing* staff sat down with two of FAA's leading experts in the area of ADS-B equipage: James Marks from the Aircraft Maintenance Division's Avionics branch, and Alex Rodriguez of the Aircraft Certification Service's Communications and Surveillance Technologies section (and no, not the New York Yankees!) Together they were able to tackle some important questions and debunk many of the myths about ADS-B equipment choices, specifications, and installation procedures. Their responses, presented in a two-part series, should hopefully clear up some of the confusion of the ADS-B Out requirement and get folks on the proper path toward compliance.

Myth: **Since the airlines and the military are getting a free pass beyond 2020, the FAA will wind up extending the deadline for everyone. Why should I bother installing now? And aren't our international partners behind schedule too?**

There are no plans for the FAA to extend the mandate for ADS-B Out equipment beyond the existing 2020 deadline date. We realize there is some confusion about certain segments of industry getting exemptions from the rule. That is simply not true. To be clear, we're not giving anyone a free pass; airlines or Department of Defense, and both have plans to equip. Part of the confusion is that when people hear exemptions for airlines they think it's a blanket exemption for ADS-B. What we are actually doing is allowing certain qualifying air carriers and operators to use GPS equipment that may lack two specific navigation parameters contained in the rule for a limited time. These operators must still be ADS-B Out equipped and meet all of the remaining performance requirements. For more details on this exemption, including a fact sheet and an operations bulletin, visit www.faa.gov/nextgen/equipadsb/exemption.

As for the DOD, they have identified some platform compatibility issues — in particular with certain fleets that will soon retire — but they are hard at work to get their aircraft equipped by the deadline. In fact, the installation numbers for the military have recently picked up.

And as far as progress on equipping ADS-B Out outside the United States is concerned, our foreign partners are actually following suit with our regulation and will likely be only a few months behind.

Myth: **The longer I wait to equip, the cheaper the prices will be and the more technically advanced options I'll have.**

With regard to cost, we did see a period of significant price drops for ADS-B boxes within the last two years, but those have really stabilized since. It's worth pointing out that it costs a certain amount of money to produce these units and that we may have already realized the bottom in terms of pricing. Furthermore, as the demand for ADS-B boxes continues to rise, it's rational to think the prices will go up as well. So waiting around might not bring about the cost advantage you were hoping for.

As far as waiting for the technology to advance, we're not seeing anything new or novel in the technology for the near future. What's coming down the pipeline is pretty much identical to what's out there already. The manufacturers are mainly just modifying things for certain platforms or are changing a

feature or two. We don't see anything increasing massive functionality or that will significantly drive costs down. Our Equip ADS-B website (www.faa.gov/nextgen/equipadsb) has a list of approved ADS-B Out devices and a searchable database of devices provided to the agency by the equipment manufacturers. We will update this page regularly to keep you apprised of any changes.

At last check on the FAA's website, there were 12 ADS-B Out vendors, with about 45 models. With so many options, models, and manufacturers to choose from, where does an owner even start? What are some of the differentiating factors for these systems? And if they are all designed to the same set of performance standards, could I not get by with just picking the cheapest one?

For starters, it's possible you may not need to equip with ADS-B at all. But assuming you do, there are some important differentiating factors, and configuration and compatibility issues you'll want to consider before just settling on the option with the lowest price tag. To understand this better, let's review for a minute. With any certified ADS-B Out system, you'll need A), a position source (there are options, but a WAAS GPS is clearly the most common) and B), a compatible means of transmitting that position information. There are two types of transmitters you can choose from: the Mode-S transponder with Extended Squitter (1090 MHz), or the Universal Access Transceiver (978 MHz). Both of these are certified to a set of standards for each and so in terms of meeting the prescribed performance requirements, they operate the same way.

Where the differences come in for the manufacturers from one to the other are the features they offer. Some units have integrated features (a WAAS GPS and ADS-B transponder combined in one unit) while others are separate. The best option for you really depends on what type of equipment already exists in your aircraft and what type of flying you expect to do. For aircraft owners that have more of a bare bones set up when it comes to avionics, they might lean more toward those all-in-one units for a couple reasons: having everything they need in one box saves both space and weight. Others might love their existing Mode C transponder and don't want to get rid of it. In that case, they can then just upgrade their GPS (if needed) and install a UAT device to satisfy the ADS-B part of rule. In fact, some manufacturers have a drop in replacement for an older Mode C transponder — a nice convenience that prevents you from having to tear out the entire transponder interface. Just be wary of the unit's interoperability with your GPS.

Then there are those that want to get the biggest bang for their buck and take full advantage of the situational awareness benefits that ADS-B In offers (i.e., traffic and weather displays). Those owners may prefer an integrated system with both -In and -Out capability and that has a built-in display or is Wi-Fi capable so you can display information on your tablet.

Another important consideration is the airspace you fly in. If you fly at or above FL 180 (18,000 ft.), or internationally, you'll need a 1090 system. If you don't fly at or above FL 180, you can choose either a 1090 or UAT system. Although some people may never intend to fly in 1090-required airspace, they are still opting for a Mode S system in case they change their mind or want to beef up their aircraft's resale value.

> **There are some important differentiating factors, and configuration and compatibility issues you'll want to consider with ADS-B Out equipment before just settling on the option with the lowest price tag.**

As we mentioned earlier, there is also the real possibility for some aircraft owners to not have to equip at all. There is a vast amount of airspace under 10,000 feet where ADS-B Out is not required. On the other hand, if you're based at an airport within Class B or C airspace, the rule will definitely affect you. An easy way to remember this is that if you need a transponder to fly now, you'll need ADS-B Out when the mandate takes effect. If you're still not sure, have a look at the FAA's "Do I Need to Equip?" flow chart at www.faa.gov/nextgen/equipadsb/equip/. You'll also find a clear breakdown of ADS-B rule airspace requirements at www.faa.gov/nextgen/equipadsb/airspace/requirements.

How can ADS-B Out system installations be approved?

Initial ADS-B Out system pairings (transmitter/GPS) must be approved for installation using the Type Certificate (TC), Amended TC (ATC), or Supplemental Type Certificate (STC) process. Consult your Aircraft Certification Office to determine the appropriate approval process for these initial installations. Once the performance of the initial pairing has been established, the FAA considers follow-on installations of the same pairing to be approved.

Approved pairings can be installed under the Field Approval process, or if certain conditions are met, installed without further approval from the FAA. A recent policy memo, Installation Approval of ADS-B OUT Systems, dated March 2, 2016, contains more information on this change. This document will soon be available at www.faa.gov/nextgen/equipadsb/installation/.

Be on the lookout for part two of this article in the July/Aug 2016 issue. ✈

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

SABRINA WOODS

There's No Place Like the Home 'Drome

Airports of the Future

Many aviators and aviation enthusiasts look upon their local airport and FBO as their "home away from home." The idea of having a fixed location that could provide a whole host of services to include aircraft fueling, parking, access to flight instructors, and aircraft maintenance, began to take root after the First World War. Eager "Aces" scooped up the sudden military surplus of aircraft and used them to traipse from town to town. Some even made a bit of a name for themselves as entertaining "barnstormers" — notable performers included Charles Lindbergh, Glen Curtiss, and Bessie Coleman. With business booming, the aviators of the 1920s needed a place to beddown permanently and, with the passage of the Air Commerce Act of 1926, these "fixed-base operators" became a fixture in the community.

These airports, which in the 1920s were little more than a strip of grass, a wind sock, and a little wooden building, haven't stopped evolving. Airports today have so much more to offer a general aviation pilot than they did in Lindbergh's day. The FAA Airport Organization's Office of Safety and Standards continues to focus on building safer airport operational environments. Here are just a few of the exciting technological advancements that may be coming to a 'drome near you soon.

Anyone There?

