March/April 2020

FAA Safety BRIEFING

WEATHER TECHNOLOGY

Federal Aviation Administration

U.S. Department
of Transportation

**Federal Aviation
Administration**

ISSN: 1057-9648
FAA Safety Briefing
March/April 2020
Volume 60/Number 2

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

The Office of Management and Budget has approved the use of public funds for printing *FAA Safety Briefing*.

ABOUT THIS ISSUE ...

The March/April 2020 issue of FAA Safety Briefing *focuses on the variety of tools and technology aviators can use to avoid and/or safely mitigate what we've dubbed as UMC, or Unfriendly Meteorological Conditions. Feature articles cover some of the FAA's weather research work and programs, including more effective ways to convey cockpit weather imagery, icing avoidance, and the use of weather cameras. We also sit down with the new FAA Administrator, Steve Dickson, to discuss his take on general aviation safety.*

Cover image courtesy of Garmin.

Contact Information
The magazine is available on the internet at:
www.faa.gov/news/safety_briefing

Comments or questions should be directed to the staff by:

- **Emailing:** SafetyBriefing@faa.gov
- **Writing:** Editor, FAA Safety Briefing, Federal Aviation Administration, AFS-850, 800 Independence Avenue, SW, Washington, DC 20591
- **Calling:** (202) 267-1100
- **Tweeting:** @FAASafetyBrief

Subscription Information
The Superintendent of Documents, U.S. Government Publishing Office sells FAA Safety Briefing on subscription and mails up to four renewal notices.

For New Orders:
Subscribe via the internet at https://bookstore.gpo.gov/products/faa-safety-briefing, telephone (202) 512-1800 or toll-free 1-866-512-1800, or use the self-mailer form in the center of this magazine and send to Superintendent of Documents, U.S. Government Publishing Office, Washington, DC 20402-9371.

Subscription Problems/Change of Address:
Send your mailing label with your comments/request to Superintendent of Documents, U.S. Government Publishing Office, Contact Center, Washington, DC 20408-9375. You can also call (202) 512-1800 or 1-866-512-1800 and ask for Customer Service, or fax your information to (202) 512-2104.

FAA Safety BRIEFING

The FAA safety policy voice of non-commercial general aviation

Straight From Steve Meet FAA Administrator Steve Dickson

8 **What is WTIC?** Making Weather Technology and Information in the Cockpit Work for You

16 **Mind The Gap** Understanding Latency Issues With In-Cockpit Weather Imagery

DEPARTMENTS

HOW'S THE WEATHER?

Everybody talks about the weather, but nobody does anything about it.
— Mark Twain

Heavy rain is falling as I write this column. Since I would strongly prefer to be doing things outside, the late American humorist Mark Twain's famous lament quickly comes to mind. If you are a VFR-only pilot, you may be especially in sync with these sentiments. But even if you are instrument rated, it's not possible (and certainly not safe) to fly in all weather conditions. Conditions that are at or below minimums can keep you grounded, as can widespread convective activity or icing conditions. Those of us in maintenance/airworthiness occupations may sometimes have the benefit of a roof, but not always. In short, inclement weather can, and does, affect anyone and everyone in aviation.

Even with all of today's whiz-bang technology, there's not a lot that we can do to stop rain, ice, turbulence, or other conditions adverse to GA activity. But there is now an astonishing variety of tools and technologies that aviators can use to avoid or work safely around a wide range of UMC — "unfriendly meteorological conditions." Thanks to the unstinting work of weather researchers, tools we can't even imagine are already in the works.

WTIC, ICICLE, and More

With that backdrop in mind, and as the spring flying season gets GA airplanes and pilots moving again, the *FAA Safety Briefing* team thought it would be a great time for a fresh look at some of these developments in weather awareness. We'll start off with an overview of the FAA's

Weather Technology in the Cockpit (WTIC) program. As you will learn, this NextGen weather research endeavor is working on ways to ensure that cockpit and portable weather displays convey critical weather information more effectively. The magazine team also takes a look at how the WTIC program is working with researchers at the FAA's William J. Hughes Technical Center, the FAA Civil Aerospace Medical Institute (CAMI), and academia (Embry-Riddle Aeronautical University and the Partnership to Enhance General Aviation Safety, Accessibility, and Sustainability (PEGASAS)).

Winter may be waning, but aircraft icing can occur at any time of year if the conditions are right. Given how dangerous inflight icing can be, another article covers a field program called In-Cloud ICing and Large-drop Experiment (ICICLE). ICICLE, which started in early 2019, saw the FAA working with the National Research Council of Canada (NRC) and Environment and Climate Change Canada (ECCC). This team used research aircraft to compile new, high-quality measurements covering a broad spectrum of icing conditions (freezing drizzle, freezing rain, "small drop" icing, high liquid water contents) as well as non-icing conditions (glaciated environments and clear air).

We'll take a look at the FAA's weather camera program, which is wildly popular in Alaska. One of our most popular magazine alumnae, Sabrina Woods, makes a return appearance with her intriguingly titled "Mind the Gap" piece on … well, I'll let you discover the subject as you read.

Meet the New Administrator

Last but definitely not least, we are delighted to feature an interview with the FAA's new Administrator, Steve Dickson. Administrator Dickson has quickly become known around the FAA for his weekly "Straight from Steve" video messages, and he received a great introduction to GA issues when he hosted a GA Safety Roundtable late last year.

THERE'S NOT A LOT THAT WE CAN DO TO STOP RAIN, ICE, TURBULENCE, OR OTHER CONDITIONS ADVERSE TO GA ACTIVITY. BUT THERE IS NOW AN ASTONISHING VARIETY OF TOOLS AND TECHNOLOGIES THAT AVIATORS CAN USE TO AVOID OR WORK SAFELY AROUND UMC – "UNFRIENDLY METEOROLOGICAL CONDITIONS."

AVIATION NEWS ROUNDUP

New FAA Video Series Aims to Reduce Runway Incursions

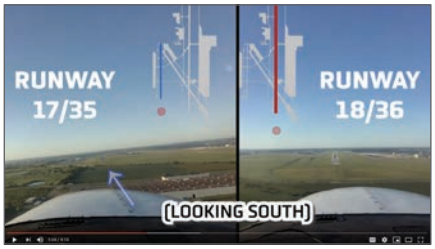
While high-profile runway safety incidents involving commercial (part 121) aircraft make the headlines, safety data shows that general aviation (GA) pilots are involved in a vast majority of these events. One of the common contributing factors to these pilot errors is a lack of awareness or misunderstanding of local runway and taxiway configurations.

To help reduce the occurrence of wrong surface incidents, runway incursions, and other high-risk events at U.S. airports, the FAA has developed the "From the Flight Deck" YouTube video series that is targeted to GA audiences.

Each 4-5 minute video will focus on approach, landing, and taxi scenarios at selected U.S. airports. The videos will feature high definition footage along with professional graphics, animations, runway diagrams, and narration to help identify and illustrate airfield hazards and hotspots.

All "From the Flight Deck" videos are available at FAA.gov/go/FromTheFlightDeck and hosted on the FAA YouTube Channel (@FAANews).

The first season of 10 airport videos features large and small mixed-use airports with a variety of traffic types, including Bedford, Mass., (KBED), Boeing Field, Wash., (KBFI), Boise, Idaho (KBOI), Long Island Mac Arthur, N.Y. (KISP), Lincoln, Neb., (KLNK), Kansas City, Mo., (KMKC), Philadelphia, Pa., (KPHL), Sonoma, Calif., (KSTS) and Teterboro, N.J. (KTEB). New locations will be released throughout the year. Subscribe to the FAA YouTube channel to see the full series and get notified about new locations (youtube.com/FAAnews).



FAA.gov/go/FromTheFlightDeck

Revised AC Provides Important Details for ADS-B Operations

On December 30, 2019, the FAA published its latest revision to Advisory Circular (AC) 90-114 (Revision B), *Automatic Dependent Surveillance-Broadcast Operations,* which provides comprehensive guidance on ADS-B operations in the National Airspace System (NAS) in accordance with ADS-B regulations (14 CFR sections 91.225 and 91.227). Of note in this revision is the clarification of certain operational policies:

- Aircraft that are exempt from 91.225 (Section 3.2)
- ADS-B Out operations during formation flying activities (Section 4.3.1)
- Owner/operator responsibilities to maintain compliance with regulatory requirements (Section 4.3.2.5.1)
- Public ADS-B Performance Report (PAPR) information and purpose (Section 4.3.2.5.6)
- ADS-B performance requirements during aerobatic flight (Section 4.3.2.6.2)
- Inoperative ADS-B procedures (Section 4.3.4.2) including a new section on the ADS-B Deviation Authorization Preflight Tool (ADAPT) (Section 4.3.5)
- Flight planning and ICAO flight plan codes (Section 4.4)
- Privacy ICAO Address (PIA) program (Section 4.4.5)
- Call sign mismatch (Section 4.6.2)

The AC also provides a helpful overview of the ADS-B system architecture, the various forms of available equipment, broadcast services available to ADS-B users, and operational considerations with regard to equipment performance requirements and airspace restrictions. In addition, five appendices in the AC cover ADS-B In-Trail Procedure operations, Cockpit Display of Traffic Information (CDTI) Assisted Visual Separation (CAVS) operations, aircraft qualification and maintenance associated with ADS-B In operations, definitions, and relevant regulations and reading material.

To access AC 90-114B, go to *go.usa.gov/xd375*.

Important Charter Guidance for Pilots and Passengers

Today, booking a charter flight can be as easy as tapping a few buttons on your mobile device. But that doesn't mean the flight is legal or safe.
If you pay for a charter flight, you are entitled to a higher level of safety than is required from a free flight from a

friend. Among other things, pilots who transport paying passengers must have the required qualifications and training, are subject to random drug and alcohol testing, and the aircraft used must be maintained to the high standards that the FAA's charter regulations require.

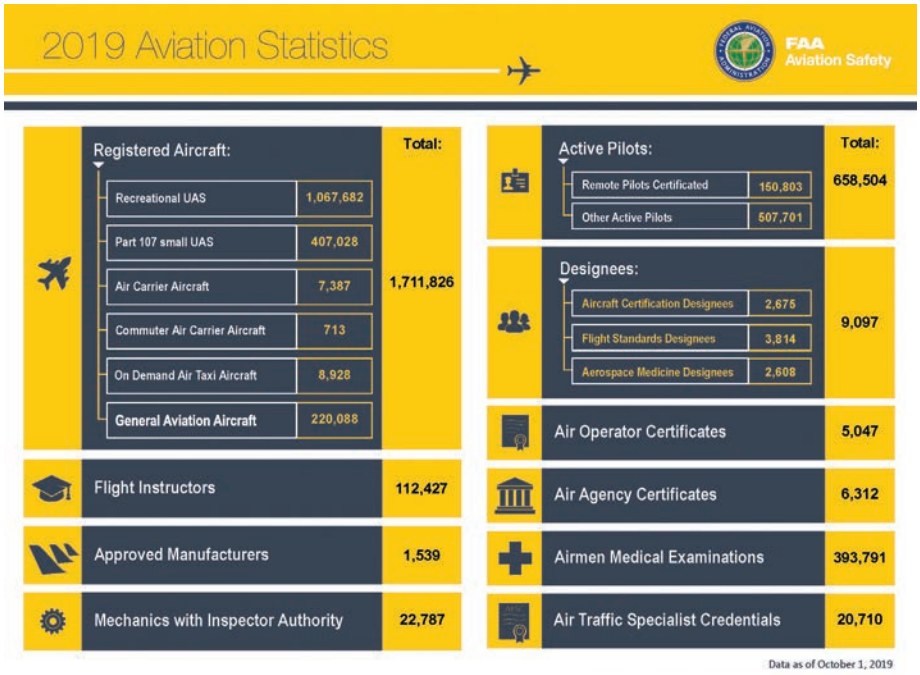
The FAA sent a letter about this issue to a company called Blackbird Air, which created a web-based app that connects passengers with pilots. The letter emphasizes an FAA policy about the requirements for pilots who are paid to fly passengers. The policy states that in addition to holding the required commercial or airline transport pilot certificate, pilots who are paid to fly passengers must also be employed by the company operating the flight. That company must hold a certificate issued under 14 CFR part 119, or the pilots themselves must hold a part 119 certificate.

Any pilot who provides charter flights without complying with the part 119 certificate requirement is violating the regulations — even if they possess a commercial or airline transport pilot certificate. Federal courts have upheld the FAA's determination.

For more information on safe air charter operations, as well as a current listing of FAA-licensed charter providers, go to bit.ly/SafeCharterOps.

2019 Aviation Statistics

The mission of the FAA's Aviation Safety organization is to provide the safest, most efficient aerospace system in the world through a data-driven, risk-based, systems approach for standards, certification, and oversight. Above is a snapshot of our aviation environment.



Procedure Following Cards Available for Printing

Before-and-After Procedure Following Task Cards are tools to help improve safety culture in the aviation maintenance field. These cards remind maintenance personnel of important steps to complete before, during, and after performing tasks. The cards are laminated and designed to hang from a lanyard. The FAA's Aerospace Human Factors Research Division has a small number of cards available for distribution; however, larger organizations may choose to print cards for their AMTs, supervisors and managers, and procedure writers.

Printing specifications are available in the PDF download at HumanFactorsInfo.com — just follow the Training and Tools link in the left margin and scroll down to download the three card types.

SAFETY ENHANCEMENT TOPICS

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

MARCH

Pilot Proficiency and WINGS
How proficiency training programs, like WINGS, can help improve flight safety.

APRIL

Stabilized Approach
Maintaining a stabilized approach and landing is a great way to avoid a loss of control situation.

NEW INSULIN-TREATED DIABETES MELLITUS POLICY FOR PILOTS

As my office works to implement significant changes to our insulin-treated diabetes mellitus (ITDM) protocol, let me take this opportunity to provide an overview.

Not long after the Wright Brothers first flew, the need for airman physical standards became apparent. Early U.S. Army pilot candidates included those medically disqualified for infantry or cavalry. This was unsuccessful as shown by the British during the first year of WWI: two-percent of aviation losses were due to enemy action, eight-percent to mechanical issues, and ninety-percent medical issues. Sixty-percent of the losses had physical deficits. Once medical standards were in place, the accidents secondary to medical causes dropped to twenty-percent after one year and twelve-percent the following year.

Early civilian aeromedical standards closely mirrored those of the U.S. Army. Just as today, the medical standards for commercial pilots were more rigorous than for a private pilot, which balances public safety and an individual's freedom to fly. Through today's Special Issuance Medical Certificate process, provisions for appropriate evaluation and risk mitigation allow us to routinely evaluate and issue for conditions that were once cause for automatic disqualification. This change is a testament to ongoing improvements in treatment and diagnostic tools.

Thanks to specific improvements in the management of ITDM and through consultation with prominent clinical specialists in diabetes, we have determined that some applicants with ITDM can now be favorably considered for either a Class I or II medical certificate under 14 CFR part 67. As you may be aware, in 1996 one of my predecessors determined that technology had matured sufficiently to allow special issuance of medical certificates for ITDM at the Class III level. The new protocol is an option for Class III medical certificates (although they can also use the prior protocol). It has no effect on pilots using BasicMed or sport pilot privileges.

The advent of new technology like continuous glucose monitoring (CGM) played a role in the FAA's new policy.