While on approach to your destination, you might just encounter a remote air traffic control tower. Advances in high definition cameras, ground detection systems, microphones, meteorological sensors, and a super high speed internet link make your conversation with a remote controller just like any other ... except that he or she might actually be located hundreds of miles away.

One "pro" of the system is that remote tower support at lower volume or seasonal airports is more cost effective than staffing a permanent tower, and another is that multiple camera feeds can project a clearer image of the facility grounds and eliminate line-of-sight and blind spot issues that some manned towers might have. This new technology has been deployed in Sweden where a remote tower currently controls a commercial airport, but it could come to a GA airport near you in the not-too-distant future. Currently, the Leesburg Executive Airport in Virginia has partnered with Saab (the security company) and the Virginia Small Aircraft Transport System, Inc. (VSATS) to test and evaluate a remote tower at this bustling GA airport later in 2016. Another such venture is at Fort Collins – Loveland Municipal Airport in Colorado.

And of course while on approach to your airport of choice, your freshly equipped ADS-B In and Out

systems will have identified your position to ATC (Out) and will alert you to encroaching traffic. As an added bonus, it will broadcast weather or NOTAMS directly to your cockpit (In).

Light Up My Life

Frequent readers of *FAA Safety Briefing* may remember "Nightlights," an article Tom Hoffmann authored in the November/December 2015 night-themed edition (www.faa.gov/news/safety_briefing/2015/media/NovDec2015.pdf). This article introduced advances in approach lighting systems known as the visual approach slope indicator (VASI) and precision approach path indicator (PAPI) lights. Supplementary to these illuminating devices, engineers at the FAA's William J. Hughes Technical Center have been working with LED and solar lighting in an effort to lower operational costs and environmental impacts of landing, runway, and taxi light systems.

Self-contained solar powered LED lights are just right for GA airports where resources to pay for lighting equipment is more limited, and where the higher visibility requirement of larger certified airports is just not necessary. These smaller lights use little solar cells to recharge their own batteries, also eliminating the need to run power supply lines all over a relatively small area. The benefits are invaluable.

In addition to the power that goes into lighting up your favorite landing strip, pilot controlled lighting is a delightfully wonderful and ever-evolving "thing." For the airports (typically non-towered) that have it installed, with just a key of the mic you can now activate PAPI, VASI, runway end identifier lights, and taxiway lights to safely guide you home. These are in addition to the runway lights you may be the most familiar with. To recap, the lights typically remain illuminated for about 15 minutes and even the intensity can be controlled to keep the level within your desired limits. Level of intensity corresponds to the number of mic keys you input — three for low, five for medium, and seven for high intensity. Just be aware that if two airports are relatively close together (such as in the heavily congested airspace in the DC metropolitan area) different airports probably have a discrete radio frequency for cueing the lighting systems so that you aren't accidentally wreaking havoc at Airport Alpha while you are trying to land at Airport Bravo.

Any Landing You Can Walk Away From …

On November 3, 2011, a Cessna 550 *Citation II* crashed at Key West International Airport when the brakes failed during landing. It skidded off the runway and into the overrun. The occupants of the Cessna walked away completely unscathed and damage to the airframe was relatively minor.

Even more recently, on January 26 of this year, a Falcon 20 came safely to rest in the overrun of Chicago Executive Airport shortly before it would have departed the airfield entirely and ended up on a four-lane highway running adjacent to the airport. Once again, no one was hurt in the mishap and the Falcon sustained minor damage.

These two incidents could have easily gone a much different, much more tragic direction. How was it that man and machine escaped virtually unharmed? It is all thanks to a wonderful substance called crushable concrete, and its brilliant application by some savvy engineers.

EMASMAX® arrestor beds are composed of blocks of lightweight, crushable cellular cement material designed to safely bring anything that comes in contact with it to a near immediate stop. This "crushable" concrete is made up of foamed silica — a recycled glass and a high-strength plastic mesh that has been poured into lanes and covered with a cement layer and sealant. The air bubbles created in the process are what collapse on impact and form the arresting mechanism.

Airports today have so much more to offer a general aviation pilot than they did in Lindbergh's day.

The arrestor bed is installed in cubes that break away and absorb the energy of the aircraft. Even better is that the block style installation means easier removal and re-installation after EMAS does its job. This application is perfect for those airports that

Photo by Tom Hoffmann

EMASMAX® arrestor beds are composed of blocks of lightweight, crushable cellular cement and installed in blocks.

simply can't expand their runway safety areas due to man- or nature-made obstacles (think: San Francisco International Airport). A typical EMAS installation is set about 75 feet from the runway end and is between 400 to 600 feet in length.

EMAS has already found a home at several commercial airports so the next step is retrofitting GA airports. Greenville, South Carolina and Reading, Pennsylvania are leading the way in this technology at smaller fields.

Geometry 101: Every Angle Covered

In addition to effectively turning a "bad landing" into just another event you can walk away from, recent updates to airport design in Advisory Circular (AC) 150/5300-13 (http://go.usa.gov/csEcV) have improved guidance on runway and taxiway layouts. The AC also addresses the inclusion of safety areas to minimize runway incursion.

FAA's Office of Airport Engineering provides critical guidance for the design of runway profile and line-of-sight requirements. Line-of-site requirements among aircraft, and between aircraft and vehicles that operate on active runways, are essential to safe operations at towered and non-towered airports. One of the new technologies the Office of Airports is evaluating will provide broadband wireless communication on the airfield. The technology will allow sensors to remotely control airport lighting, elevated signs, and NAVAIDs with minimal (or no) underground trenching for control cabling. This will tremendously reduce construction costs at airports of the future.

Planners and designers are also revamping how they lay out new airports and modify existing ones. The new taxiway-runway interface geometry advocated by AC 150/5300-13 helps to increase visual cues for improved situational awareness. Taxiway entrances are being redesigned so that you can quickly access and react to critical information signs. Planners are also encouraged to limit the number of taxiways crossing a runway. The idea behind this is that less intersecting surfaces amplify safety for airport operations, *especially* at non-towered airports.

Both planners and designers are now more aware of the benefits of avoiding the placement of taxiways at "high energy" intersections — these are runway zones where airplanes are transitioning from ground to air or vice versa — and are avoiding the use of "dual purpose" pavements (i.e., taxiing on a runway). A more efficient and safer system results when the taxiway geometry provides indirect access from an apron to a runway. It enhances situational awareness and eliminates the likelihood of two objects trying to occupy the same space avoiding a runway incursion incident.

A lot of amazing engineers, technicians, safety analysts, planners, and ground operations personnel take great care in determining ways to safely and efficiently increase the abilities of your home away from home. With these guys keeping innovation to the forefront, the future of airports looks bright. ✈

Sabrina Woods is an associate editor for FAA Safety Briefing. *She spent 12 years as an aircraft maintenance officer and an aviation mishap investigator in the Air Force.*

SUSAN PARSON

It Just Works. Seamlessly.

Design is not just what it looks like and feels like. Design is how it works. - Steve Jobs

Regular readers know I am an unabashed fan girl when it comes to Apple's array of iDevice technologies. I *love* the way I can pick up an iDevice and find that "it just works" without much effort on my part. I intuitively know how to use it. It seamlessly moves data from one gadget to another. In addition, Mr. Jobs and his chief designer, Jony Ive, worked to make products that are appealing from an aesthetic standpoint. Apple sales data shows that this integrated approach to technology design is a hit with global consumers.

The Apple Test

Along with a diverse and highly-qualified group of aviation industry experts, we in the FAA Flight Standards Service are hoping that our integrated "it just works" approach to enhancing the Practical Test Standards (PTS) will be a hit in the aviation training community starting this June.

Since 2011, the FAA has been working with industry on the Airman Certification Standards (ACS) framework, which is essentially a souped-up version of the PTS. It adds task-specific knowledge and risk management elements to each PTS Area of Operation and Task.