You may also know that Canada and the United Kingdom (UK) both allowed use of insulin by commercial pilots some years ago. The U.S. couldn't follow suit right away because both countries, to mitigate risk, imposed limitations not feasible here in the United States. For instance, they limit use of the medical certificate to two-pilot operations, require specific training for the non-diabetic pilot, and require informing other crewmember(s) of the ITDM condition. Recent improvements in CGM (continuous glucose monitoring) technology are sufficient that the FAA can now favorably consider special issuance for Class I and II medical certificates for some individuals without the need for these restrictions. My expectation is that our special issuance will provide a template for other International Civil Aviation Organization (ICAO) member states including Canada and the UK.

We announced the new ITDM protocols via the *Federal Register* on November 7, 2019. We designed the protocols to ensure that the pilot remains in good control and avoids incapacitation, subtle or overt. Both low and high blood sugar (hypo- and hyperglycemia, respectively) are associated with cognitive impairment that can cause poor decision making, slowed reaction time, and an inattention to detail, among other problems. The use of CGM allows the pilot to closely monitor blood sugar irrespective of workload and ambient conditions (turbulence, emergencies, etc.) and take corrective action in all phases of flight. In addition, a predictive function allows the pilot to take action to *prevent* blood sugar excursions outside the desired range rather than merely reacting to them, as is the case with finger-stick blood sugar testing. We have already begun to review cases under this protocol and will grant a special issuance when it is safe to do so. This is a win for the professional pilot community and it also maintains safety in the National Airspace System.

Dr. Michael Berry received an M.D. from the University of Texas Southwestern Medical School, and a master's in preventive medicine from Ohio State University. He is certified by the American Board of Preventive Medicine in aerospace medicine. He served as an FAA senior aviation medical examiner and vice-president of Preventive and Aerospace Medicine Consultants for 25 years before joining the FAA. He also served as both a U.S. Air Force and NASA flight surgeon.

LEARN MORE

Federal Register notice on new ITDM protocol
go.usa.gov/xdr3D

LEO M. HATTRUP, M.D.

SPATIAL DISORIENTATION

In this weather technology-themed issue, let's look at a relevant topic all pilots must understand: spatial disorientation. Spatial disorientation, or "Spatial-D" occurs when a pilot cannot determine their position, location, and motion relative to their environment.

The General Aviation Joint Steering Committee (GAJSC), a joint industry/government organization, recently reviewed two weather related accidents. In each case, the pilot was instrument rated (but with uncertain proficiency) and the aircraft was equipped for instrument flight. The report does not identify any mechanical issues and neither pilot had a known medical deficiency. In both accidents, spatial disorientation was quite possible. All known circumstances also indicate that the pilots ignored basic tenets of ADM (aeronautical decision-making) and CRM (crew resource management).

The first accident involved a pilot who flew his *Bonanza* into an area of low instrument meteorological conditions (IMC). He made multiple 360s (looking for better weather?) and chose to scud run at less than 600 feet AGL. There is no record of an official or unofficial weather brief, nor did he contact ATC for assistance. The final event was probably an accelerated stall near the ground (the flight path was 45 degrees pitch down through the trees). These maneuvers suggest that he possibly experienced spatial disorientation resulting in the leans or a graveyard spiral.

The second accident involved a *Cessna 340* pilot who actually had the aircraft towed to the takeoff runway. Why? He was concerned about hitting a parked aircraft or a hangar due to the reduced visibility. As the Cessna impacted the ground shortly after the departure end of the runway, the review team believes the pilot may have experienced the somatogravic illusion (a sensation of climbing due to acceleration).

The lack of CRM and ADM both clearly contributed to these accidents. It is easy to criticize and say "I would never do that." But, is that accurate? For the most part, pilots are different from the general population. Many are so-called "Type A," exhibiting both the determination and effort required to earn pilot certificates and ratings as well as the "I can handle it" confidence that can arise from successfully completing those important milestones (e.g., first solo, first instrument cross-country, etc.). Unfortunately, this same self-assurance can result in overconfidence and poor decision making. All of us are prone to continue a course of action once begun, even if the situation deteriorates from that expected. This tendency is termed "plan continuation bias." Along with pressure to perform (e.g., if passengers are present), it can also impair the pilot's ability to assess the actual risk of a situation and lead to disregarding important information such as cues suggesting spatial disorientation. In fact, a 2004 study by NASA determined that "plan continuation bias" was causal in 9 of the 19 air carrier accidents reviewed. The solution, of course, is to establish and adhere to personal limitations, ideally beginning with the preflight planning and continuing throughout the flight.

Nobody — but nobody — is immune to the impact of spatial disorientation. So please take the time to reacquaint yourself with spatial disorientation and human factors on a regular basis. Maintain instrument proficiency. Debrief your flights looking for areas to improve. Finally, determine your go/no-go points for all phases of flight early in the planning process.

Consider these resources:

- Pilot Safety Brochures
  bit.ly/PilotSafety
- Spatial Disorientation – Visual Illusions
  go.usa.gov/xdrab
- Aeronautical Information Manual (AIM), Chapter 8
  bit.ly/AIMChp8
- Instrument Flying Handbook, Chapter 3
  go.usa.gov/xdraQ
- Helicopter Flying Handbook, Chapters 12 and 13
  go.usa.gov/xdraE and
  go.usa.gov/xdram
- FAA Glider Flying Handbook, Chapter 13
  go.usa.gov/xdraV
- Spatial-D Fact Sheet
  bit.ly/SETopics

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

SUN 'N FUN AEROSPACE EXPO

FAA SAFETY CENTER FORUMS

March 31 – April 5, 2020

	08:30 a.m. - 09:45 a.m.	10:00 a.m. - 11:15 a.m.	11:30 a.m. - 12:45 p.m.	1:00 p.m. - 2:15 p.m.	2:30 p.m. - 3:45 p.m.
Tuesday **MARCH 31**	Most Common Cause of Fatal Accidents - Loss of Control	Future of Airman Testing and the Designee Program	The Future of Flight Service	Simulators and Safety	Backup Navigation During GPS Outages
	Ed Verville *FAA Designated Pilot Examiner* WINGS: BK3 AFS098457	Robert Reckert *FAAAFS-600* WINGS: BK3 AFS098436	Joe Daniele *Leidos Flight Service* WINGS: BK3 AFS098440	Marci Veronie *Senior VP Avemco* WINGS: BK3 AFS098443	Vince Massimini *MITRE* WINGS: BK3 AFS098977
Wednesday **APRIL 1**	Wilderness Survival PT 1	Wilderness Survival PT 2	Summer is the Best Time for Flying, But Am I Ready?	Understanding Class E Airspace for UAS	Runway Safety Discussions: "The Good, The Bad, and The Ugly"
	Mike Millard *FAA AFS-830* WINGS: BK3 AFS098445	Mike Millard *FAA AFS-830* WINGS: BK3 AFS098446	Ian Johnson *FAA Aviation Weather Branch* WINGS: BK2 AFS098464	Kevin Morris *FAA AFS-850* WINGS: BK3 AFS098447	Noel Kirby & Aimee McCormick *FAA Office of Runway Safety* WINGS: BK3 AFS098821
Thursday **APRIL 2**	Threat and Error Management	Straight Talk About Aviation Safety	Meet the FAA	What Would You Do in These Maintenance Situations?	TFRs
	Patrick Hempen *FAA Accident Invest. Director* WINGS: BK2 AFS098452	John & Martha King *King Schools* WINGS: BK3 AFS098454	FAA Leadership	Mike Millard *FAA AFS-830* AMT: MT-IA AFS098455	LTC Mitchell Walrod *NORAD* WINGS: BK3 AFS098822
Friday **APRIL 3**	AUVSI Trusted Operator Program (TOP) for Drone Operators	FAA Charles Taylor Master Mechanic and Wright Brothers Master Pilot Awards Ceremony		Secrets Only Pilots Know About Airports	STEM-AVSED
	Jenny Rancourt *Cert. Manager AUVSI* (08:30 - 9:00)	Presented by FAA VIP (10:30 - 12:00)		Tom Slater *FAASTeam Rep* WINGS: BK3 AFS098458	James Brough *FAA STEM AVSED Office*
Saturday **APRIL 4**	Single Pilot IFR PT 1	Single Pilot IFR PT 2	The Future of Flight Service	Recreational Drone Flying	NOTAMS
	Jeff Edwards *AvSafe, LLC* WINGS: BK2 AFS098459	Jeff Edwards *AvSafe, LLC* WINGS: BK2 AFS0984560	Joe Daniele *Leidos Flight Service* WINGS: BK3 AFS098461	Kevin Morris *FAA AFS-850* WINGS: BK3 AFS098462	Grag Garmon *FAA ATO* WINGS: BK3 AFS098823
Sunday **APRIL 5**	**Forums Closed - Exhibits Open** Find *WINGS* programs in your area all year long at: www.faasafety.gov				

Appropriate AMT / WINGS credit will apply to events by using the associated #AFS098XXX listed in each box.

FAA Forum & FAA Exhibit Hall Opens Daily at 08:30 a.m. Schedule is subject to change; for updates check the QR code to the right or go to: bit.ly/FAAForums2020

To register for these events go to: bit.ly/2S5csQ2

WHAT IS WTIC?

Making Weather Technology and Information in the Cockpit Work for You

By Ian Johnson and Gary Pokodner

The human brain is an amazing organ, but most of us are still limited in terms of how much information we can truly absorb, process, and retain at any given time. With all kinds of information coming at us from various sources, it's easy for humans to succumb to errors in perception.

That's why the FAA's Weather Technology in the Cockpit (WTIC) NextGen Weather Research program is working to determine how to ensure that weather information presented in today's cockpit, whether on portable or installed displays, conveys vital weather information more effectively. The WTIC program works closely with the William J. Hughes Technical Center cockpit simulator facility which has five general aviation, four commercial, and one helicopter flight simulation devices. Having such equipment makes it efficient to conduct studies that use a variety of repeatable operational scenarios with a large number of volunteer pilots.

VFR into IMC

One of the main goals of WTIC research is to recommend a set of minimum performance recommendations for weather displays. For instance, WTIC researchers are looking for ways to highlight changing weather conditions in order to improve pilot recognition of such developments. VFR pilots should know that flying into instrument meteorological conditions (IMC) can lead to a potentially serious situation, and few pilots intend to cross that line. In reality, the transition from visual meteorological conditions (VMC) into IMC can be fairly rapid, or gradual and subtle. So anything that notifies the pilot of impending changes in visibility could be lifesaving.

Early research in this area focused on METAR symbology, with color changes to indicate the change from VFR to IFR. Researchers using displays currently on the market quickly found that there is wide variety in how different manufacturers present this information. Consequently, pilots who voluntarily participated in WTIC research sometimes missed changes in METAR symbology and continued their flight into IMC when they should have been considering changing course or diverting to an alternate airport. The study also revealed wide variance in pilot perceptions and suggested that the industry needs to find more salient ways of presenting a change to

Ian Johnson and Gary Pokodner help pilots see the dangers of weather encounters with the WILD simulator at Sun 'n Fun.

Ian Johnson with the WILD simulator.

visibility conditions. In short, these results point to gaps in displays and the need for depictions to be more consistent, salient, intuitive, and effective across platforms.

What You See …

Another significant issue that WTIC research identified was that pilots do not fully understand the capabilities and limitations of Next Generation Weather Radar (NEXRAD) graphic displays.

NEXRAD is a great, long-range strategic planning tool that should be used to avoid hazardous weather areas, such as lines of thunderstorms. The mistake pilots often make is assuming that NEXRAD depictions are presented in real time, when in fact processing and transmission time can result in the image being up to 20 minutes old by the time it is displayed on a cockpit device. This lag is significant because thunderstorm cells can form and move far more quickly than your display may indicate.

To address image latency, the WTIC program is working with researchers from the Partnership to Enhance General Aviation Safety, Accessibility and Sustainability (PEGASAS), an FAA-sponsored Center of Excellence for General Aviation. PEGASAS has developed a table-top training device, the Weather Information Latency Demonstrator (WILD), which can adjust latency for any specified time interval to demonstrate the difference between the NEXRAD imagery and what the pilot sees out the window.

WTIC researchers used the WILD to examine how latencies affect a GA pilot's weather decision-making. Among other things, they found that few pilots can accurately judge distances to clouds or to IMC conditions. Some flight training device manufacturers are now incorporating the WILD concept to help pilots understand the gap between cockpit weather graphics and out-the-window conditions, and improve pilots' ability to detect and avoid hazardous weather events. The WTIC program has also been briefing pilots on simple triangulation techniques and methods for rough estimations of distance that have been shown to be significantly more accurate than "guessing" distance to clouds, IMC, or other hazards.

Read on for more information about WTIC!

Ian Johnson is an engineering psychologist and human factors researcher in the FAA's NextGen Aviation Weather Division's Weather Technology in the Cockpit (WTIC) program. He has master's degrees in human factors in aviation systems and aviation/aerospace safety systems from Embry-Riddle Aeronautical University. He also holds a pilot certificate for single and multi-engine airplanes.

Gary Pokodner is the program manager in the FAA's NextGen Aviation Weather Division's Weather Technology in the Cockpit (WTIC) program. He worked in design, reliability, development, testing, and acquisition of avionics at Aeronautical Radio, Incorporated (ARINC) for 25 years before joining the FAA in 2011 to work on aviation weather research.

LEARN MORE

FAA's WTIC Program
bit.ly/FAAWTIC

NTSB Safety Alert – In-Cockpit NEXRAD Mosaic Imagery
bit.ly/NTSBAlert

Will You Make Good Decisions About Bad Weather?

The FAA's Weather Research Program Has Answers

By Jennifer Caron

Which type of weather data would you rather have in the cockpit? Do you want weather data that is valid at the current time, includes a forecast, but is not completely accurate? Or, would you rather have a weather display that's picture perfect, but anywhere from 15 to 20 minutes old? Of these, which would you use to make a good decision to avoid bad weather?

These are the kinds of questions that the FAA's Weather Technology in the Cockpit (WTIC) program examines to find the most effective ways to present weather information in the cockpit so pilots can consistently and accurately interpret that information, understand its limitations, and use it effectively to avoid adverse weather.

WTIC is one of two research programs in the FAA's Next Generation (NextGen) Aviation Weather Division. Along with the Aviation Weather Research Program (AWRP), the WTIC program seeks to enhance aviation safety by minimizing the impact of adverse weather on flights operating within the National Airspace System.

Let's take a look at how the WTIC program is identifying solutions to help improve your knowledge and interpretation of the weather conditions ahead. We'll also talk about recommendations the WTIC program has made to industry on how to deliver weather in a format that's not only manageable, but is easy to understand.

The Challenge

According to a 2005 safety study by the National Transportation Safety Board (NTSB), "errors in decision-making, such as plan continuation errors or incorrect assessments of weather-related risk, may be made by pilots who are either unfamiliar with the [weather conditions prevailing in an area in general, or over a long period of time], who lack total and/or recent experience identifying marginal weather conditions, or who lack experience getting or reading weather reports."

The Solution

Granted, pilots are not meteorologists. However, a pilot does need to know how weather may impact his/her flight, the capabilities and limitations of the airplane, and his/her personal minimums. This is where the FAA's WTIC program comes in. "We need to find a better way to teach pilots the weather, and determine areas where pilots have a weakness," says Ian Johnson, an engineering psychologist and human factors researcher in the WTIC program. One of WTIC's main objectives is to uncover gaps in pilot training, as well as gauge the pilots' understanding and interpretation of cockpit weather sources (e.g., SIGMETs) and weather products (e.g., METARs).

In 2015, the WTIC program reached out to Embry-Riddle Aeronautical University (ERAU) for help in addressing gaps in pilot weather training. In response, ERAU developed 95 weather-related, multiple choice questions to assess GA pilots' knowledge of aviation weather concepts and principles, where to obtain the aviation weather products, and how to interpret the aviation weather products (e.g., forecasts, observations, etc.). The sample of pilots evaluated included pilots of all ages and genders, with a variety of flight time, whose certificates and/or ratings ranged from student pilots, to private and commercial pilots, with and without an instrument rating.

It was no surprise that instrument rated commercial pilots had the highest scores, but their scores were not significantly higher than private pilots either with or without an instrument rating. Student pilots had the lowest levels of aviation weather knowledge.

Overall, pilots scored higher on weather sources (e.g., SIGMETs, surface charts, and upper level charts), but lower (50-percent or less, which means they failed) on interpretation of weather products (e.g., radar, AIRMETs, satellite data, METARs, and PIREPs).

"The takeaway from these results is that GA pilots struggle to interpret weather products, which places them at a greater risk of flying directly into hazardous weather," Johnson explains. "It was clear that GA pilots need more training on basic principles of weather phenomena and weather product interpretation to diagnose bad weather in advance," says Johnson.

Ian Johnson and Gary Pokodner with the WILD simulator.

To address these concerns, WTIC sponsored two areas of weather training development. They reached out to the National Association of Flight Instructors (NAFI) to develop a training course aimed at improving weather knowledge and interpretation. WTIC assisted NAFI in creating a course to help flight instructors improve their ability to teach aviation weather to pilots; specifically, in areas where pilots demonstrated a weakness, as was noted from the results of the ERAU study. A second course was created to help pilots enhance weather decision making during flight.

You can find both courses online, and they're free. Flight instructors, visit bit.ly/WxNAFI. Pilots, go to FAASafety.gov and enter ALC-521: Enhancing Wx Knowledge and Training in the search bar. Be sure to register or log in to your account to receive WINGS credit for the course.

NEXRAD Images – Delayed, Not Live

WTIC further found that many GA pilots do not understand that in-cockpit weather displays are latent — not presented in real-time. The only source for real-time, radar imagery is an airborne weather radar in your cockpit. Unless you have this equipment, data-linked cockpit gadgets will always show delayed images.

Just for example, Next Generation Radar (NEXRAD) mosaic images can be delayed anywhere from ***15 to 20 minutes***. ***It is not a five minute delay***, as is commonly thought. Also, remember that ***the time stamp on the display reflects a delay*** from ground radar, in addition to the

> **What you see out the window is real, what you see on the display is delayed. Don't fly your aircraft solely based on your NEXRAD display.**

time it takes to create the graphic, and the time delay in reaching your cockpit display. For more, read the NTSB's safety alert at bit.ly/NTSBAlert.

"What you see out the window is real, what you see on the display is delayed," Johnson explains. "Don't fly the airplane solely based on what you see on that data-linked display."

Cockpit displays of data-linked weather, like NEXRAD, are meant to be used for strategic planning to help fly a wide berth around a line of thunderstorms that can be 100 or more miles ahead. Unfortunately, some pilots make the mistake of trying to navigate through perceived "holes" in the storms which could disappear entirely by the time the airplane actually arrives, resulting in an aircraft getting dangerously close to adverse weather.

Results from Aviation Safety Reporting System (ASRS) reports and a small ERAU study showed that 33- to 50-percent of the time pilots thought the weather on their route and at their destination was better than it really was.

"Weather is not linear, it is dynamic," explains Gary Pokodner, the WTIC program manager. "You can't forecast growth and decay. A new thunderstorm cell can pop up behind the one a pilot is watching, and this can happen in a matter of minutes. Don't cut corners or shoot gaps, just steer clear."

Wild, Wild Simulated Weather

To help GA pilots understand how easy it is to misread in-cockpit weather information, WTIC worked with the Partnership to Enhance General Aviation Safety, Accessibility and Sustainability (PEGASAS), which is a group of universities on a research grant from the FAA. Together they developed the Weather Information Latency Demonstrator, or WILD.

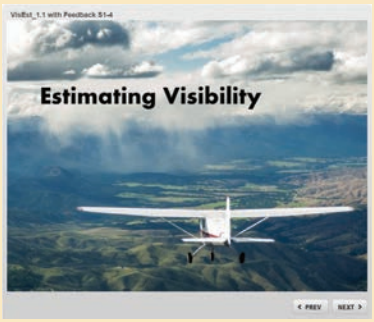
WILD is a desktop simulator designed to teach pilots about the effects of latency, how to better spot weather change color cues on the display, and to observe the potential differences between cockpit NEXRAD imagery and out-the-window conditions. In the WILD simulation, pilots fly a scenario with a thunderstorm ahead of the aircraft. Many pilots who tried it thought they could watch the storm and anticipate where it would be in 5-10 minutes. They were surprised when the virtual flight took them straight into a new thunderstorm cell or low visibility. Pilots using WILD have thus been able to learn more about the dangers of latency and poor visibility and make better weather avoidance decisions.

WTIC is transitioning its findings from the WILD to flight simulator providers, as well as data-linked weather manufacturers. They are recommending better ways for manufacturers to format displays and add industry-wide consistency to weather change color schemes. Thanks to Mindstar Aviation, pilots had an opportunity to fly the WILD capabilities in the Pilot Proficiency Center during EAA AirVenture 2019. If you want to try your skill at navigating hazardous weather in the safety of a WILD simulator, stop by the FAA Safety Hangar at AirVenture 2020 and at the FAA Safety Hangar at the Sun 'n Fun Aerospace Expo 2020.

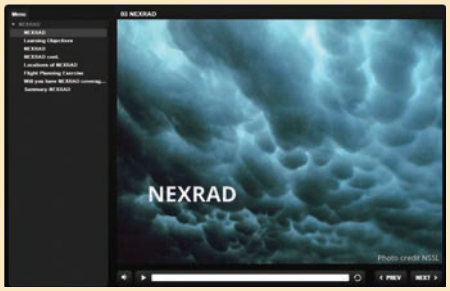
Meanwhile, here are some online — free! — courses that can teach you more about the limitations of weather displays in the cockpit.

1. Latency Training Module | *bit.ly/LatencyTrain*

2. Visibility Training Module | *bit.ly/VisTrain*



3. NEXRAD Training Module | *bit.ly/NEXRADTrain*



Conditions Ahead

WTIC continues work on a wide range of projects. First is the FAA's "Shark Tank" project. The winner of the Shark Tank competition suggested using Automatic Dependent Surveillance-Broadcast (ADS-B) reports to get turbulence

information. This revolutionary idea was picked up by WTIC for research at the National Center for Atmospheric Research (NCAR) and is showing great promise in providing accurate turbulence observations. To find out more, read the "Shark Tank – FAA Style" sidebar.

WTIC also has two activities related to visibility determination. First, is the WeatherXplore app. It is an augmented reality training aid where you can use your phone or tablet to connect with links to aviation weather web content and training modules. It's available now as a prototype. Visit the Apple Store or Google Play to download it for free. The second visibility project is the triangulation method for estimating distances. It applies the slant-range technique of using reference points on the aircraft, and points on the ground, to judge distance. In lab tests, pilots learned this technique easily, and it resulted in statistically significant improvements over their current methods, which basically involves just guessing to estimate distances.

WTIC has completed the process to "null out" the latency in NEXRAD by using forecast information from models and it works. A demonstration plan has been created to see how well pilots understand the information and use it. The FAA's Civil Aerospace Medical Institute (CAMI) will run the demonstration in the next few months.

Intrigued? Stay tuned; we'll keep you posted on the large portfolio of WTIC projects to help you make good decisions about bad weather.

Jennifer Caron is *FAA Safety Briefing*'s copy editor and quality assurance lead. She is a certified technical writer-editor in aviation safety and flight standards.

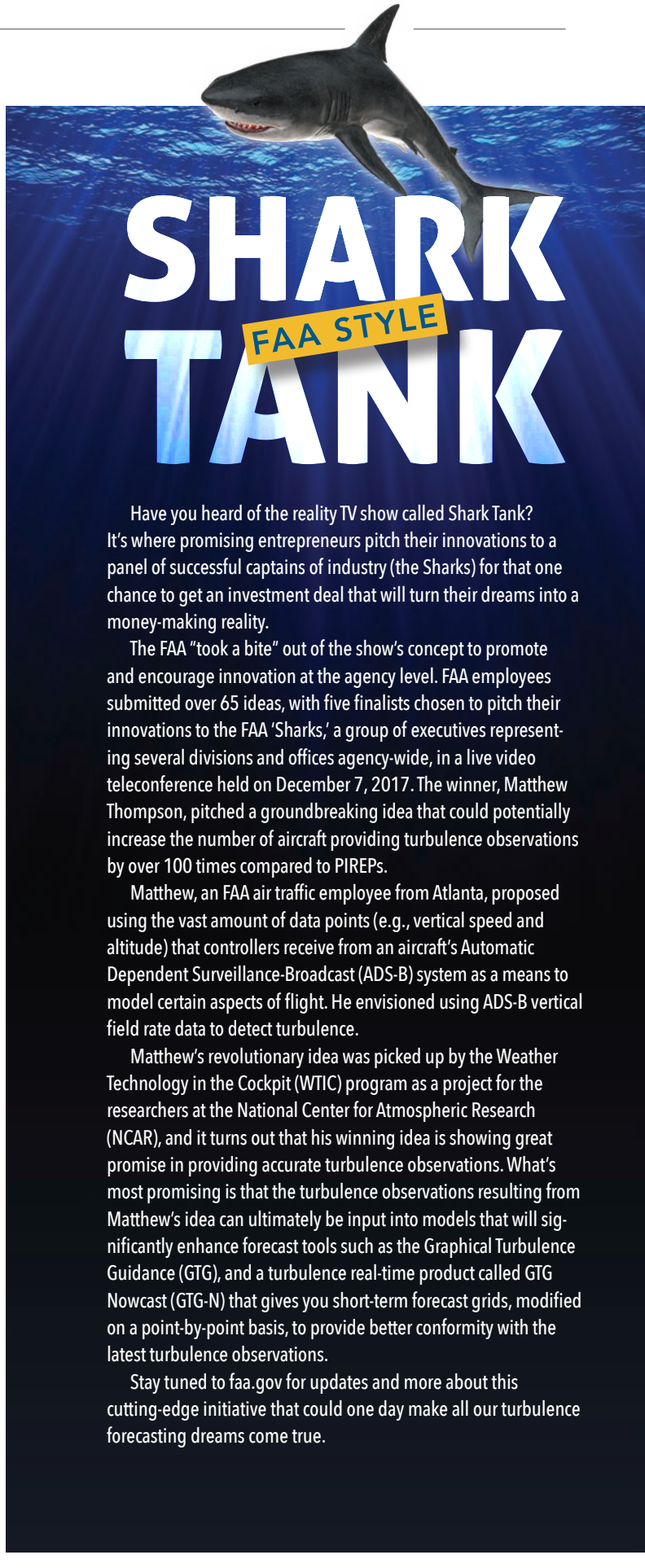
LEARN MORE

FAA's WTIC Program
bit.ly/FAAWTIC

National Weather Service, Pilot's Guide for Aviation Weather
bit.ly/NWSAvWx

Pilot's Handbook of Aeronautical Knowledge
bit.ly/PHAKCh13

NTSB Safety Study: Risk Factors Associated with Weather-Related GA Accidents
bit.ly/NTSBWxStudy



Have you heard of the reality TV show called Shark Tank? It's where promising entrepreneurs pitch their innovations to a panel of successful captains of industry (the Sharks) for that one chance to get an investment deal that will turn their dreams into a money-making reality.

The FAA "took a bite" out of the show's concept to promote and encourage innovation at the agency level. FAA employees submitted over 65 ideas, with five finalists chosen to pitch their innovations to the FAA 'Sharks,' a group of executives representing several divisions and offices agency-wide, in a live video teleconference held on December 7, 2017. The winner, Matthew Thompson, pitched a groundbreaking idea that could potentially increase the number of aircraft providing turbulence observations by over 100 times compared to PIREPs.

Matthew, an FAA air traffic employee from Atlanta, proposed using the vast amount of data points (e.g., vertical speed and altitude) that controllers receive from an aircraft's Automatic Dependent Surveillance-Broadcast (ADS-B) system as a means to model certain aspects of flight. He envisioned using ADS-B vertical field rate data to detect turbulence.

Matthew's revolutionary idea was picked up by the Weather Technology in the Cockpit (WTIC) program as a project for the researchers at the National Center for Atmospheric Research (NCAR), and it turns out that his winning idea is showing great promise in providing accurate turbulence observations. What's most promising is that the turbulence observations resulting from Matthew's idea can ultimately be input into models that will significantly enhance forecast tools such as the Graphical Turbulence Guidance (GTG), and a turbulence real-time product called GTG Nowcast (GTG-N) that gives you short-term forecast grids, modified on a point-by-point basis, to provide better conformity with the latest turbulence observations.

Stay tuned to faa.gov for updates and more about this cutting-edge initiative that could one day make all our turbulence forecasting dreams come true.

Your pathway to pilot proficiency ...

FAA Aviation Safety

Join the *WINGS* Program

What is *WINGS*?

The FAA *WINGS* program provides pilots with a plan to accomplish knowledge training and flight training on specific topics known to cause GA accidents.

To earn a phase of *WINGS*:

- Complete 3 approved knowledge courses/seminars
- Complete 3 approved flight activities with your CFI

As a *WINGS* pilot, you will:

- Be safer and feel more confident when you fly
- Get a *WINGS* completion certificate and lapel pin
- Get a chance to win a **sweepstakes cash prize**
- Satisfy the flight review requirement

Sign Up Today at *FAASafety.gov*

CROWDSOURCING WEATHER CONDITIONS

A New Take on PIREPs

If you shop online, you've probably scrolled through at least a few product reviews before clicking the buy link that delivers the purchase to your doorstep in a few days' time. During the last Christmas shopping season, crowdsourced customer reviews were more valuable to me than breathless product information drafted by advertising agencies. Wave-offs saved me money and frustration, and glowing reports guided my better selections. Because I benefit so much from fellow shoppers' experience, I reciprocate by contributing my own reviews.

You probably know where I'm going here. When browsing aviation weather sources to determine whether you can safely fly, official information in METARs, TAFs, AIRMETs, SIGMETs, and other products is important. You can also count on its integrity. Still, no matter how hard weather forecasters work to get it right, Mother Nature has a way of changing things up. Consequently, there is no substitute for also getting "real world" and near real time reports from those who have flown before you.

You can probably think of times you have benefited from the crowdsourced weather more commonly known as PIREPs (pilot weather reports). Icing can be notoriously difficult to forecast. Icing may be under-reported because few aircraft are equipped for flight into known icing (FIKI) conditions; therefore, there will be no or few PIREPs in those areas. If and when PIREPs do exist, they can help determine the accuracy of a forecast or, alternatively, if the path is clear.

Need to know when you'll be on top of an overcast layer? PIREPs are the best source. The list of useful items goes on: cloud bases, tops, and layers; flight visibility; precipitation; visibility restrictions (e.g., haze, smoke, and dust), actual winds and temperatures aloft; and hazardous conditions (e.g., thunderstorms, icing, turbulence, wind shear).