Seamless Functionality

The ACS started as a long overdue effort to fix the airman knowledge tests, which were roundly criticized for being disconnected from, well, everything. Too many knowledge test questions were outdated or irrelevant to the knowledge and skill needed to operate in today's National Airspace System (NAS). The ever-lengthening list of "special emphasis" items was not connected to any PTS Area of Operation or Task. And since there was no clearly defined standard for knowledge or risk management, there was no structured way to keep standards aligned with guidance handbooks and test questions, or with the practical test.

That all changed when our industry partners — collaborating with us through a series of formal Aviation Rulemaking Advisory Committee working groups — recommended that we explicitly define the necessary knowledge and risk management elements for each certificate and rating, and add them to the skill elements in the PTS.

The ACS provides seamless functionality in several ways. It clearly defines what an applicant must **know** (aeronautical knowledge), **consider** (risk management), and **do** (skill) to pass the knowledge and practical tests for a certificate or rating. It connects knowledge and risk management to specific skills. That helps applicants, instructors, evaluators, and other stakeholders understand what the FAA expects in each phase of the certification process, and how it all works together. The ACS coding — anchored in the standard rather than in references like today's Learning Statement Codes (LSCs) — enables the FAA to align standards for knowledge, risk management, and skill with guidance handbooks and knowledge test questions, and to maintain that alignment.

Look and Feel

The ACS also improves the look and feel aspects of certification system design. As noted, it offers a comprehensive presentation of the knowledge, risk management, and skill requirements for an airman certificate or rating. It streamlines document management by integrating the test guides (FAA-G-8082 series) and the knowledge testing authorization requirements matrix into the ACS. Once the FAA has the ability to report ACS codes on the Airman Knowledge Test Report, the ACS will eliminate the need for today's Learning Statement Reference Guide. In addition, the ACS "defragments" PTS information by consolidating scattered material in the PTS introduction and Task notes into topic-focused appendices (e.g., "Safety of Flight").

It Just Works

For all these reasons, the FAA participants and our industry partners believe the ACS meets the "Apple Test" for design and functionality. We are eager to make the Private Pilot-Airplane and Instrument-Airplane rating ACS available to applicants, instructors, evaluators, and other stakeholders this June, and we hope you will find that it just works — seamlessly.

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

Learn More

FAA Airman Testing web page
www.faa.gov/training_testing/testing/

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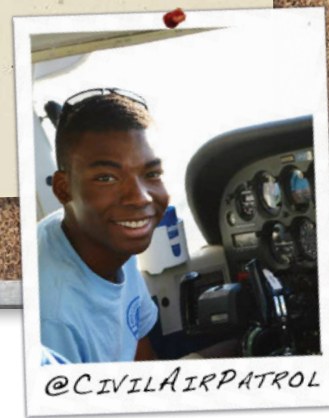@MARTINSAVIATION

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Flying Photobombs

Pilots and the Selfie Generation

@BJCOMEDY

Photos of some #StudentPilot followers from Twitter

@CIVILAIRPATROL

I f you're a pilot, you like to let people know you're a pilot. That's what you do.

And if you're a *Millennial Generation* pilot, you take photos of yourself flying. That's what you do.

These selfie photos and videos serve to entertain, inform, instruct, and record an astonishing diversity of pilots, planes, and places. Personal gadgets and gizmos can up the fun-factor of personal flying, but don't let them distract you from the flying part.

Using a cell phone, tablet, or camera in flight can distract a pilot from his or her primary duty —

Fiddling with camera settings while trying to juggle the many responsibilities you have as pilot in command puts you at risk of departing controlled flight, missing ATC radio calls, blundering into the wrong airspace, or colliding with traffic you failed to spot.

to fly the aircraft first. The NTSB agrees and has added "Disconnect from Deadly Distractions" to its 2016 Most Wanted List for operators of all modes of transportation. The agency cites a 2011 helicopter crash caused by fuel exhaustion as part of its rationale for emphasizing the dangers of distraction. The pilot, flight nurse, flight paramedic, and patient were killed. One of the four contributing factors was "the pilot's distracted attention due to personal texting during safety-critical ground and flight operations."

Preflight your Gadgets

Planning ahead so you don't get distracted by your mobile device during critical phases of flight should be part of your preflight checklist. It is especially important if you want to record from the outside of your aircraft. Regulations prohibit the attachment of non-approved devices to a type-certificated aircraft, which means you will need to get FAA approval on a case-by-case basis to attach your camera to the outside of your aircraft.

The method of mounting the camera, whether by permanent installation or attachment, matters in terms of what kind of FAA approval is required. Most cameras used by GA pilots are self-contained, portable, and sufficiently lightweight to have no appreciable effect on handling the aircraft or affecting airworthiness. For mounts that strap-on or secure with a common screw, a minor alteration is typically approved, and an entry in the aircraft logbook is made by a qualified maintainer.

On the other hand, if the mount is permanently attached to the aircraft by hard-point mechanical methods or it interfaces with aircraft navigation or electrical systems, it becomes a major alteration because it may appreciably affect airworthiness. This kind of installation requires the use of other FAA-approved data or a field approval evaluation.

Title 14 Code of Federal Regulations (14 CFR) part 43 stipulates that an aircraft may not return to service after an alternation until approved by a certificated mechanic. And a pilot flying under 14 CFR part 91 may not operate an aircraft after maintenance has been performed, which includes minor and major alterations, until approved for return to service.

Mounting methods such as glue, suction cups, or duct tape are typically not acceptable. Failure to stay secured could cause harm to the aircraft or persons and property on the ground in the case of an in-flight detachment, which would be considered a "careless operation" under 14 CFR section 91.13 and section 91.15 for dropping an object from an aircraft.

The bottom line is that all attachments require some sort of approval. Each must be evaluated for its application and complexity to ensure safety. If you have a question, start by calling your local Flight Standards District Office (FSDO).

Secure your Gear

If the camera is a secondary portable unit hand carried onboard (inside the aircraft), the FAA typically will not get involved. Ensure that all devices used for in-flight photography are safely secured. Never place a camera, GPS, or any other mobile device in a location where it could literally be a flying hazard (e.g., freely flying around the cockpit in the event of turbulence). Even if an unsecured device doesn't hit anything, it inevitably creates a distraction from flying duties.

Fiddling with camera settings while trying to juggle the many responsibilities you have as pilot in command puts you at risk of departing controlled flight, missing ATC radio calls, blundering into the wrong airspace, or colliding with traffic you failed to spot. Keep your priorities in order and secure that selfie gear before getting in the air.

Uploading your Selfie

Getting a great photo or video posted on your social media channel of choice is the aspiration of every "good" *Millennial*. However, your role as a pilot always comes first. Trying to connect to the cellular network below you is not worth the distraction — it's not legal either. The Federal Communications Commission (FCC) restricts connecting to all "cellular radiotelephone systems" while in the air according to 47 CFR section 22.925:

Cellular telephones installed in or carried aboard airplanes, balloons or any other type of aircraft

must not be operated while such aircraft are airborne (not touching the ground). When any aircraft leaves the ground, all cellular telephones on board that aircraft must be turned off.

This rule is why cell phones and tablets have an "airplane" mode, which disables the cellular connection to comply with FCC rules. It does not, however, disable selfie-taking capability.

Regulations prohibit the attachment of non-approved devices to a type-certificated aircraft, which means you will need to get FAA approval on a case-by-case basis to attach your camera to the outside of your aircraft.

Since connecting to a cellular data network while in the air is not an option, do be wary of succumbing to *get-home-itis* in that rush to post the perfect picture. Adding filters and hashtags is much easier on the ground anyway. *#FlySafe*

Sharing photos of your flights with family and friends is a great way to bolster a positive relationship between the public and general aviation community. Keep flying fun, but keep it safe. Preflight your selfie gear and plan for photo ops.