It's a Two-Way Street

In aviation, as in shopping, crowdsourcing only works when there is an actual crowd offering information. If you are a PIREP consumer, please be a PIREP provider as well.

The PIREP format is printed on many of the most popular kneeboards, so you don't need to memorize a thing. You might find it helpful to think in terms of *who*, *when*, *where*, and *what*. In any case, please write the following sentence on your kneeboard in large bold print: *INFORMATION IS MORE IMPORTANT THAN FORMAT OR PHRASEOLOGY!* Hazardous weather information is important, but so is data on favorable conditions, especially if you find them in the context of a gloomy forecast.

The traditional method for making a PIREP is to tell ATC or Flight Service that you have a pilot report and let them tell you when they are ready to copy your information. These days, though, you can also use tablet and smartphone friendly PIREP submission tools. Some have auto-populated values based on user preferences or GPS data. Another option is the FAA's electronic PIREP submission tool at the NWS Aviation Weather Center Digital Data Service (ADDS) website. Registered users (*see Learn More*) can electronically submit PIREPs for instant graphical display and nationwide distribution.

Caveat Emptor (Buyer — and Flyer — Beware!)

There is a dark side to online shopping reviews, so it pays to look for "verified purchase" indications. PIREPs are far less likely to be fabricated in the crowdsourced weather world, but you still need to read with a critical eye. Few pilots are professional meteorologists, so the ability to properly assess and relay weather conditions is likely to be inconsistent. A new or low-time pilot may have a tendency to overestimate, and what a B-787 pilot reports as "light chop" will be far more intense for a C-150 pilot.

To refine your own reporting skills, take a look at the Aeronautical Information Manual and FAA Advisory Circular 00-45H, *Aviation Weather Services*. Above all, just remember that those who use PIREPS — an eager audience that includes fellow pilots, ATC, Flight Service, and the National Weather Service — will appreciate anything you can offer, and the more the better.

LEARN MORE

"How to Be a Weather Wingman," March/April 2018 *FAA Safety Briefing*
https://adobe.ly/2FBn459

FAA Form 7110-2
bit.ly/USChartSup

ADDS Registration
www.aviationweather.gov/user/register

FAA InFO 14011: Electronic Submission of Pilot Weather Reports
go.usa.gov/xnVcW

For questions on PIREP procedures
9-AWA-ATO-SYSOPS-FS@faa.gov

MIND THE GAP

Understanding Latency Issues with In-Cockpit Weather Imagery

By Dr. Sabrina Woods

I was very fortunate to be stationed in England for several years while on active duty. Living abroad often brings about wonderful new experiences and at times, new challenges to overcome. I distinctly remember exploring the open-air markets as a treat; learning to drive on the opposite side of the road (and car) was a trial. Sunday roast and tea times were a delight, while 140-plus days a year of rain could be a mood dampener. London's West End was a must do, football (aka soccer) was king … and then there was the Tube.

The Tube, which is a 156-year-old, predominantly underground transit railway system connects all of London and several outlying cities. Due to changes in the shape and heights of the trains themselves, significant horizontal and vertical gaps now exist between the cars and some of the older legacy platforms when certain trains arrive for boarding. The technology got better, but it introduced new, unforeseeable hazards into the system that had to be accounted for. Instead of trying to find some one-size-fits-all device to fill the ever-changing gap distances, someone chose a "*Mind the Gap*!" announcement to advise passengers of the risk of getting hurt. It resonates with domestic and international passengers alike and no one ever forgets it. Indeed, the phrase has almost become synonymous with the London Underground, and with London herself.

The phrase also makes me think of a problem very near and dear to my heart: the continuing issue of GA accidents and incidents related to unintended flight into instrument meteorological conditions (IMC).

Shooting the Gap

A Piper *Cherokee Six* was on a cross-country flight when the pilot flew into an area of heavy rain showers. The IFR-qualified pilot informed an air traffic controller that he was in "bad" weather and was going to try to get through it. He never reported in again. The aircraft wreckage was found about 450 feet from a residential structure, minus the left wing, vertical stabilizer, rudder, and the right wingtip fuel tank. Those parts were located 200 feet from the main wreckage. The pilot and his family were fatally injured.

Photo courtesy of the NTSB.

A section of the left wing from a *Cherokee Six* that suffered an inflight breakup due to a weather encounter.

Post-accident examination of the left wing spar showed that the wing failed in positive overload. Conditions at the time of the accident indicated the potential for heavy rain showers, thunderstorms, winds in excess of 45 knots, clear air turbulence, and low-level wind shear. The pilot had a GPS unit with a current subscription for Next Generation Radar (NEXRAD) and likely used this information for flight planning and diversion purposes. The problem is that at the time of the accident, the depiction in the cockpit would most likely have displayed weather conditions that

existed a couple of minutes earlier. By the time the pilot arrived, the gap he was shooting for had firmly closed.

The owner's manual for the GPS unit in this accident stated that "NEXRAD data is not real-time" and in fact, NEXRAD data can be as much as *20 minutes older* than the age indicated on the cockpit display. This time difference can be significant, especially if a pilot is using it to navigate through inclement weather that can change quickly, significantly, and without notice.

Gap Analysis

The term "gap analysis" in research typically means comparing the actual performance of something to its potential or desired performance. But for me, "gap analysis" is the very real concern that pilots are unaware that the weather depicted on displays in GA cockpits might not reflect what is actually going on outside, and that pilots are navigating based on that displayed information unknowingly.

My counterparts in the FAA's Weather Technology in the Cockpit (WTIC) NextGen weather research program work hard to incorporate weather and human performance research into the standards and guidance documents that improve pilot decision making. One of the biggest issues they are tackling is keeping pilots informed about the inherent lag in weather dissemination and application depictions.

Information presented in the cockpit is delayed because the National Weather Service needs upwards of five to 15 minutes to create a mosaic of precipitation from NEXRAD radars and render the data as a graphic. It can take five *more* minutes for the graphic to reach the cockpit. A timestamp on the image may only refer to the most recent data contributing to the mosaic image and might not include the delay required to develop the graphic in the first place. If GA pilots are unaware of that key discrepancy, the consequences can be fatal. The display may result in a dangerously false sense of existing conditions, especially when the aircraft is already headed for inclement weather. Approaching pilots might think there is a gap they can scoot through, only to discover — too late — that the gap is long gone. The result can be inadvertent entry into IMC conditions.

Note: another risk in shooting a gap is that if you get "too close" to a storm, you can hit severe turbulence. FAA guidance recommends 20 miles as the minimum safe distance from a convective storm to avoid the risk of severe turbulence, which for GA can also be fatal.

See page 12-22 of the *Pilot's Handbook of Aeronautical Knowledge* (go.usa.gov/xd42t) for more details on thunderstorm hazards.

According to WTIC researchers, cockpit displays of data-linked weather are meant to be used for strategic planning, with the goal of helping pilots keep a respectful distance away from thunderstorms. It is also critical for pilots to assess these big-picture weather issues *before* takeoff. Regardless of how technologically advanced weather forecasting and depiction applications have become, they are still best used as a planning tool, and not as an in-the-soup fire-fighting tool. By then, the damage has been done and the odds of it ending well are not good.

Betting Your Life

So why do we keep going? Why do we end up in situations that, viewed from afar (and from the safety of the ground), we know we shouldn't? It's because we humans have an innate desire to continue pursuing an endeavor simply because we've already invested money, effort, or time in it. This is in spite of the fact that the pursuit might lead us into danger or worse. We do it because we have a very real, almost tangible understanding of what we have already invested, and we value it very strongly — definitely more than the unknown change in course!

In other words, if a pilot chooses to divert or abort a flight due to weather, he or she knows *for sure* that there will be wasted time, probably a significant loss of money, and possibly the disappointment of not reaching the intended destination. If, on the other hand, the pilot continues to fly, a successful outcome remains to be seen and is thus the "unknown" in this equation. In the end, the risk of diverting the aircraft feels higher than proceeding into that unknown. We go for the gamble.

This desire gets compounded if we have ever done this sort of thing before and gotten away with it. Each time we have a successful outcome, our risk-aversion needle slips a little further into the "eh, what could possibly go wrong?" category, despite the fact that the hazard does not change. I call this whole phenomenon the human factors version of *Betting on the Come*. We don't have what we need at the moment but we hope that when the time arrives, we will get what we want! It's a dangerous gamble, especially when weather is involved. Weather is the house and, just as in a casino, the house always wins.

Photo courtesy of Garmin.

Mind the Gap!

Here's what I want you to remember: The weather information you access and use as a pilot might not always be exactly as it seems. Just like the London Underground, the technology has gotten better. But in so doing, it has introduced new, unforeseeable hazards into the system that have to be accounted for. Over-relying on your gadgets and gizmos and failing to appreciate their limitations might get you caught up in a bad situation. So, avoiding the bad is a matter of actively working to reconcile what your app is telling you with other pieces of information inside and outside the cockpit. One great (and cheap) tool is the Pilot Weather Report (PIREP). Passing pertinent info back and forth among your fellow flyers about "how it *really* looks out there" is indispensable (and did I mention cheap?!).

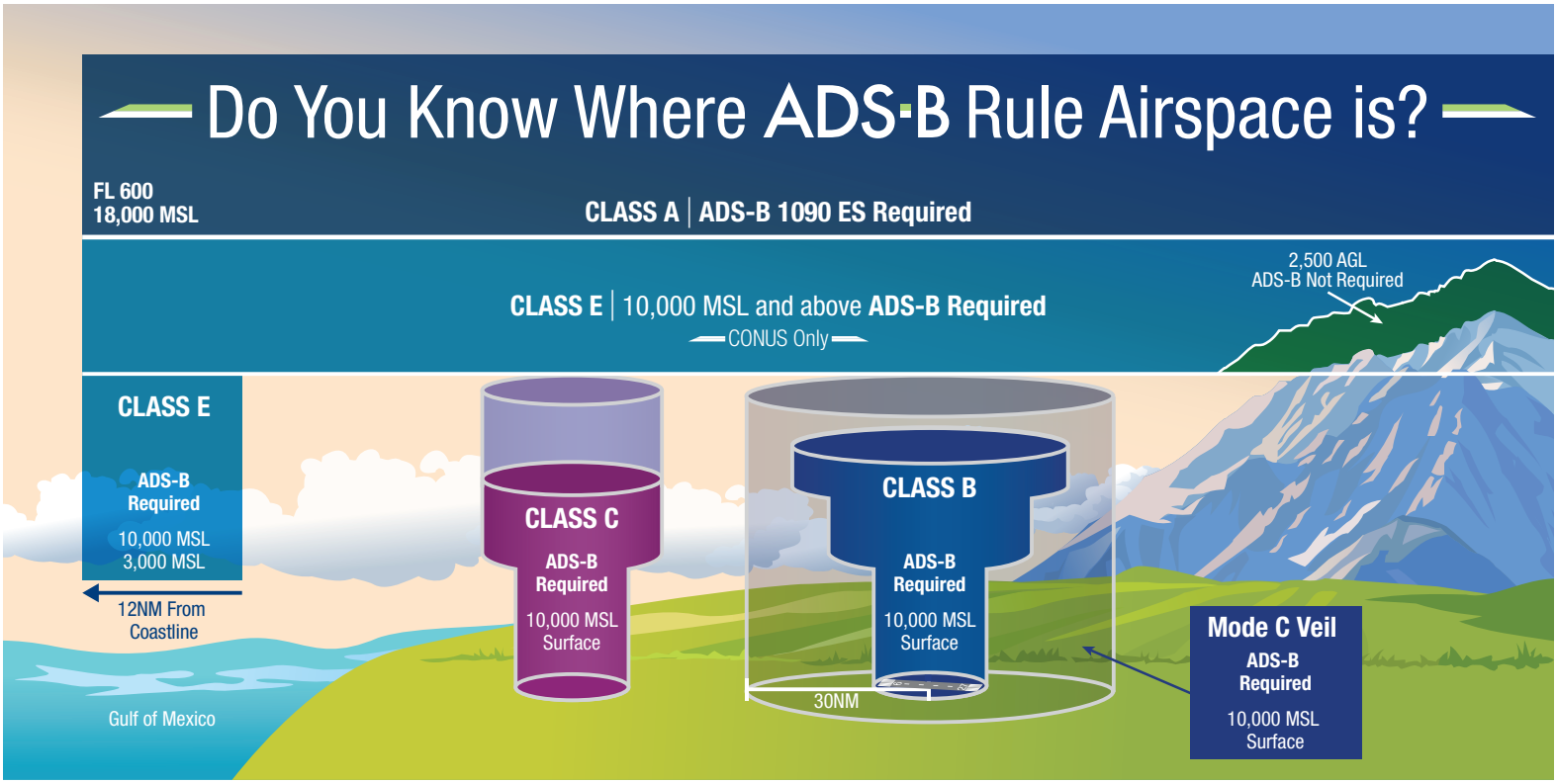
Recognize that if you are out flying, it probably means you have somewhere to go. It also means you are already biased to want to continue on your journey despite evidence indicating it might not be the best idea. This is the very definition of get-there-itis. To combat these natural tendencies, build a plan and stick to the plan. A good plan should have a Plan B (and possibly C) in it. Determine and adhere to your personal minimums. Respect the limitations of technology, *Mind the Gap!*, and navigate well away from weather.

LEARN MORE

Air Safety Institute Case Study "Time Lapse"
youtu.be/83uvKWJS2os

NTSB Safety Alert on In-Cockpit NEXRAD Mosaic Imagery
bit.ly/NexradMosaic

Into the WILD – Pilots get Weather Wakeup Call
faa.gov/nextgen/library/wild



Key	
AGL	Above Ground Level
FL	Flight Level
MSL	Mean Sea Level
NM	Nautical Miles

ADS-B Out Requirements

Federal Aviation Administration

Produced by FAA Communications • 2020-AJM-004

OPERATION ICICLE

NEW FAA PROGRAM TACKLES AIRCRAFT ICING

By Marilyn Pearson

Winter in the United States can produce some of the riskiest weather for aviation, including freezing rain, freezing drizzle, and sleet. But these dangerous weather conditions were ideal for the FAA's In-Cloud ICing and Large-drop Experiment (ICICLE) campaign. ICICLE seeks to collect in-flight data in some of the most challenging North American icing conditions.

ICICLE is part of the FAA's Aviation Weather Research Program, whose research aims to minimize the impact of weather on aircraft in the National Airspace System (NAS). Through ICICLE, the FAA will support development of both terminal and national-scale icing products. Data collected from ICICLE will help develop and validate weather tools to identify icing conditions a pilot might encounter, both in terminal area and en route environments. By improving weather tools and model forecasts, the FAA hopes to reduce aircraft icing-related accidents and fatalities.

Two FAA projects administered the ICICLE campaign: the Inflight Icing program (that supports research for the en route domain), and the Terminal Area Icing Weather Information for NextGen (TAIWIN) research project (that

Some members of the ICICLE team after a flight in mid-February 2019.

supports development and testing of new capabilities for the terminal area domain). Stephanie DiVito, FAA lead for both TAIWIN and ICICLE, notes that "Identifying these complex icing environments and forecasting them can be difficult. But for those who need to stay out of icing or certain types of icing, knowing where it does and does not exist is critical to safe operations."