Paul Cianciolo is an assistant editor and the social media lead for FAA Safety Briefing. *He is a U.S. Air Force veteran, and a rated aircrew member and search and rescue team leader with the Civil Air Patrol.*

A/C TRANSITION
THE UNEXPECTED
FRAT TOOLS
PILOTS & MEDS

1.usa.gov/1QmoKz8   1.usa.gov/1UnMn91   1.usa.gov/1HqCkGR   1.usa.gov/1XgLXDX

FLY SAFE

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SURVIVAL
V_{mc} & AOA
ENHANCED VISION
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For a complete list of #FlySafe (GAJSC) topics, go to faa.gov/news/safety_briefing.

JAMES WILLIAMS

X-Ray Vision and Alphabet Soup

DECODING GA VISION SYSTEMS

I may be part of the last generations to remember the ads for X-ray glasses that appeared in the back of comic books and magazines aimed at young people. These mail-order novelties usually sold for a few quarters, or dollars in the later years. Of course they weren't exactly legit, but who wouldn't be willing to risk a few bucks for even the slightest chance for such power? Well, as it turns out, the power of "X-ray" vision is not so much of a far-fetched novelty anymore — at least in aviation.

Synthetic vision displayed on a cockpit display.

We now have two technologies that allow us to literally see through the dark and the clouds. While there is some overlap in this technology, this article will focus on Enhanced Vision (EV) and Synthetic Vision (SV), rather than night vision. For more information on night vision, please see the articles listed in the Learn More section. EV and SV use very different approaches and technologies to give you a bright and clear picture of the outside world, no matter how dark or cloudy the sky may be. Naturally, each of these approaches has its advantages and drawbacks.

Synthetic Vision

SV is by far the more accessible in terms of cost and equipment. It relies on marrying technologies already included in many avionics suites and even some hand-held systems. SV uses a detailed and high quality database of terrain features and obstacle data to create a virtual 'world.' The SV system uses an accurate aircraft position provided by an on-board GPS to display this virtual world around your aircraft. The advantage of this system is that regardless of the weather or light conditions, you will have a "clear view" out of the front of the aircraft. You could literally paper the windshield of the aircraft (not a suggestion, mind you!) and still see outside. It's important to remember that SV is not a navigational system. SV designed to improve situational and terrain awareness and is not intended, or authorized, to be used as a navigational system.

There are two potential faults though — location data and database information. While GPS is usually very reliable, its weak signal is vulnerable to interference. Although, the FCC has done a great job of shielding GPS frequencies, the possibility exists that someone transmitting on or near those frequencies could potentially jam the GPS. And of course there's the potential for active interference or spoofing,

EV allows a pilot to see through darkness, smoke, haze, smog, dust, light fog, and even rain.

but that's usually limited to military action. These GPS issues are not a fault with SV and apply to any system that uses GPS.

The other potential issue is the quality and currency of the database used to create the virtual world your aircraft is relying on for safe navigation. While terrain is pretty much static, obstacles are constantly changing. This is probably the biggest issue with SV, because what you're seeing may not be a 100 percent accurate depiction of the actual world outside. In other words, your SV system is only as good as the its foundational database. So it is worth investigating how adept a system is at creating and updating that database.

But perhaps the best advantage SV has is its relatively low cost. You can add it to many popular flight instrument systems or even utilize systems built into accessories like a portable GPS unit, or an app on your tablet. There are many variables, so it's worth investigating which one best suits your needs.

Enhanced Vision

EV may seem like a close cousin of Synthetic Vision, but it's actually a very different technology. EV uses sensors on the aircraft to "see through" weather or darkness. While this sensor comes in a variety of forms, by far the most common is infrared (IR), which senses temperature differences and produces a high quality real-time image of the outside scene. EV allows a pilot to see through darkness, smoke, haze, smog, dust, light fog, and even rain. In heavier conditions, EV may lose some of its ability relative to SV, but what it shows you is what's actually out there, not what the database says should be out there.

There are a wide variety of EV systems on the market and prices vary greatly, for good reason. The older and more advanced systems use a super cooled IR sensor to allow the sensor to more easily detect the temperature differences. However, these systems

require a mechanical means of cooling, which limits the number of aircraft that can support this added equipment and which can add significantly to the installation cost. Previously, EV was the purview of high-end business jets as an installation could run close to a million dollars. Even on the cheaper end it probably was between $250,000 and $500,000. More recently, new systems have come onto the market that don't require mechanical cooling. With this new generation, we're looking at a ballpark figure of $25,000. While still a significant investment, this price point brings EV to the realm of possibility for GA.

The key advantage of EV is that what you see is what's actually outside. There's no concern about the location inaccuracies or the database being out of date. That being said, the very significant cost difference, many thousands of dollars vs. a few hundred, means that EV isn't nearly as accessible as SV.

What Difference Does One Little Letter Make?

Some eagle-eyed readers may have noticed I'm using EV in lieu of Enhanced Flight Vision Systems (EFVS) or Enhanced Vision Systems (EVS). You may have also noticed I didn't mention anything about the operational credit that is given to EFVS on approaches. This was intentional. While it may seem like the only difference is one little letter, it's not — at least as far as FAA regulations are concerned. First and foremost, the regulations permit a qualified EFVS to be used in lieu of natural vision to descend below DA/DH or MDA down to an altitude of 100 feet above the touchdown zone elevation provided all of the requirements of 91.175(l) are met. Those requirements include enhanced flight visibility, visual reference, and other operating requirements. Second, to qualify as an EFVS, the sensor image must be displayed on a Head Up Display (HUD) along with the other required flight information and flight symbology specified in 91.175(m). The EFVS imagery and other cues which are referenced to the imagery and external scene topography, must be presented so they are aligned with and scaled to the external view. EVS does not meet these requirements. This becomes a big issue for fitting an EFVS in most small GA aircraft. So while the information presented on an EVS might be very similar to that of an EFVS, the lack of a HUD will prevent the EVS from using the operational credit that an EFVS would receive.

Like Peanut Butter and Jelly

Some things just go together. While we've largely compared these two systems independently, there
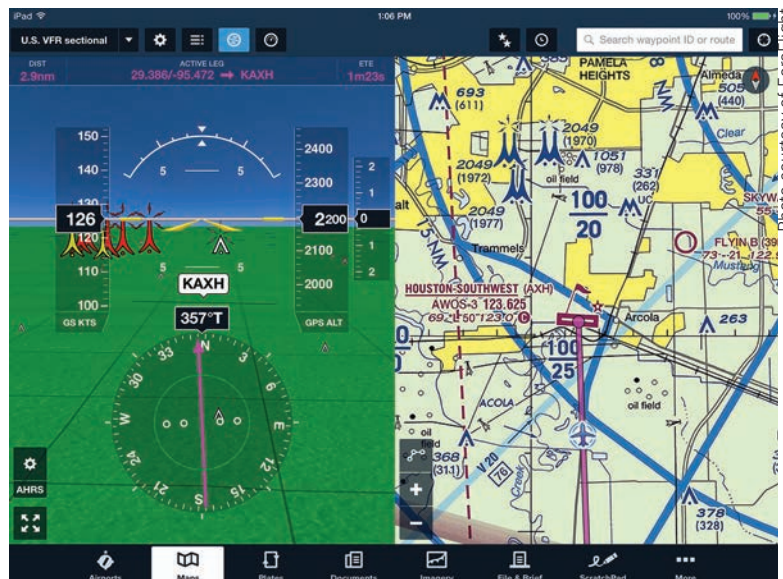
Synthetic vision displayed on an iPad.

is a compelling argument for combining them. Although you could operate these independent systems side by side, a more powerful solution is what's called a Combined Vision System. "A CVS is based on a combination of different technologies that may include both real-time and computer-generated images," Terry King, an Engineering Psychologist and FAA expert explains. "While no CVSs are currently approved for operational credit, the regulations make provision for the FAA to approve 'for credit' operations for future CVSs that might be certified and operationally approved for these operations." King adds, "Depending on the operation, this may require an operator to obtain authorization to conduct these operations."

Each system has its limitations and advantages. Used independently or in combination, these systems will improve situational awareness and safety. If your budget can justify it, Synthetic Vision and Enhanced Vision can give you those X-ray glasses you always wanted, but didn't get as a kid. ✈

SV uses a combination of high quality location data and a database of topography and obstacles to create a virtual representation of what is around the aircraft.

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

Spaceports Launch the Next Frontier in Flight

The Basics of Commercial Space Operations

PAUL CIANCIOLO

Daily launches of spacecraft through our National Airspace System (NAS) may become the norm in a few years. While that might elicit visions of falling reentry vehicles and dodging high-powered rockets for some members of the general aviation (GA) community, don't fret! It's the FAA's job to make sure that space operations don't jeopardize public health and safety, and that the air traffic system functions smoothly for all of its users. Let's take a look into the new frontier of government and industry collaboration making this a safe reality.

Photo courtesy of Spaceport America

Early morning colors at Spaceport America.

Unlike NASA, which is a civil research and development agency, the FAA is a regulatory agency responsible for providing a safe and efficient aerospace system. This responsibility includes regulating commercial space transportation. That's where the FAA's Office of Commercial Space Transportation (AST) comes into play.

The FAA is responsible for regulating all private launch and reentry activities and the operations of launch and reentry sites. This task includes all commercial launches or reentries within U.S. borders or outside of our borders when conducted by U.S. entities. All commercial launches and reentries must be licensed by the FAA, but suborbital reusable rockets and launch vehicles have the option to operate under an experimental permit. Launch and reentry site operators must also be licensed in order to operator their commercial "spaceports."

Airports of the Future

FAA licensed launch and reentry sites are commonly referred to as spaceports. Each spaceport is specifically licensed according to the type of launch and reentry operations conducted, (e.g., a vertical rocket launch or a horizontal space-plane takeoff and landing.)

Every spaceport is different, and each is typically designed to support specific types of vehicles. Consequently, the FAA considers each request for approval on a case-by-case basis to ensure public safety and proper integration into the NAS. Some spaceports, like Mojave Air and Space Port (KMHV), are collocated with a public airport. Others, like Spaceport America (9NM9) in New Mexico, are built for a specific purpose.

There are currently 10 active spaceports with FAA launch site operator licenses, which are located in Florida, Texas, California, New Mexico, Alaska, Virginia, and Oklahoma. An operator license authorizes launches or reentries from one site within a range of operational parameters of the same family of vehicles that are transporting specified classes of payloads or performing specified activities. An operator license remains in effect for five years from the date it's issued.

Flying into Space

Though the FAA does not offer an astronaut certificate or rating, crew are required to have vehicle training tailored to the specific operation. When a piloted vehicle is travelling through the NAS to and from a spaceport, the pilot or remote operator must have at least a FAA private pilot certificate with

A spaceport is marked with a magenta rocket symbol on VFR aeronautical charts.

VSS Unity is Virgin Galactic's new SpaceShipTwo and is the second vehicle of its design ever constructed.

Photo by Jack Brockway/Virgin Galactic

an instrument rating — the spacecraft will always traverse Class A airspace, and it will require contact with air traffic control (ATC).

"Currently, we accommodate space operations by blocking off, or 'sterilizing,' a large amount of airspace," notes Teri Bristol, FAA's Air Traffic Organization Chief Operating Officer, in a recent message to employees. "This approach works today because there are so few operations and most take place from only a couple of coastal locations. But as commercial space operations increase, this could potentially create lengthy delays or reroutes for other aircraft. We're going to have to move from accommodation to integration, meaning that we take into account the needs of all airspace users — just as we are doing with unmanned aircraft."

A spacecraft pilot must also have training on the specific launch vehicle flown. Crew requirements are detailed in Title 14 Code of Federal Regulations part 460.

Though the FAA does not offer an astronaut certificate or rating, crew are required to have vehicle training tailored to the specific operation.

Hitching a Ride

There are also requirements for any human along for the ride into space or near-space. Non-crew members are designated as space flight participants, which is legally different from the status of a passenger on a certificated aircraft. Before receiving compensation or making an agreement to fly a space flight participant, a spacecraft operator must inform each participant in writing about the risks of the launch and reentry, including the safety record of the launch or reentry vehicle type and obtain written informed consent. An operator must present this information in a manner that can be readily understood by a space flight participant with no specialized education or training.

An operator must also train each space flight participant before flight on how to respond to emergency situations, including smoke, fire, loss of cabin pressure, and emergency exit. Security requirements to prevent any space flight participant from jeopardizing the safety of the flight crew or the public must be also implemented — participants may not carry on board any explosives, firearms, knives, or other weapons.

What Goes Up, Must Come Down

A suborbital reusable launch vehicle (RLV) is the spacecraft of choice for the new private space industry because of significant cost savings. The FAA may issue an experimental permit rather than a license for the launch of and reentry of reusable suborbital rockets or RLVs for:

- Research and development to test new design concepts, new equipment, or new operating techniques;
- Showing compliance with requirements as part of the process for obtaining a license; or
- Crew training prior to obtaining a license for a launch or reentry using the design of the rocket for which the permit would be issued.

Unlike orbital launches that need to gain a significant horizontal velocity, most suborbital RLVs essentially fly straight up. Once they reach space, the laws of physics bring the vehicle back down to Earth after giving the occupants several minutes of microgravity. Because RLVs are specifically designed to return to Earth for reuse, the FAA issues RLV mission licenses that combine a launch and a reentry license into one. Let's take a look at the different ways launch and reentry vehicles travel though the NAS.

One concept is the familiar rocket with a capsule on top, like Blue Origin's New *Shepard*. There are no control surfaces to maneuver the rocket, so other traffic must be clear of the area during launch. Airspace, including the areas where the booster rocket and capsule will eventually come down, must be cleared around the spaceport to minimize risks to other aircraft.

Another concept launches horizontally. An example is XCOR Aerospace's Lynx, which is similar to a typical airplane in that it takes off horizontally from a runway — but it does so under rocket power. After a controlled ascent reaching Mach 2.9, its momentum carries it the rest of the way into space. Then the spacecraft glides back down and lands at a spaceport as a glider on reentry.

And a third suborbital RLV concept involves the combination of two aircraft, such as Virgin Galactic's *SpaceShipTwo*. The spacecraft is attached to and carried by the mothership into Class A airspace, where it is released at 50,000 feet. The spacecraft then accelerates to Mach 4 to reach space. The spacecraft returns to Earth as a glider and lands on a runway of a commercial spaceport.

Tracking Stardust

To help with automating airspace integration with spacecraft, the FAA is prototyping a tool called the Space Data Integrator (SDI). A real-time operational demonstration should be happening when SpaceX's *Dragon* spacecraft comes in for its next reentry mission, which should be around the publish date of this article.

"Through SDI, we'll be able to automate the operational procedures that air traffic controllers currently perform for space operations," explains Bristol. "We'll be able to determine the right amount of airspace to block off for these operations and more efficiently release the blocked airspace so it's available for other airspace users. We'll also be able to adapt to contingencies. For instance, if we know that a reentry is coming in off course, we can block off new airspace and release the old airspace."