> **By improving weather tools and model forecasts, the FAA hopes to reduce aircraft icing-related accidents and fatalities.**

Frosty Flying

From January through March 2019, the National Research Council of Canada (NRC), in collaboration with the FAA and Environment and Climate Change Canada (ECCC), flew a Convair-580 twin-engine research aircraft into forecasted icing conditions in and throughout Rockford, Illinois and neighboring states. Scientists and engineers from the ECCC, the NRC, the FAA, and the National Center for Atmospheric Research (NCAR), worked to collect extensive environmental measurements using multiple onboard instruments.

Forecasters monitored the weather throughout the program, both for short and long term planning. On a typical flight day, at about midnight before the flight, the on-duty forecaster began an in-depth analysis of current and forecasted weather for the day. Partnering universities nearby often released weather balloons to further analyze the cloud structure. Then in the early morning hours, scientists and Convair-580 crew members began work on the flight planning. The research team used the forecasts to plan the timeline, flight route, and altitudes needed for the flight crew to capture the in-cloud and surrounding ice-prone conditions. The airplane was equipped with special instruments to measure the range of particle sizes and concentration of both droplets and ice crystals throughout the takeoff, en route, and landing phases of the flights. Onboard cloud and precipitation radars allowed the scientists to characterize clouds above, below, and ahead of the aircraft. Because the size and concentration of liquid drops and particles influence the impact of icing on an aircraft, measuring these fields was key. The flight program targeted a broad spectrum of icing conditions.

Convair side-window icing indicative of supercooled large droplet SLD environment.

Convair in the snow.

Ben Bernstein, ICICLE science lead and primary operations director, helped identify and forecast icing conditions and guide the aircraft into and out of these conditions. "This flight program targeted a broad spectrum of icing conditions, including supercooled large drops, and focused on challenging transitions in icing that are critical to providing essential icing information to the flying public," Bernstein explained.

To enhance safety and allow for sampling at low altitudes, ICICLE teams operated over relatively flat terrain. The crew flew profiles that allowed capture of the entire vertical structure, from near the surface to above cloud top. Missed approaches captured sub-cloud and near surface conditions. Although air traffic volume limited access to favorable icing conditions in close proximity to cities like Chicago, light traffic in most areas of the domain enabled valuable 24-hour sampling.

It Takes a Team

NCAR was a critical partner in the research. During ICICLE, NCAR's expertise in terminal area and in-flight icing conditions supported daily forecasting of weather condi-

Runback icing on Convair wing during flight.

Convair windshield iced up in flight.

Ice accretion on Convair cockpit window.

tions, flight operations, and initial analyses of icing weather tools under evaluation. A team of forecasters monitored the weather outlook and provided guidance on the best areas to find icing conditions. NCAR staff also monitored real-time data from satellite, radar, and ground-based instrumentation to help direct the aircraft once it was in flight. Other scientists supporting the program came from organizations such as the National Oceanic and Atmospheric Administration Earth System Research Laboratory, NASA Langley Research Center, the Desert Research Institute, Meteo-France, the UK Met Office, Deutscher Wetterdienst (the German meteorological office), and universities including Valparaiso, Northern Illinois, Illinois-Urbana Champaign, and Iowa State.

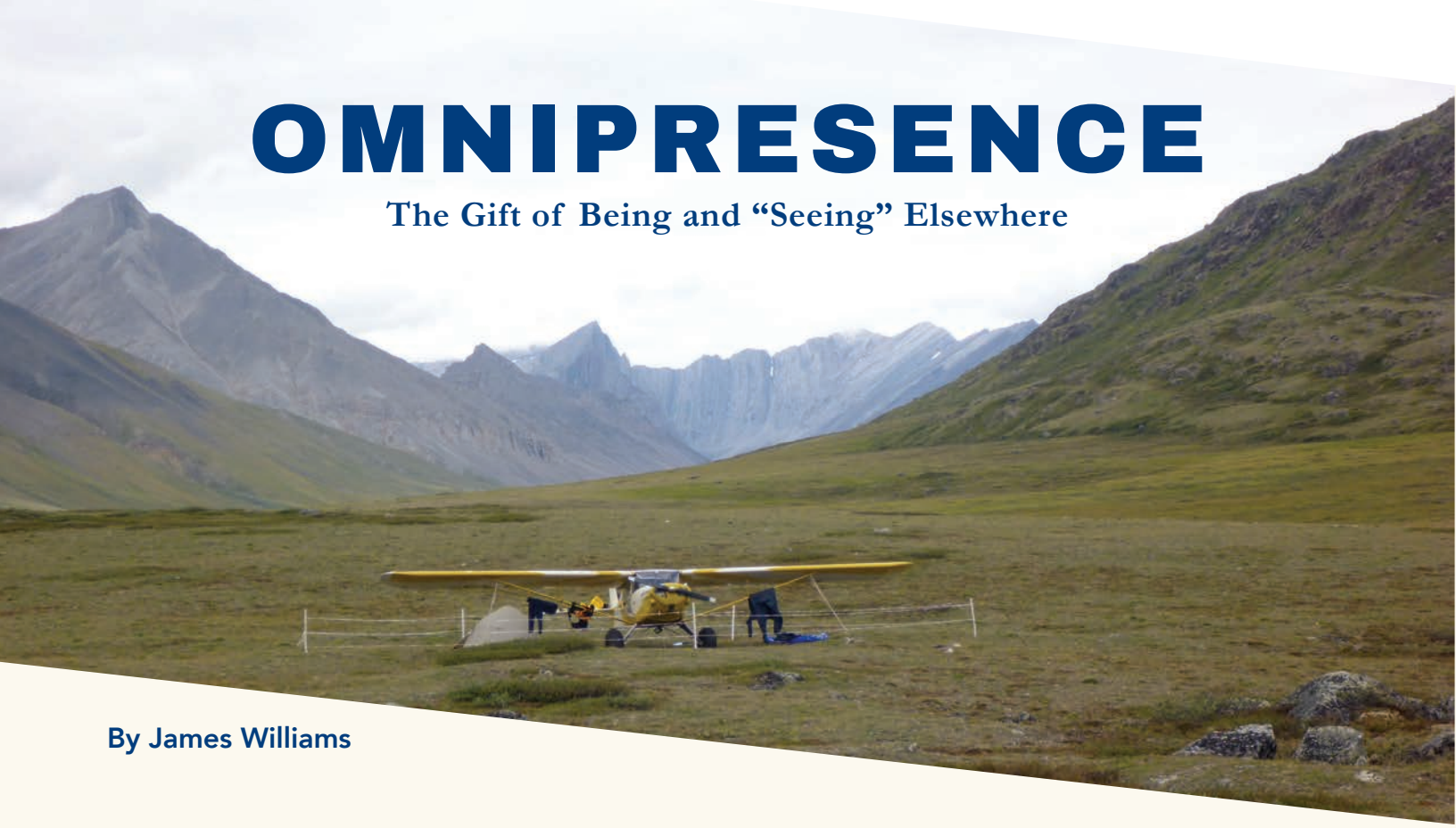
"There's been a lot of collaboration on this project, with everyone focused on our mission," says DiVito. "ICICLE was a major success, and we have collected a remarkable dataset that will help us continue to meet the FAA's mission of improving safety in the NAS."

So what are the next steps for ICICLE? Although the team is still processing and analyzing the vast amount of data that was collected, the FAA expects to publish an ICICLE science and operations plan, along with a detailed scientific article describing the program, deployment, and data collected, sometime later this year. Be on the lookout in a future issue for more on this important program.

Marilyn Pearson is an aviation safety inspector in the FAA's General Aviation and Commercial Division.

OMNIPRESENCE

The Gift of Being and "Seeing" Elsewhere



By James Williams

Omnipresence is a neat trick if you can pull it off. Officially defined as the state of being widespread or constantly encountered, it basically means being everywhere at the same time. Think how handy that would be to pilots! Sadly, such abilities have always been the province of more divine beings. This inherent limitation has led to a dangerous trend — the "let's just take a look" flight.

We've all done it. "It doesn't look that bad here, I'll just turn around if it gets worse." At best, this approach is expensive and time-consuming. At worst, it is dangerous and potentially deadly. We've all been burned by a bad forecast or a lack of real-time data, not just at the destination but at points along the way. The good news is that modern technology in the form of carefully-placed weather cameras brings the benefits of omnipresence to everyone.

What is a Weather Camera?

The FAA's weather camera program started about two decades ago in Alaska as a way to give pilots "eyes on" meteorological information in areas too remote for more traditional observation. The Alaska Weather Camera (WCAM) program goal was to stop the "go-out–and-take-a–look" flights by placing cameras in mountain passes, and remote or unattended airports, so pilots could "see" the weather conditions before takeoff.

Given the widespread availability of low-cost but high-quality cameras nowadays, this description skims over the very real challenges of making the program work as intended. The logistics of installing, powering, and maintaining these cameras, especially in an area as unforgiving as Alaska, are just the beginning. There is also the need to get images back to a central server in a timely manner and at a reasonable cost. Fortunately, some of these challenges diminished as technology improved and cameras became more resilient.

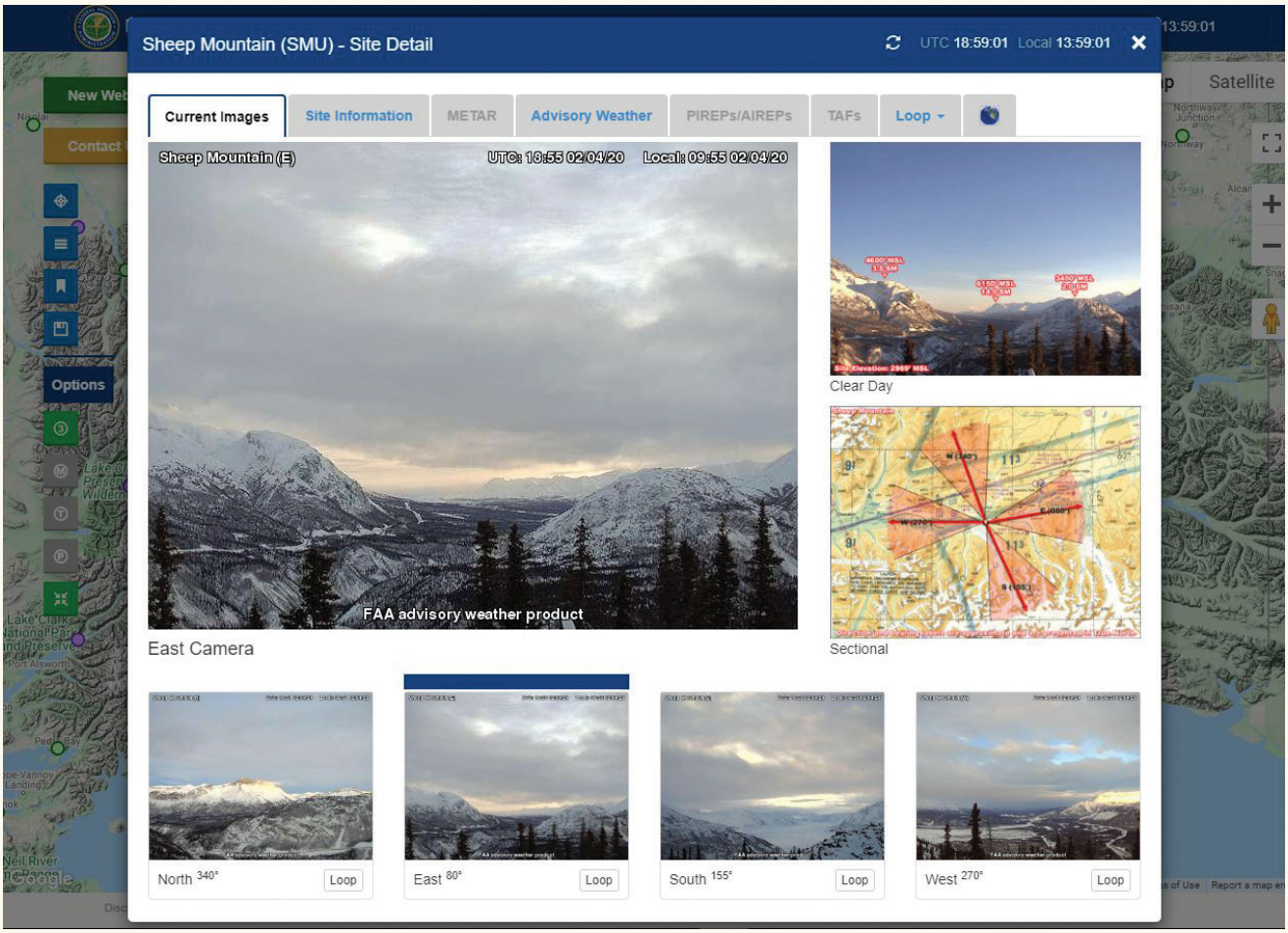
You are Here

The current WCAM program has 230 Alaska camera sites and 178 sites hosted by NAV Canada, Canada's civil air navigation services provider. Each site offers between two and four camera views that show current conditions, a comparative Clear-Day image, and a 6-hour loop of previous images to show trends. These cameras are consolidated and available to view at: *avcams.faa.gov*.

A 2012 FAA study concluded that the WCAM program had coincided with and contributed to a 53-percent decrease in the weather-related aviation accident rate in Alaska. No surprise there; omnipresence that allows pilots to "see" the actual weather and how it is trending at critical points on a flight path is powerful. Given this success, you may be wondering why these cameras aren't being used outside of Alaska. There's a plan for that.

Where to?

With encouragement from a 2013 National Transportation Safety Board (NTSB) recommendation, there are plans to expand the WCAM program beyond Alaska. First up: Hawaii. While the Hawaiian climate is very different from Alaska, the Aloha State experiences the same rapidly changing weather that makes weather cameras so useful. The FAA



An example of a weather camera site.

has identified 23 critical sites and has devised technical solutions for those installations. The agency has also gathered some of the necessary funding to begin the rollout of Hawaii weather cameras and expects to complete the process over the next two years.