These efforts are helping the FAA plan and prepare for the safe and efficient integration of commercial space operations into the NAS. Space flight is a an exciting new chapter in aviation history, and one the FAA remains committed to keeping safe for pilots at any altitude. And if you haven't already, equip your GA aircraft with ADS-B so you can be part of the FAA's enhanced network that will provide safe separation from all airspace users, including spacecraft. Stay tuned as we accelerate into the future of commercial space travel! ✈

Paul Cianciolo is an assistant editor and the social media lead for FAA Safety Briefing*. He is a U.S. Air Force veteran, and a rated aircrew member and search and rescue team leader with the Civil Air Patrol.*
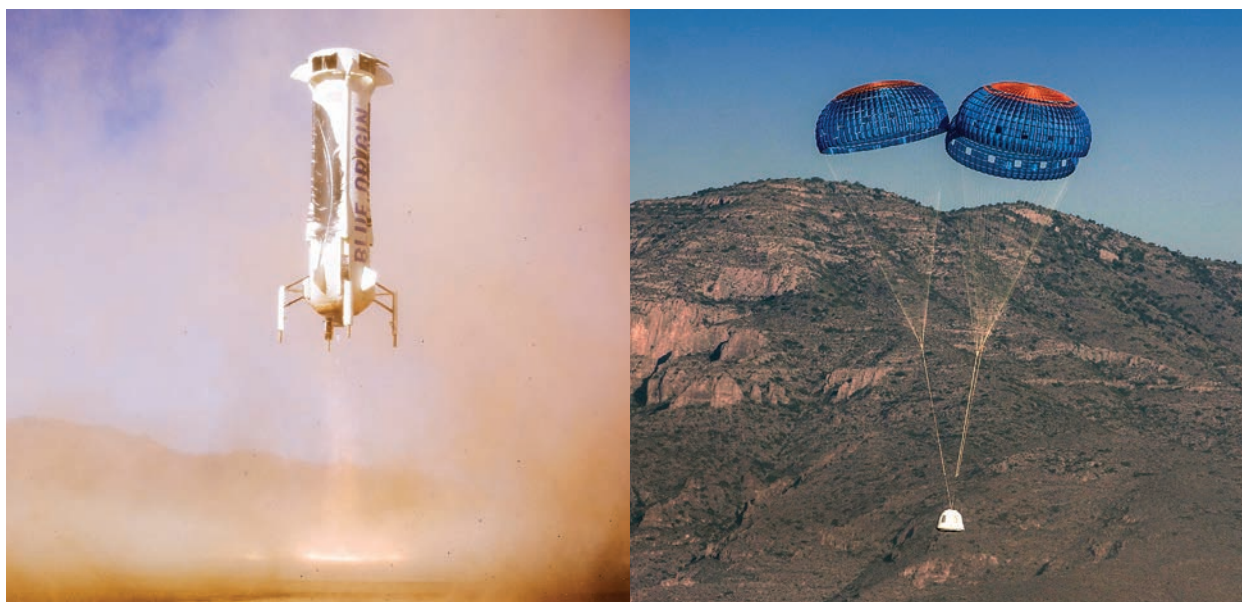
Photos courtesy Blue Origin

(Left) Blue Origin's New Shepard booster executes a controlled vertical landing at 4.2 mph.
(Right) After a clean separation from the propulsion module, the New Shepard crew capsule descends to a gentle landing in the west Texas desert.

Class is No Longer in Session: EFB Installation

NextGen technologies are entering the cockpits of general aviation (GA) pilots at a rapid pace. Sprouting from the days when Federal Express repurposed a laptop computer to access information normally found in paper manuals, today's electronic flight bags (EFBs) are possibly the most common tool GA pilots use to access NextGen capabilities. Current EFBs feature extensive capabilities, including quick and effective flight plan filing, accurate real-time performance calculations, seamless (and paperless) information updates through data transfer, and access to weather and traffic information enabled by NextGen's Automatic Dependent Surveillance – Broadcast (ADS-B) In program.

Previously, in order to have all of this wonderful power at your fingertips, there were three different EFB classifications with different guidance for each. But in the interest of clarity and in order to streamline the process, the FAA has eliminated those classes and divided EFB into two main categories: Portable and Installed; both able to host Type A (see Appendix A of Advisory Circular 120-76D) and Type B (see Appendix B) software applications.

Portable EFB: This type is the most popular form of EFB use in GA and has the least amount of regulation. These are the off-the-shelf variety that have had no FAA oversight in design or production. You need only ensure that your EFB software program of choice, loaded on your favorite tablet, is carefully secured for takeoffs, landings, and those more turbulent phases of flight so the device doesn't become a projectile and potentially cause harm. These handheld devices are not considered part of the aircraft type design, so they are not to be in the type or supplemental type certificate (TC/STC).

These EFBs typically sit in a cradle or docking station, and can even be temporarily connected to existing aircraft power. Disconnecting the device from its mount must remain a relatively easy affair, and, as with regular handheld devices, they are not considered part of aircraft type design and therefore do not have to be in the TC or STC.

Next is Installed EFB — the ones that are hard installed in the cockpit. At the very least the mounting is permanently affixed. You must adhere to multiple regulations regarding airworthiness and you may need an STC in order to proceed. AC 20-173 (http://go.usa.gov/c892V) provides guidance for EFB installation for this type. Some of the items the AC addresses are mounts (e.g., arm-mounted, cradle, yoke mounts or clips, docking-stations), crashworthiness, and access to provisional power with regard to switches, fault protection, power source, and data connection, to name a few. In particular, the power interface between your EFB and your aircraft can be tricky, so enlist the services of a certified, knowledgeable maintenance technician if you are considering going this route.

With regard to accessibility, be sure to ask yourself: "am I reaching too far to get to it?" "can I see the screen adequately?" and "is this thing going to come loose at the wrong time?" You need to be aware of the draw of power the device has on your overall systems, and what systems might become compromised from EFB use. Be aware that overcharging the lithium batteries found in most portable devices can quickly become a fire hazard that you should be prepared to handle if necessary.

And above all, please consider what functions you want to use the EFB for and be proficient with them *before* you take off so that it does not become a distraction later. While the EFB serves as an excellent resource, there is potential it could also lead to pilot distraction, fixation, and automation startle. With every new advancement in technology, a basic understanding of how you interface with the machine must be considered lest the tool turn into a hazard.

Sabrina Woods is an associate editor for FAA Safety Briefing. *She spent 12 years as an aircraft maintenance officer and an aviation mishap investigator in the Air Force.*

Editor's note: At the time this article was written this AC was in draft and is expected to go final later this year.

Learn More

AC 120-76D Authorization for Use of Electronic Flight Bags: www.faa.gov/aircraft/draft_docs/media/afs/AC_120-76D_Coord_Copy.pdf

A Long Term Plan of "Attack"

By now you have likely heard of the FAA's policies that make it easier to install a potentially life-saving device on your aircraft — the angle of attack (AoA) indicator system. These small but extremely valuable devices warn pilots of an impending aerodynamic stall. Policy guidelines published by the FAA in 2014 streamlined the approval process and deemed the installation of certain AoA devices as a minor alteration. This was welcome news for pilots who may have been interested in acquiring these devices, but who were otherwise prohibited by the costly installation and approval process.

So with many GA aircraft now boasting this new technology (or operators preparing to do so), what can we say about its effectiveness in preventing loss of control situations? Are we seeing beneficial behavior changes? How about its intuitiveness? And with so many products now available, how is standardization being addressed?

The answers to these questions (and more) are all part of the FAA's long term action plan for studying AoA systems and providing additional policies and guidance for their use and installation. Given the magnitude of AoA research that is needed, not to mention the aspects of the AoA systems we're still unsure of, the FAA has conducted research with partners in government, industry, and academia. The FAA's PEGASAS (Partnership to Enhance General Aviation Safety, Accessibility, and Sustainability) program is a contributor to that research effort, working directly with students and faculty from a core group of universities across the nation (www.pegasas.aero).