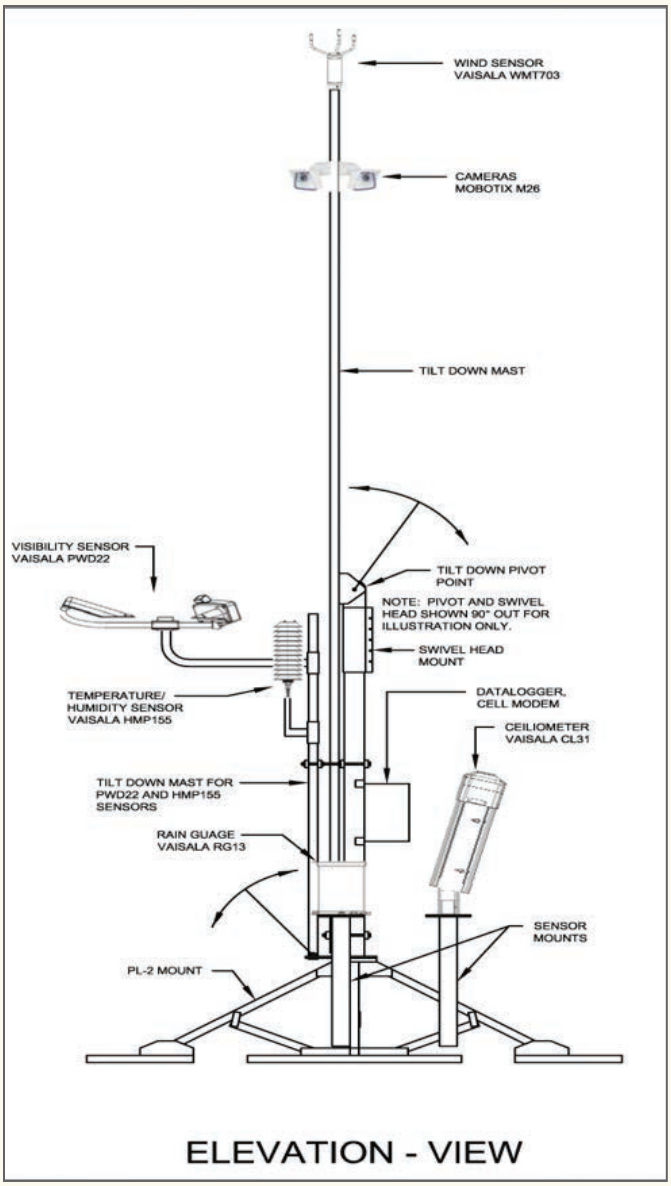
> **Modern technology in the form of carefully-placed weather cameras brings the benefits of omnipresence to everyone.**

Wondering about the lower 48 states? The FAA is working with organizations like state level departments of transportation and municipal governments to integrate the images from their existing camera systems. For example, the agency has recently signed a Cost Reimbursable Agreement with the Colorado state Division of Aeronautics to transfer its technical solutions, and to assist them with the installation of robust and capable camera facilities at 13 of their mountain-top Automated Weather Observing System (AWOS) facilities. Upon completion, the FAA wishes to integrate those images into its weather camera website for all aviators to use as a part of their flight and operational decision making. The FAA hopes this partnership will provide a template for other state Departments of Transportation (DOTs) and municipalities to follow in the future.

The FAA also hopes to establish more agency-owned systems. The agency has identified 170 possible weather camera sites in the continental United States, typically in mountain passes with known controlled flight into terrain (CFIT) hazards. However, the partnership avenue allows the WCAM program to grow faster than FAA resources alone would permit. The hope is that the minimal technical requirements for weather camera equipment will allow for a plethora of non-FAA cameras to be added to the system. If you know a location that might benefit from a weather camera, talk to your state DOT representatives to see if they might be interested in supporting and/or partnering with the FAA.

The Road Ahead

Going forward, several innovations hold promise for the WCAM program. First are a host of improvements to the WCAM website. You can already see some of these



A diagram of a modernized weather station that includes cameras.

improvements in the new site: *avcamsplus.faa.gov.* It adds mobile device support, more map layers, graphical icons for METARs/TAFs/PIREPs, airport information documents, and a search function. More functions are on the horizon. These include route-based data acquisition, more weather data sets, the ability to develop and save favorites and flight routes, and a graphical user interface (GUI) for dispatchers and flight followers.

There are also a number of hardware improvements. New camera technology allows for higher resolution images with 360 degree views, which allows for larger individual images and enables users to pan, tilt, and zoom within the image. The new camera systems under consideration will have higher resolutions and will possess night vision (starlight) capability.

In another potential advance, the FAA is working with the Massachusetts Institute of Technology on an algorithm to use edge detection to determine visibility from the camera images. The algorithm, Visibility Estimation through Image Analytics (VEIA), works by learning landmarks with known distances and comparing current images to ideal ones. In that way, it estimates visibility the same way humans do. Validating VEIA results against Automated Surface Observing Systems (ASOS) readings found VEIA to be more than 90-percent accurate in detecting low visibility.

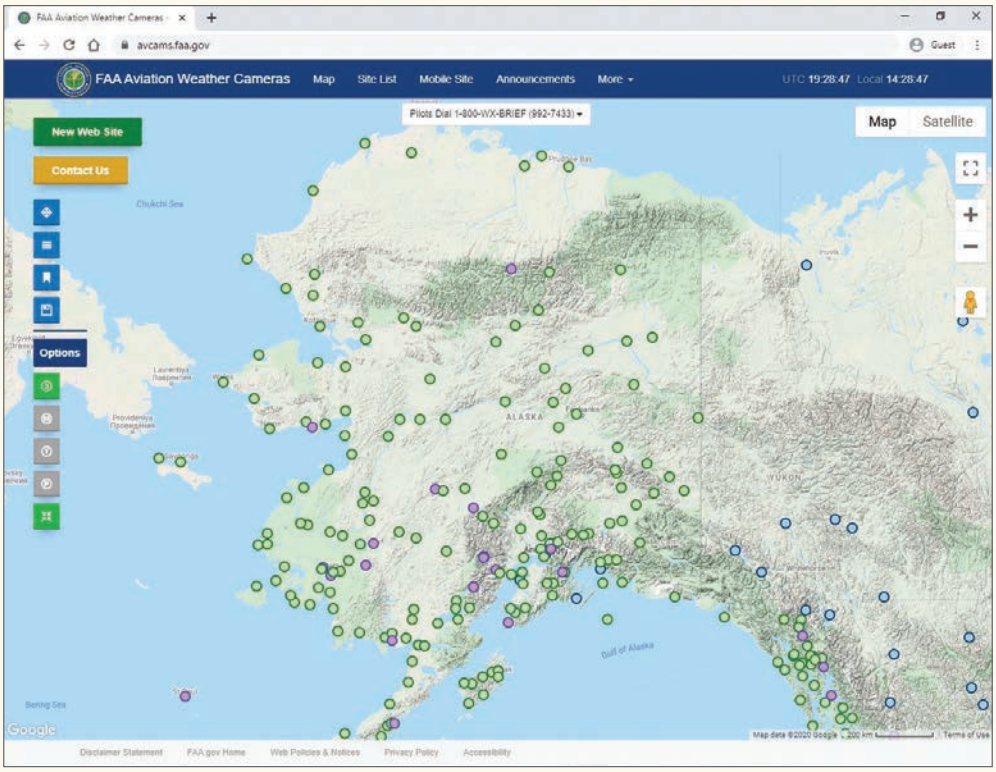
> **The FAA is working with state and municipal governments to host images and video feeds from their existing camera systems. Another idea is to expand by leveraging existing traffic cameras.**

Finally, the FAA is considering new weather observing systems to fill gaps in current airport METAR coverage. New systems would have lower installation and operation costs while adding weather cameras. Combining low cost weather observation with cameras not only helps the WCAM program, but also supports the National Weather Service with general forecasts.

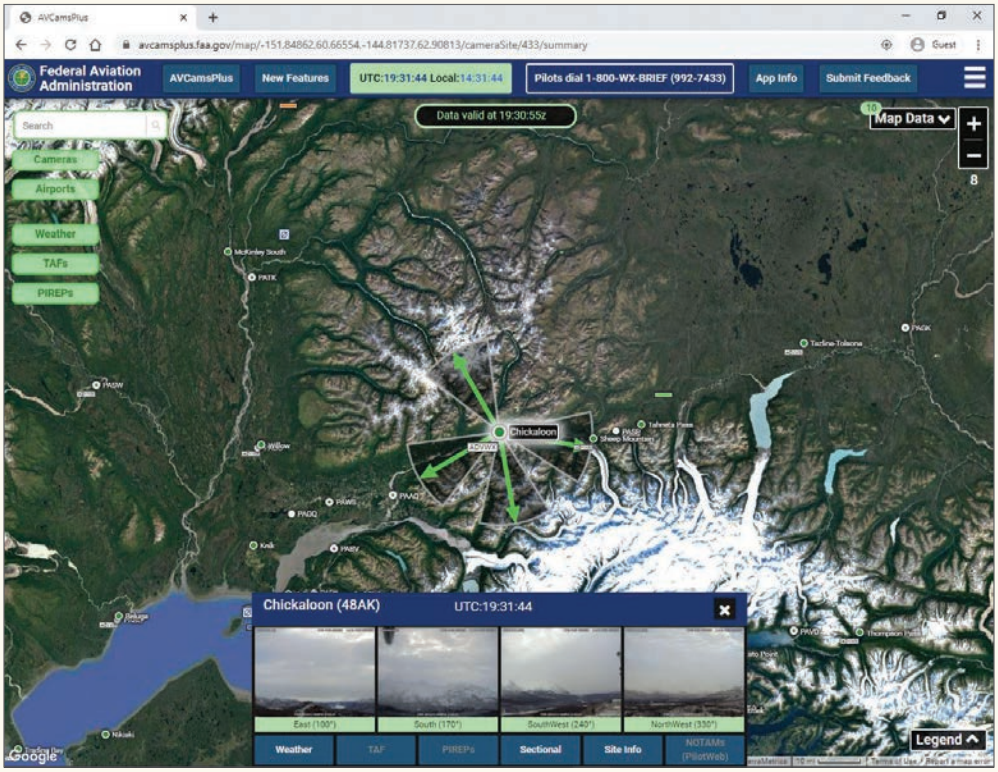
New camera technology would also be a valuable weather tool for unmanned aircraft system (UAS) operations in the National Airspace System. UAS seldom operate from airports, often in remote areas without traditional weather reporting systems. Additionally, boundary layer forecasts are not provided by the National Weather Service, further supporting the benefits of weather cameras.

Thanks to the weather camera program, omnipresence is within reach.

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



An image of the weather cameras available in Alaska in early 2020.



A screenshot of the new AV CAMS Plus website showing the enhanced layout of the camera site integrated into the map which allows faster movement between camera sites.

STRAIGHT FROM STEVE

FAA Administrator Steve Dickson chats with William and Mikayla Moore, two Aviation Career Education (ACE) Academy participants, during a recent "Straight From Steve" video segment.

Meet FAA Administrator Steve Dickson | ***By SusanK. Parson***

"It's all about the people" is the way Steve Dickson summarizes his approach to his challenging new job as FAA Administrator.

FAA employees have quickly learned that he practices what he preaches. Shortly after he took office, Steve — as he is universally known in the agency — instituted a weekly "Straight from Steve" video message to let FAA employees know first-hand what he's seeing, hearing, thinking, and doing as he does the job. He warmly engages FAA employees that he spots on his metrorail commute to work, regularly grabs a cup of coffee in the employee cafeteria, and is happy to chat with colleagues in the corridors. When the *FAA Safety Briefing* team interviewed him recently, Steve shared a story about talking airplanes with an employee who mentioned having a collection of airplane models. They stopped by for a look and, Steve offered to take a selfie so the employee could "prove" that the FAA Administrator had personally paid a visit.

Professional Flight Path

During a recent General Aviation Roundtable event, leaders of the major GA organizations got their own opportunity to hear straight from Steve about his approach to this important sector of the aviation community. He acknowledged to this audience that his aviation background in the U.S. Air Force and in the air carrier environment didn't include a lot of GA. But as he stressed both then and again to the *FAA Safety Briefing* team, he recognized the wide-ranging importance of this vital sector and he is eager to learn.

In that connection, Steve fondly remembers his first powered GA flight experience. "I was at the U.S. Air Force Academy," he recalls, "and I had done soaring during my first year. Over the summer, though, a neighbor who was a retired Pan Am captain took me from Orlando to Cedar Key in his Mooney. I was really impressed by what we could do

in a small plane." Steve also remembers enjoying the sports-car-like style and performance of the Mooney.

He loved the experience but, as anyone who went to a service academy will understand, Uncle Sam's demands on his time didn't allow him to pursue GA flying. Instead, Steve went on to solo in the T-37 before moving to military aircraft including the T-41, the T-38 jet trainer, and the F-15.

> **Steve is excited to bring his broad aviation experience in line operations and management to the FAA's front office.**

After leaving the Air Force, Steve found a professional aviation home at Delta Airlines, first as a flight engineer on the venerable B-727. His distinguished air carrier career eventually took him into the "front office" of practically every aircraft type in the fleet: B-757/B-767, B-737, and the A-320. Steve also spent time in Delta's executive front office, serving as senior vice president of Flight Operations. In that role, he was responsible for the carrier's global safety and operational performance, as well as pilot training, crew scheduling, and regulatory compliance.

People Are Our Strength

Steve is excited to bring his broad aviation experience in line operations and management to the FAA's front office. As a people person, he advocates greater interdependence as a key to greater safety. "We need to have our people working across all lines of business, looking for opportunities to improve, and best practices that we can apply in new ways." He is also interested in finding new ways to recruit, train, and mentor the workforce of the future. Steve summarizes his role as providing overall vision, reprioritizing as needed, and helping the team stay focused on execution of the FAA's core mission — safety.

"Safety is obviously our top priority," he stresses, "and I also think we can make better use of data and processes to raise the bar." Steve is especially interested in seeing the transition of raw data to information that can be used to enhance safety, and in finding strategic opportunities to apply some of the best practices in the air carrier world to GA. He is quick to recognize that the diversity in GA requires adapting and scaling such approaches. "I've spent time in Europe, and while they have lots of glider clubs, they don't have the kind of GA activity that we do. We have to find ways to increase safety without limiting freedom or discouraging innovation."

Though Steve doesn't have a lot of spare time in his new role, we did ask what he likes to do in his off-duty hours. "I love spending time with family, including my two grandchildren — all still in Atlanta." As an avid reader of history, he is also enjoying the history-rich museums and monuments in the Washington metropolitan area. "There is just so much to see and do here," he notes, "and I'm glad to have the opportunity to work at the FAA and to live in this area."

So there you have it — straight from Steve!

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

ADAPTing to ADS-B

How Non-Equipped Operators Can Request Access to ADS-B Rule Airspace

By Tom Hoffmann

Got ADS-B? If you're based in, or frequently transit airspace that requires a transponder, there's a good chance you had your aircraft outfitted with Automatic Dependent Surveillance–Broadcast Out technology to comply with the January 1, 2020 mandate. However, for some aircraft owners on the outer fringe of ADS-B Out rule airspace, or in more remote areas with predominantly Class G airspace, the decision to equip was not quite as clear-cut. The question that comes up now for those who did not equip with ADS-B Out is — can I still access "rule" airspace as defined in 14 CFR 91.225? The answer is ... it depends.

The FAA anticipated the need to allow some operators not equipped with ADS-B Out, or those with systems that don't meet the performance requirements, to access rule airspace on a case-by-case basis. The agency outlined the parameters for this deviation capability in April 2019 with a *Federal Register* policy statement (*go.usa.gov/xpdEG*). According to the policy statement, ATC will continue to provide air traffic services to aircraft operating within its airspace, including those aircraft not equipped with ADS-B Out. However, a non-equipped operator will be responsible for ensuring compliance with the regulations and for obtaining authorization before flying.

To request a preflight authorization for aircraft that do not meet the performance or equipage requirements for ADS-B Out, pilots can access the new ADS-B Deviation Authorization Preflight Tool (ADAPT) online at faa.gov/go/adapt.

Before you use the ADAPT tool, though, here are a few important factors to consider:

- Aircraft must be equipped with an operational transponder and operational altitude encoder (e.g., Mode C).
- Requests must be submitted no earlier than 24 hours before your intended departure time.
- Requests must be submitted no later than one hour before your intended departure time.

You must use the online ADAPT tool to request an authorization. Requests made via telephone or while inflight will not be considered.

Figure 1 outlines the steps needed to submit preflight authorization into rule airspace using ADAPT.