Spearheading the AoA analysis efforts within the FAA are the Aircraft Certification Service's Small Aircraft Directorate and the William J. Hughes Technical Center. "We have several ongoing and recently completed FAA research projects pertaining to general aviation AoA systems," says Robert McGuire, manager of the Flight Controls and Mechanical Assistance Program. "To help us with these projects, we routinely leverage the help of industry experts and research labs all over the country."

A good example of that teamwork is evident with the agency's work in studying derived AoA data from Attitude Reference Heading Systems (AHRS) on GA aircraft. This project aims to characterize AoA data that is inferred by aerodynamic modeling and software algorithms (as opposed to those systems that measure AoA mechanically) and develop minimum performance standards for that equipment. The FAA's partners with this endeavor include Aspen Avionics, and, Texas A&M and Ohio State University from the PEGASAS team. Testing is currently underway that will look at how derived AoA data can be impacted by sensor characteristics, vehicle dynamics, and air mass motion. In a similar study, Adaptive Aerospace Corp. is researching how derived AoA data compares to AoA that is sensed mechanically.

This research is also helping to aid development of a flight envelope protection system that will work in concert with an AOA sensor and prevent pilots from making improper control inputs during critical situations. In fact, the FAA has already designed, built, and flight-tested a low cost prototype envelope protection system for GA aircraft that is capable of being retrofitted into existing GA autopilot systems and is participating in an experimental flight test program with LAM Aviation on an AoA limiter system. (Your days are numbered loss-of-control!)

Another area of concern with AoA systems is the operational consistency between different makes and models, as well as baseline interpretability. Status indicators on some models are visual, or aural, or both. You might get anything from flashing red arrows with a Siri-like voice saying you're angle is too high, to hearing a Geiger counter sound like you're flying over Chernobyl. Studies hope to show and determine the level of standardization that needs to exist with AoA status displays, symbols, and nomenclature, as well as determine baseline training and education requirements. The FAA is already well on its way toward building familiarity with these different features and functions having flight tested and categorized (with the help of partner Skyward Bound LLC) 80 percent of the commercially available AoA sensors.

To address the issue of cost for AoA devices, the agency hopes to have some changes in place by 2018 that would continue to simplify the certification process and, in turn, provide more affordable options for pilots.

Stay tuned for more on the FAA's plan of "attack" for AoA. For additional information on AoA projects, contact Dave Sizoo (David.Sizoo@faa.gov) at the FAA's Small Airplane Directorate or Robert McGuire (Robert.J.Mcguire@faa.gov) at the Tech Center.

One Size Does Not Fit All

There are few marketing phrases that are more dubious than the one stating "one size fits all." For the most part it's just not true. And even if it does "fit," there are times where it might just not fit your specific needs at the time.

The same concept often applies to aviation safety. In these pages we've discussed how adapting some elements of Safety Management Systems (SMS) designed for large air carriers can be a very effective way of improving our own safety management system and enhancing your own safety culture. The key in that idea is that we adapt them to serve our own unique set of circumstances when preparing for flight. We often just have to make the process work for our own unique set of circumstances — plain and simple.

The FAA's Aviation Safety Information Analysis and Sharing (ASIAS) Program is one such SMS product that we are currently adapting. Soon it will be coming to a helicopter hovering in your neck of the woods. ASIAS gathers information from the usual FAA databases as well as information from participating air carriers and corporate operators Flight Operations Quality Assurance (FOQA) and Aviation Safety Action Programs (ASAP). This gives ASIAS specific details about accidents and incidents that the FAA records for discovering potential precursors found in FOQA and ASAP data. The goal of having this additional data isn't for the purpose of enforcement action, but rather for gaining a better understanding of the operational environment for helping operators mitigate risk associated with various helicopter mission profiles.

The goal of having this additional data is to get a much better picture of what's happening and help come up with solutions to prevent the next accident.

Helicopters are different from fixed wing aircraft in many ways. This means that a straight application of ASIAS parameters to the helicopter world would probably provide information incongruous to helicopter pilots. In the large air carrier world, details about what parameters to record and at what interval to record them have all been standardized with FOQA. Efforts are also well underway to bring fixed-wing GA onboard with a similar Flight Data Monitoring (FDM) program (see the Jan/Feb 2016 issue for more on that). Unfortunately though, FDM is less robust on the rotorcraft side. This means that in order for a database like ASIAS to work, a lot of vetting and standardization legwork has to be completed upfront to better ensure quality information is provided to end users. We also have to redefine what it means to exceed safe operation limitations, as well as establish (and validate) parameters specific to rotorcraft operations. Things that would seem devilishly dangerous in a fixed wing aircraft might be par for the course in a helicopter.

To help get us to that point, the FAA is working with the Partnership to Enhance General Aviation Safety, Accessibility, and Sustainability (PEGASAS), a group of world-class researchers, educators, and industry leaders focused on enhancing GA safety.

As part of the FAA's work on this topic, a team of researchers from the William J. Hughes Technical Center near Atlantic City, NJ, led by engineer Cliff Johnson, are busy working on FDM applications for helicopters. Currently the FAA is testing out these platforms on a Sikorsky S-76 that can record multiple FDM units of measure during a single mission. Combined with research from other partners of PEGASAS, this allows the team to test findings and validate certain assumptions. The Sikorsky helicopter utilized at the Tech Center also allows researchers to move the FDM measuring units around in the helicopter to test what effect this might have on the data gathered and on the aircraft's flight characteristics. It is important to provide consistent and usable data, and to ensure that it is comparable across various different types of helicopter operations.

By determining how that data might be configured into the ASIAS database, the members of PEGASAS and the FAA hope to be able to provide this valuable tool to the rotorcraft community. The enormous strides made in the part 121 air carrier are due in large part to the ability to find accident precursors in data and mitigate those risks before they become an accident. Our hope is that ASIAS will bring the same improvement to the helicopter community as it has to the commercial aviation industry. Now that's a safety standard that should fit most, if not all our needs and desires.

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

Flight Forum

NVG Flying

As a former Night Vision Goggle (NVG) instructor in the United States Air Force, it was awesome to see you address the subject of NVG flying in the [Nov/Dec 2015] FAA Safety Briefing! Very cool!
— Ravi

Excellent! The article titled "T = Terrain Avoidance" found here: www.faa.gov/news/safety_briefing/2015/media/NovDec2015.pdf is one of many in our "N.I.G.H.T." themed edition that can help aviators and maintenance technicians learn a bit more about the wonders and the risks of operating in the twilight hours.

From Twitter

Just a note, I've had unhooked cowl flaps, seats out of tracks and other small things after annual. (In response to the February 2016 Safety Enhancement topic: *Advanced Preflight After Maintenance*, found here: www.faa.gov/news/safety_briefing/2016/media/SE_Topic_16_02.pdf)
— Dr. Zoom

Learning From Others

Your articles are always well-written, informative, and interesting. Thank you for sharing your experiences [in Jan/Feb 2016 "Postflight"] with the misheard landing instruction. Not only did it fit right in with the issue's theme of Compliance Philosophy, it really drove home the point that mistakes do happen to everyone, no matter what skill or experience level. You also showed exactly what to do, from interacting with ATC to completing the NASA form.

We all learn, or should learn, from our mistakes. One pearl of wisdom I picked up years ago, is that we should learn from others' mistakes as well, because we don't have enough time in our lives to make all those mistakes ourselves. Thank you for everything you have done, and continue to do, to help us fly safely.
— George

Thanks so much for a wonderful note. We are so glad to know that you found the article helpful. We completely agree with your observation that it is so much better to learn from the mistakes of others than make them yourself. Every one of us owes a great deal to those who have shared their mistakes and what they learned as a result, and the least we can do is "pay it forward" by offering up our examples in FAA Safety Briefing.

Email Help

How do I email my students certain articles from the FAA Magazine? The article on "May the Forces Be With You" is excellent and a great follow up to our recent ground school. (Knowing my students, if I send them the entire magazine, at this stage, they won't focus on this article) Thank you.
— Susan

There are a few ways to do this, but if you add "#page=" with the page number after the link to the PDF (#page=12 in this case), it will go right to that page in the PDF. This works for most web browsers.

Loss of Control

Tom and Sabrina;
Thank you for your recent articles regarding takeoff LOC and startle factor. Both articles are very well written, accurate, and informative.
— Jeff

Thank you for the comment. Both of these areas are critical to a better understanding of loss of control mishaps.

FAA Safety Briefing welcomes comments. We may edit letters for style and/or length. If we have more than one letter on a topic, we will select a representative letter to publish. Because of publishing schedule, responses may not appear for several issues. While we do not print anonymous letters, we will withhold names or send personal replies upon request. If you have a concern with an immediate FAA operational issue, contact your local Flight Standards District Office or air traffic facility. Send letters to: Editor, *FAA Safety Briefing*, AFS-850, 55 M Street, SE, Washington, DC 20003-3522, or email SafetyBriefing@faa.gov.

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

The Human Factor

I've long since established by *bona fides* as a technophile, so writing articles for a technology-focused issue is right up my alley. I want to close this issue, though, by reminding us all that the single most important piece of technology in the aircraft is — drum roll, please — the human who is operating the controls.

Machines can make our lives easier and accomplish tedious tasks much faster (and better) than we can. Even so, the well-documented challenges in developing Artificial Intelligence (AI) show that there is still no technology superior to the human brain. Our brains are the repository of wide-ranging knowledge, life experience, and intuition. Without any conscious effort, we are constantly combining, refining, and reframing mixtures of that knowledge, education, and intuition to meet each new situation or challenge that we encounter. When you pause to ponder the wonder that is your own brain, it is positively awe-inspiring.

Use Your Head

The sad thing is that too many times, too many of us put too much faith in the shiny new technologies. I certainly include myself in that group. But then the gadget goes awry, and I find myself muttering (okay, sometimes even swearing) about how technology is great … except when it isn't. You probably don't have to think very long or very hard to recall technological troubles with just about every device you use.

So I am trying to train myself to think and work with technology in the same way I think about dealing with weather. When it comes to tackling the meteorological elements, the pilot and the plane constitute a team; each brings something to the party, but neither can compensate fully for the other's weaknesses. Applying that construct to technology, it's important to remember that things go best (and safest) when the human actor and the mechanical/electronic factor both bring their A game to the flight. In addition to being physically and mentally healthy, the human needs to provide the attitude, the aptitude, and the attention. The machine needs to be in tip-top condition. You probably realize that it's pretty much always up to the human to ensure that both elements of the "team" meet those requirements.

> **Technology can make our lives easier and accomplish tedious tasks much faster (and better) than we can. Even so, the well-documented challenges in developing Artificial Intelligence (AI) show that there is still no technology superior to the human brain.**

Listen to "Gut Feelings"

Though not personally known to me, I count author Malcolm Gladwell among my mentors because I have learned so much from the piercing perceptions and keen insights in his body of work. One of my favorite Gladwell books is *Blink*. It explores the reasoned underpinnings of so-called snap judgments and gut feelings that a narrow definition of reason would compel us to dismiss. In essence, *Blink* contends that human beings take in a great deal more information than we can consciously, or "rationally," process. Nevertheless, other parts of the brain do note, process, and catalog information that might eventually be served up in the form of eye-blink conclusions, or in a kind of diffuse but gnawing sense of unease. Don't forget that "*all* available information" might well include those instant "doesn't look right" observations. Since listening to the "doesn't feel right" instinct might be key to keeping the number of landings equal to the number of takeoffs, always investigate and resolve such issues before you leave the ground or, if already underway, before you continue.

Trust … but Verify

Former president Ronald Reagan made this Russian proverb famous in the context of an arms reduction treaty, but the advice certainly applies just as well to your dealings with technology. As Wikipedia notes: "Trust, but verify recommends that while a source of information might be considered reliable, one should perform additional research to verify that such information is accurate, or trustworthy."

When it comes to technology, I can't possibly improve on that advice.

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

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FAA Faces

Alex Rodriguez

Aerospace Engineer, Communication and Surveillance Technologies Section

"As a child I always enjoyed taking things apart and figuring out how they worked. But I could never successfully put them all back together — as my mother would always find out," FAA Aerospace Engineer Alex Rodriguez explains. "This is one of the reasons why I decided to pursue an engineering degree after graduating from high school in Miami."

As every good engineer starts out — with a pile of parts — Alex attended the University of Florida where he earned a bachelor's degree in electrical engineering so he could put those parts back together again. While in school, he did research under the mechanical engineering department related to a military drone project, which was the catalyst for his interest in aviation. A 2006 internship with the FAA further encouraged that interest.

After graduating, Alex got a job with Rockwell Collins as an electrical engineer, where his duties included designing and certifying transponder and traffic collision avoidance systems — or TCAS for short. He also pursued his master's in electrical engineering. Then, after learning from a coworker about an opening in the FAA's Aircraft Certification Branch, Alex applied to join the FAA team.

Under the umbrella of the FAA's Aircraft Certification Service, the Communication and Surveillance Technologies Section is responsible for the promotion of aviation safety through issuance of aviation regulations (Technical Standard Orders or TSOs), policy, and advisory material related to the certification and installation of surveillance equipment.

The majority of Alex's accomplishments arise from the interaction between his section and other branches of the FAA. He has worked to streamline the certification process related to Automatic

Dependent Surveillance – Broadcast (ADS-B) Out equipment, which is mandated for anyone flying in transponder-required airspace on January 1, 2020.

"I have learned that to work well and provide a positive effect in the community, there needs to be collaboration across all FAA lines of business," he notes. "Flight Standards, Aircraft Certification, Spectrum Engineering and Policy Office, ATO Program Office, and the FAA International Office all work together to ensure that the decisions made do not negatively impact the users of our airspace."

Alex's collaborative skills have contributed significantly to improving not only the U.S. airspace system, but also the airspace systems of several countries in Central and South America — where he has also improved industry perception of the FAA. He facilitated the foundation for ADS-B implementation in the rest of the Western Hemisphere.

Alex's deep understanding of the ADS-B equipment manufacturing industry and exceptional ability to recognize safety and efficiency opportunities has made him highly effective as co-chair of the Equip 2020 Installations and Approvals Working Group. Equip 2020 is an FAA-industry committee created by the FAA administrator to identify and overcome barriers to equipping with ADS-B Out. Alex has implemented changes to the ADS-B Out installation advisory circular (AC 20-165B online at http://1.usa.gov/1LWLxjw), provided clarification to installation policy, and resolved several issues that were impeding progress on equipage. His expertise was also instrumental in providing a great deal of the information in this issue's "Mandate Myth-busting" article.

"Because we see technology moving faster than we can typically keep up, the FAA continually works to ensure that aircraft meet a minimum level of safety. This minimum level of safety is not only for the one GA pilot in his aircraft, but for that GA pilot flying in the same airspace as a Boeing 737 or Airbus 330," explains Alex. "Systems such as ADS-B Out and ADS-B In have been designed to help provide a pilot with a better understanding of what is around them — better situational awareness."

Our airspace is vast, but it's smaller than you think. FAA employees like Alex are working hard to make sure everyone that needs to fly, can fly safely.

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*Look Who's Reading
FAA Safety Briefing*

Overseeing the world's largest fleet of single-engine piston aircraft means
being prepared for anything. That's why I read *FAA Safety Briefing*.

— Maj. Gen. Joe Vazquez, Civil Air Patrol National Commander