Keep in mind that several factors determine whether a request will be accommodated. These include Air Traffic Control (ATC) workload, runway configurations, weather, and operations into capacity-constrained airports (i.e., airports operating at (85-percent capacity or greater). You

Step 1 **Access the ADAPT Website**

Submit your authorization request no earlier than 24 hours before, and no later than one hour before, your intended departure time.

Step 2 **Enter Flight Details using the Flight Information Entry Form**

This step checks for alternate surveillance availability based upon your proposed route of flight and aircraft avionics equipment configuration. Please note this step does not constitute filing a flight plan.

Step 3 **Enter the Deviation Request and Additional Flight Details**

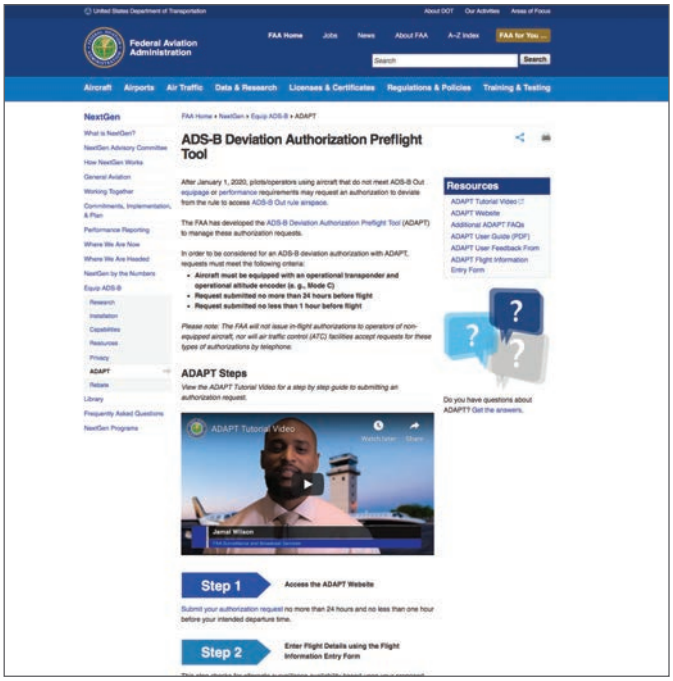
Provide additional details describing the nature of your deviation request. You must verify your information is correct and accurate by selecting the verification check-box or the request cannot be submitted.

Step 4 **Receive Request Status**

After submitting a request, you will receive an immediate automated response via the ADAPT website indicating the status of the request (Approved, Denied, Pending) followed by an official FAA email response. When you receive an official email approval, you are authorized to conduct your flight.

Note: Pending requests are sent to an FAA-designated Air Traffic Control (ATC) representative who will review the request. These personnel are available between 6:00 am and 10:00 pm Eastern Time. All pending requests will be automatically denied 30 minutes before the proposed flight if not reviewed by the ATC representative.

Figure 1



The FAA's ADAPT Tool web page.

should never assume that the agency can, or will, grant authorization to operate, even for operations outside a capacity-constrained area. The only way to ensure seamless access to ADS-B rule airspace is to equip with the appropriate ADS-B Out equipment.

For more information on ADAPT, including an ADAPT tutorial video and frequently asked questions, please go to *faa.gov/go/adapt*. You can also send questions to *adapthelp@faa.gov*.

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

LEARN MORE

FAA's ADAPT Tool web page
faa.gov/go/adapt

ADAPT Flight Info Entry Form
sapt.faa.gov/form.php

ROLL of HONOR

Wright Brothers *Master Pilot Award*

The FAA's most prestigious award for pilots is the Wright Brothers Master Pilot Award. It is named in honor of the first U.S. pilots, the Wright brothers, to recognize 50 years of exemplary aviation flight experience, distinguished professionalism, and steadfast commitment to aviation safety. In 2019, we recognized the following Master Pilots. For more about the award, go to FAASafety.gov/Content/MasterPilot.

Robert Edison	AK
Dwayne King	AK
William Bohman	AK
Ray Atkins	AK
George Frushour, Jr.	AK
Harry Kieling	AK
Edward Berisford	AL
Tommy Dobson	AL
James Gray, II	AL
Richard Heckman	AL
Gregory Koontz	AL
Fred Masterson, Jr.	AL
Carrol Smith	AL
John Hicks, Jr.	AL
Ricky Phillips	AL
Ronald Maines	AR
Dennis Thomas	AR
Maurice Way	AR
Frank Osborne	AR
Gerald Loyd	AR
Randal Warren	AR
Harrell Clendenin	AR
Donis Hamilton	AR
Howard Ginn	AZ
James Price	AZ
William Frame	AZ
Francis Keen	AZ
Thomas Rachford	AZ
Mark Rubin	AZ
John Schmidt	AZ
Jack Winover	AZ
William Bohannan, Jr.	AZ
Barbara Harper	AZ
Robert Wick	AZ
Robert Hayes	AZ
James Sorter	AZ
Derwin Grimm, Jr.	AZ
Paul Swenson	AZ
Jeffrey Kokes	AZ
Joseph Sottile, Jr.	AZ
Thomas Warner	AZ
Franklyn Campbell	CA
Kenneth Ciszek	CA
Wade Holbrook	CA
Marc Wolf	CA
Daniel Affourtit, Jr.	CA
Patrick Belanger	CA
Terry Blumenthal	CA
H Craig	CA
Ralph Eschenbach	CA
Richard Humble	CA
Karen Kahn	CA
Charles Piper	CA
Michael Thornton	CA
Dean Winslow	CA
Ross Aimer	CA
William Brooks	CA
Kenneth Lorell	CA
Robert Wilmeth	CA
Larry Betts	CA
Dale Black	CA
Victor Copeland	CA
Timothy Donahue	CA
Edward Kovac	CA
Charles McLaughlin	CA
Ralph Meyer	CA
Richard Throckmorton	CA
James Doolittle, III	CA
Harry Kernahan	CA
Timothy Kramer	CA
Carl Mauck	CA
Stephen Sullivan	CA
Warren Williams	CA
Daniel Chapman	CA
Douglas Keep	CA
Stanley Dollinski	CA
Michael Marquard	CA
Philip Schultz	CA
Gene Carswell	CA
John Lichty	CA
Orland Pritchard	CA
Stanley Rosenthal	CA
Julie Clark	CA
Ernest Hunt	CA
John Litton	CA
Ronald Murphy	CA
Vince Nastro	CA
Jerald Bernacchi	CA
David Corsiglia	CA
Daniel Hoppy	CA
Wayne Moon	CA
Eddie Phipps	CA
Daniel Seidel	CA
David Weir	CA
Roger Hoh	CA
Peter Murray	CA
Lloyd Rasner	CA
Robert Barry	CA
William Boggess	CA
John Peters	CA
Landall Ropke	CA
Frederick Schieich	CA
Robert Simon	CA
Rickey Utermoehlen	CA
James Baron	CO
Neal Smith	CO
General Robin Olds	CO
Charles Todd	CO
Donald Sommer	CO
Thomas Broadbent	CO
Richard Barclay	CO
Robert Caldwell	CO
Michael Gaston	CO
Robert Sneed	CO
Richard Socash	CO
Paul Taylor	CO
Alex Watson	CO
Barry Wyttenbach	CO
Thomas Ryan	CO
Michael Donnelly	CO
Robert Brand	CO
Stephen Dailey	CO
Robert Heckendorf	CO
Keith Serkes	CO
Volker Bahnermann	CT
John Laroche	CT
Christian McIntyre	CT
William Foley	CT
Richard Neil	DE
John Chirtea	DE
Lauren Wallace	DE
Charles Nute	FL
Norman St. Peter	FL
Charles Bukoski	FL
Dennis DiDonna	FL
Peter Pierpont	FL
Phillip Vernon	FL
Stanley Baumwald	FL
John Bone	FL
MIchael Ebaugh	FL
Paul Freeman	FL
John Grones	FL
Herbert Imhoff, Jr.	FL
Joseph Laliberte	FL
Lawrence Lasater	FL
John Mazur	FL
Harry Palmer	FL
Brian Becker	FL
Ronnie Creel	FL
Willam Davidson	FL
Robert Dowell	FL
Jeffrey Edwards	FL
William Farnham	FL
Richard Gazda	FL
Mary Jane Law	FL
Arthur Patstone	FL
Kenneth Rivard, Jr.	FL
John Thomas, Jr.	FL
Bruce Armstrong	FL
Henry DeGraaff	FL
Albert Frank	FL
Robert Frister	FL
Wilson Grier	FL
Donald Heuchan	FL
Raul Mendez	FL
John Nagy, Jr.	FL
Terry Ogle	FL
Ralph Saunders, Jr.	FL
Ivan Young	FL
Jerold Bogartz	FL
Thomas Cooper	FL
Daniel McCue	FL
Charles Glass	FL
Shawn Knickerbocker	FL
Robert Lindsay	FL
Richard Pollak	FL
John Schedel	FL
Ronald Tanner	FL
Gary Winter	FL
Bruce Hill	FL
Clifford Hoffman	FL
James Jansa	FL
Robert Jones	FL
Armando Lopez	FL
David Maib	FL
Ellinor McElroy	FL
Daniel McElroy	FL
Walter Miller, Jr.	FL
Harley Pickett, III	FL
Harry Shannon	FL
Franz Zimmer	FL
Luca Bencini-Tibo	FL
Ron Burkdoll	Fl
Jerry Chabrian	FL
Joseph Hunt	Fl
Richard Karl	FL
Jose Pumares	FL
James Kimball	FL
John Heemsath	FL
Otis Johnson, Jr.	FL
Jane Kimball	FL
Daniel Kurt	FL
Melvin Woods	FL
Obie Young	FL
Craig Fordem	FL
Scott Charlton	FL
Stephen Davidson	FL
Benjamin Musialek	FL
Herbert Schall	FL
David Desimone	GA
Duane Huff	GA
Edmund Laird, Jr.	GA
Charles Maire, Jr.	GA
Thomas Shefchunas	GA
Jack Smithers	GA
Charles Green	GA
Tim Schnabel	GA
Ronald Anderson	GA
James Buckley	GA
Clark Schadle	GA
Anthony Stein	GA
William Barron, Jr.	GA

Conrad Mora	GA
John Enticknap	GA
Hubert Holloway, Jr.	GA
Thomas Young	GA
Keith Edgecomb	GA
James Sanford	GA
Michael Butts	HI
David Lusk	HI
Robert Blair	HI
David Wilson	HI
Scott Allen, Jr.	HI
John Fisher	HI
Robert Moore	HI
Mahlon Hamilton	HI
Mehran Riggi	HI
Thomas Burns	IA
Roger Clark	IA
Duane Smith	ID
Larry French	ID
Daniel Hutchison	ID
Allen Rice	ID
Earl Smith, III	ID
Don Pischner	ID
Mark Bauer	IL
Larry Flesner	IL
Larry Fiesner	IL
James Gould	IL
Thomas Kersten	IL
Michael Carlson	IL
Mark Clark	IL
Gregory Frister	IL
Milton Gray	IL
James Rezich	IL
William Smith	IL
Robin Blakkolb	IL
Charles Downey	IL
Leslie Kimmel	IL
Clyde Zellers	IL
Edward Shafer	IL
James Miller	IL
Richard Sommer	IL
Raymond Hillson	IL
Craig Brown	IN
Richard Rowe, Jr.	IN
Edward Daugherty	IN
Ladean Dick	IN
Dorel Graves, Jr.	IN
Dennis Phillips	IN
Douglas Eckart	IN
William Gottschalk	IN
Timothy Kaufman	IN
Dale Long	IN
Mike Nichols	IN
Frank Bailey	IN
Lee Malambri	IN
A. Schene	IN
James Wright	IN
James Clark	KS
Henry Gresham, Jr.	KS
Richard Novak	KS
Stephen Piepenbrink	KS
James Pitts	KS
Gary Steele	KS
Richard Neuer	KS
Kenneth Brock	KS
William Casey	KS
Orval Dale	KS
John Kliewer	KS
Darwin Steinle	KS
Jeffrey Terrell	KS
Nicholas Thielen	KS
David Cochran	KS
David Hayden	KS
Clark Stewart	KS
Carl Price	KS
Jeffrey Peterson	KS
Ted Ogle	KY
James Drymon	KY
Robert Johnson	LA
John Randall	LA
Larry Baker	LA
Ronald Jenkins	LA
William Underhill	LA
Jack Lenox, III	LA
Michael Lewis	LA
Stephen Knapper	LA
Martha Dunbar	MA
Peter Gerstberger	MA
Charles Case	MA
William Guenon, Jr.	MA
David Margolis	MA
Jeanne Ohnemus	MA
James Ellis	MA
Carl England, Jr.	MA
Volney Vashaw	MD
Robert Biel	MD
James Lang, Jr.	MD
Edward Tabler	MD
Richard Funkhouser	MD
Joseph Gauvreau	MD
Lindon Christie, Jr.	ME
Mario Pecchia	MI
Roger Salo	MI
David Schilstra	MI
Walter Trancygier	MI
Phillip Wade	MI
John Feldvary	MI
Gareld Underwood	MI
Judson Cooper	MI
Manfred Franke	MI
David Mccredie	MI
Albert Schiffer	MI
Mark Grant	MI
Robert Jordan	MI
Dennis Pedersen	MI
Brian Van Wagnen	MI
Kenneth Dannenberg	MI
Richard Penman	MI
Henry Smith	MI
Douglas Conciatu	MI
William Downing	MI
David Hull	MI
Jeffrey Kyff	MI
Donald Nolte	MI
Carl Shemwell	MI
Frank Woodhams	MI
Michael Gardonio	MN
Herman Knoop	MN
Karl Vollmers	MN
Richard Wasbbotten	MN
Joesph Westermeyer	MN
Paul Krueger	MN
Michael Mattson	MN
Burt Ackerman	MN
Verlus Burkhart	MN
Christophe Cooper	MN
Jeffrey Dinsmore	MN
Ronald Houle	MN
Gaylen Lerohl	MN
James Luger	MN
William Mavencamp, Jr.	MN
Daniel Whipple	MN
Stephen Johnson	MN
Steven Schell	MN
Sheldon Hendricks	MO
Gary Davis	MO
Glenn Frister	MO
Patrick Kesler	MO
Patrick Kessler	MO
Kenneth Sandy, Jr.	MO
Ronald Anderson	MO
Stephen Brown	MO
Roger Coats	MO
Christopher Hope	MO
Lloyd Bingham	MO
Chester Hartley, Jr.	MO
Larry Marshall	MO
Stanley Mehrhoff	MO
Larry Stobel	MO
Charles Cook	MO
Marvin McCanles	MO
Frederick Wile	MS
Michael Meek	MS
John Green, Sr.	MS
William Ross	MS
Bruce Bullion, III	MS
Brian Dunlop	MT
Billy Stebbins	MT
Russell Beree	MT
Dallas O'Connor	MT
Gary Martin	MT
Ted Schye	MT
Richard Fox, Jr.	MT
Charles Causey	NC
Benson Causey, Jr.	NC
Kenneth Cox	NC
David Culp	NC
Clarence McLean	NC
Charlie Morris, Jr.	NC
Thomas Primm	NC
Milton Ward	NC
Frederick Watkins	NC
Maurice Deming	NC
Rene Lopez	NC
Theron Wright	NC
Robert Belville	NC
John Dennis	NC
Gary Beck	NC
Jerry Gunter	NC
Roger Montambo	NC
Larry Jenkins	NC
Michael Creider	NC
Kenneth Duncan	NC
Zelotes Knotts, III	NC
Ronald Schreck	NC
James Yankaskas	NC
Mark Cigal	NC
Jan Randle	NC
Kenneth McAlear	NC
Carl Larson	ND
Harold McConnell	ND
Gary Spivey	NE
Kent Schroeder	NE
Thomas Skinner, Jr.	NE
David Moll	NE
David Patton	NE
Michael Sides	NE
Marc Myette	NH
Robert Pustell	NH
Peter Eiche	NH
Kenneth McLaughlin	NH
William McCollum	NJ
Dwight Staehler	NJ
Robert Argila	NJ
Walter Ellis, Jr.	NJ
Philip Biazzo, Jr.	NJ
Gerald Innella	NJ
Michael Meenan	NJ
Thomas Ritz	NJ
Kenneth Dominy	NM
William Wright, Jr.	NM
Lee Otto	NM
Mark Sturm	NM
Don Ice	NM
Raymond Jenkins	NM
Ralph Navar	NM
Albert Lowenstein	NM
Richard Moynihan	NV
William Glasser	NV
Russell Smith	NV
James Manley	NV
Guy Willis	NV
James McNeill	NV
Robert Malara	NY
Donald King	NY
Michael Friel	NY
Ronald Ward	NY
Margaret Naumann	NY
Richard Wyeroski	NY
Charles Burtch	NY
Norman Freed	NY
James Coward	NY
Mario Barra	NY
Jerry Donselman	OH
Ralph Leadbetter	OH
James May	OH

ROLL of HONOR

Donald Miller	OH
James Hupman	OH
Donald Diemer	OH
Wayne Williams	OH
Alan Kettunen	OH
Larry Zetterlind	OH
Philip Yoder	OH
John Darst	OH
Roger Saddler	OH
Clifford Fauber	OH
Herbert Haar	OH

John Boggs	OK
Clinton Plant	OK
Paul Shireman	OK
Gary Coulter	OK
Stanley Young	OK

Ian McDonough	OR
Harlo Provernmire	OR
Raymond Beverly	OR
Walter Krupnak	OR
Barbara VanArsdale	OR
Barbara Campbell	OR
Lyndon Wilson	OR
Raymond Johnson	OR
Charles Hess	OR
Daniel McMahon	OR
Stephen Stowe	OR
Robin Brooks	OR

Dale Clemens, Jr.	PA
John Gage	PA
John Williams, III	PA
Charles Martin	PA
Bruce Witkop	PA
Carl Kelley	PA
Alan Olson	Pa
Arthur Rosenberg	PA
Bruce Brown	PA
Karl Striedieck	PA
Charles Adams	PA

Jorge Echegoyen	PR
Alberto Quadreny	PR

Lowell Powers, Jr.	RI
Kenneth Johnson	RI
Frank Sherman	RI

Robert Carson	SC
Cletus Funderbunk	SC
Daniel McNeil	SC
Philip Picard	SC
James Sheron	SC
John Schmidt	SC
John Reuther	SC
Edward Simpskins	SC
Robert Beitel	SC
Raymond Petty, Sr.	SC
Eddie Booth	SC
Charles Martin	SC
Robert Dickson	SC
Les Kanna	SC

James Cox	SD
Robert McLaughlin	SD
Vernon VanDerhule	SD

Milton Griffis	TN
Hal Medling	TN
Wayne Breeden	TN
Herbert Powley	TN
Gregory Swierz	TN
Paul Mercandetti	TN
James Summers	TN
William Torphy	TN
Ben Welch	TN
Gregory Wrobel	TN
Joe Brown	TN
Wilbur Sensing, Jr.	TN
Arden Kunkel	TN
Bill Colbert	TN
Richard Haldeman	TN
Richard Rudolph	TN
John Seubert	TN
David Thompson	TN
Thomas Walker, II	TN
David Swindler	TN
James Johnson	TN

John Blum	TX
Shelby Casey	TX
Raymond Chatelain	TX
Terry Heffley	TX
Bruce Lynn	TX
Daniel Mahoney	TX
Ronald Patton	TX
Richard Ries	TX
Thomas Schad	TX
Robert Sommer	TX
Steven Sorich	TX
Elmo Townsend	TX
Curtis Farley	TX
Dan Kenley	TX
William Schmitt	TX
Thomas Street	TX
Paul Curs	TX
Harold Moore	TX
Denny O'Hara	TX
Joe Sasser	TX
Lyndol Askew	TX
John Couzelis	TX
Jeffery German	TX
William Nalle	TX
James O'Connell	TX
John Bartholomew	TX
Robert Dean	TX
William Fitzgerald	TX
Donald McMoy	TX
Robert Spradlin, Jr.	TX
Don Bickham	TX
William Carey, Jr.	TX
Paul Carlton, Jr.	TX
Stewart Chuber	TX
Thomas McBroom	TX
Timothy Salaika	TX
Arthur Thompson	TX
Thomas Adams	TX
John Benham, II	TX
Gary Potter	TX
Wayne Richey	TX
Theodore Burgdorf	TX
Don Christiansen	TX
John Mathers	TX
Patrick Minnahan	TX
James Rice	TX
Timothy Ruhl	TX
Richard Smith	TX
Henry Wunderlich	TX
Gerald Bradley	TX
Walter Davy	TX
Daniel Fox	TX
Ted Harp	TX
David Shuffer	TX
Richard Sutton	TX
Herbert Taylor	TX
Raymond Watson	TX
James Cook	TX
Vance Duffy	TX
Leon Johnson	TX
Paul Lasen	TX
Edward Livermore, Jr.	TX
Ronald McIntosh	TX
Charles Miller	TX
Thomas Navar	TX
Jose Portela	TX
John Baganz	TX
Lauren Bitikofer	TX
Thomas Butt	TX
Ann Pellegreno	TX
James Uselton	TX
Nick Owen	TX
Arthur Stark	TX
Edward Strong	TX

David Baird	UT
Brent Watson	UT
Orin Kinghorn	UT

John Bland, Jr.	VA
Richard Spencer	VA
George Snyder, Jr.	VA
Van Lanier	VA
John Weyrich	VA
Michael Pearson	VA
John McCombs	VA
Jose Soncini	VA
William McSwain	VA

James Furlong	WA
Dale Weir	WA
Dan Wynia	WA
John Larson	WA
Richard Fernalld	WA
Eric Rairdon	WA
Randall Enyeart	WA
Barry Halsted	WA
Jack Huffman	WA
Joseph Maridon	WA
Paul Michael	WA
Norman Kellman	WA
Clifford Miller	WA
Paul Myers	WA
Roger Runion	WA
Bob Agee	WA

David Finstad	WI
Kim Gaertner	WI
Keith Myers	WI
Richard Hanusa	WI
James Schneiter	WI
Edward Knutson	WI
John Willkomm	WI
Leslie Wright	WI
Roger Fetterly	WI
Thomas Cordell	WI

Wesley Beicher	WV
Cleveland Benedict	WV
Vincent Collins	WV
Peter Rork	WY
Thomas Malyurek	WY

Charles Taylor *Master Mechanic Award*

The FAA's most prestigious award for aircraft mechanics is the Charles Taylor Master Mechanic Award. It is named in honor of the first aviation mechanic in powered flight, Charles Taylor, to recognize 50 years of exemplary aviation maintenance experience, distinguished professionalism, and steadfast commitment to aviation safety. In 2019, we recognized the following Master Mechanics. For more about the award, go to FAASafety.gov/Content/MasterMechanic.

Thomas Hoosier	AK
Dwayne King	AK
Charles Pike	AK
Clifford Stockton	AK
William Tinney, Jr.	AK
Robert Hemm	AL
Robert Robbins, Jr.	AL
Frank Osborne	AR
Peter Benedikt	AZ
Dominick Gallo, Jr.	AZ
Wayne Henderson	AZ
Lawrence Pederson	AZ
Wayne Ross	AZ
James Sorter	AZ
Joseph Sottile, Jr.	AZ
Benjamin Thorp, Jr.	AZ
Michael Banville	CA
Harry Barnett	CA
Pedro Bejarano	CA
Phillip Dumas	CA
Jeffrey Fullard	CA
Claude Giddley, III	CA
Benny Guzman	CA
Gary Kappa	CA
Kenneth Muller	CA
Julio Perez	CA
Philip Schultz	CA
Robert Scoble Jr.	CA
Norman Stadel	CA
Joe Zeiger	CA
Earl Hoffman, Jr.	CO
Alex Watson	CO
Thomas Barclay	CT
Joseph Rheubeck	CT
William Carmin	FL
Little Crowell, Jr.	FL
Robert Gallagher	FL
Alfonse Hartman	FL
John Heemsath	FL
Bruce Hill	FL
Ernesto Jaramillo	FL
Nasim Kahn	FL
James Kimball	FL
James Moreno	FL
Sergio Perez	FL
Craig Peterson	FL
James Porter	FL
Peter Reed	FL
Mark Richter	FL
Randall Ross	FL
Milford Samuel	FL
Olan Scott	FL
Harry Shannon	FL
John Thomas, Jr.	FL
Richard Weiss	FL
Don Brown	GA
James Buckley	GA
Theobald Groesser	GA
Walter Harvey	GA
James Hoak	GA
Anthony Stein	GA
Walter West, Jr.	GA
Leon Mattern	GU
Larry Kelley	HI
Garrick Chang	HI
John Fisher	HI
Mark Jernigan	HI
Abe Abel	ID
Earl Smith, III	ID
Mark Bauer	IL
Henry Krevel	IL
James Rezich	IL
William Shelton	IL
Garner Williams	IL
Robert Zilinsky	IL
Lee Chamberlain	IN
Dorel Graves, Jr.	IN
Malcolm Porter	IN
A. Schene	IN
Duane Ayre	KS
David Cochran	KS
Louis Gollin	KS
David Hayden	KS
Jack Williams	KS
Richard King	KY
Samuel Blanchard	MA
John Donahue	MA
Noel Fisher	MA
Charles Sawyer	MA
Blake Story	MA
Donald Solomon	MD
William Turnow, Jr.	MD
Glenn Williams	ME
Eugene Comer	MI
Curtis Anderson	MN
Stanley Weitemier	MN
Dennis Brown	MO
Patrick Covey	MO
Patrick Covey	MO
Joseph Ilardi	MO
Keldon Kener	MO
Walter Martin	MO
Gerasim Mayden	MO
James Meyerpeter	MO
Steven Murphy	MO
James Sullivan	MO
Charles Lirette	MS
Brian Vercoe	MT
Gary Beck	NC
Charles Causey	NC
Robert Csanyi	NC
Darrell Hudson	NC
Ricky Simmons	NC
John Sutherland	NC
Gregory Swift	NC
Leo Sawatzki	NE
Donald Witt	NE
Walter Davis, Sr.	NJ
Walter Ellis, Jr.	NJ
John Gilbert	NJ
Ronald Mittelstaedt	NJ
Larry Otter	NJ
Louis Ramm	NJ
Ralph Valles	NJ
Willie Ford	NV
Charels Gebhardt, Jr.	NV
Dennis Ramaglia	NV
Guy Willis	NV
James Wilson, Jr.	NV
Eugene Dell'Italia	NY
Robert Malara	NY
Tommy Malone	NY
Joseph Zych, Sr.	NY
John Hughes	OH
Leroy Moore	OH
Earl Redmond	OH
Larry Brown	OK
Christopher Erickson	OR
Raymond Johnson	OR
Steven Phillips	OR
Richard Chmell	PA
Jerome Cupec	PA
James DeMarr, Jr.	PA
Louis Detrick	PA
David Donahue	PA
John Penzone	PA
Robert Beitel	SC
John Phillips	SC
Thomas Kitterman	SD
Charles Clapper	TN
Jerald Cooper	TN
Michael Jolicoeur	TN
Arden Kunkel	TN
Billy Shannon	TN
James Summers	TN
Littleton Billingsley, Jr.	TX
Franklin Brooks	TX
Arthur Coffman	TX
Michael Horton	TX
William Lester	TX
Alan Pakcyk	TX
Ronald Patton	TX
Michael Raridon	TX
Arthur Risco	TX
Thomas Schad	TX
Glen Scott	TX
William Smouse, Jr.	TX
Raymond Watson	TX
Arthur Irvine	VA
Kenneth Minck	VT
Gerald Locati	WA
Bradford Young	WA
Roland Schable	WI
Louis Young	WI

DRONE 54, WHERE ARE YOU?!

The Road to Remote ID

To adjust slightly the lines of famous '60s singer-songwriter, Bob Dylan — the skies, they are a changin'. The unmanned aircraft (UAS) community continues to grow. UAS registrations have surpassed 1.5 million. Drone sightings are everywhere in the news; this winter even saw national coverage of alleged mysterious drone sightings across Colorado and Nebraska. On the commercial front, the FAA has now allowed two companies to deliver packages, in limited areas, beyond visual line of sight of the pilot. The agency has also proposed a rule to allow drones to operate over people and at night.

While opportunities are expanding for widespread use of drones, we must be mindful of other NAS users. Protecting people, whether flying or on the ground, is always a priority. Traffic management is integral to maintaining safety in the NAS. That, in turn, requires us to know what's flying. As the then acting FAA administrator Daniel K. Elwell noted at the 2018 UAS Symposium, "for this industry to flourish commercially and be of public service, all aircraft — unmanned or otherwise — must be identifiable." Consistent with that idea, proposed regulations for operations over people and night operations will not take effect until regulations for remote identification are in place.

Remote ID isn't a completely new concept. In 2016, Congress tasked the FAA to work with industry on ways to implement a remote ID concept. An aviation rulemaking committee of over 70 industry members developed recommendations for remote ID rules, taking into account technology, security considerations, and implementation. This led to the formulation of the FAA's rulemaking project in 2018 on remote ID.

If you've ever followed a rulemaking project, you may already know the heavy lift necessary to even propose a rule. The FAA has to establish standards, ensure that there is a means for the public to comply with those standards, develop the rationale for both, conduct an economic analysis, and coordinate across the government to avoid adverse impact on areas outside its realm of responsibility. Aviation community interest has been high, with the topic at the forefront of many drone related conferences and congressional hearings on the status of the rule.

Rulemaking hasn't been the only front for addressing the remote ID concept. ASTM International has been working to develop technical standards for remote ID, and expects to publish those standards in early 2020. Additionally, an FAA and industry cohort will be collaborating to develop a framework for how third-party service suppliers can support the remote ID concept. Each of these is an important piece to implementing remote ID. All of them being worked in collaboration with the industry and the public. But one of the more anticipated opportunities for engagement that the public has been waiting for is the publication of the proposed rules for Remote ID.

On December 31, 2019, the FAA met a major milestone by issuing the Remote ID Notice of Proposed Rulemaking. With the chance to impact and shape a final rule, the proposal has drawn thousands of comments. As it looks forward, the FAA will address those comments and begin its efforts to publish a final rule. While there is more work to do to allow this industry to flourish, publication of the proposed rule means we are now one step closer toward that goal.

Emanuel Cruz is the manager of the Safety and Operations Branch in the FAA's UAS Integration Office.

LEARN MORE

FAA Information Page on UAS Remote Identification
bit.ly/UASRemoteID

DON'T FAIL THE **VEIL!**

You must be equipped with ADS-B Out to fly inside the 30 NM radius Mode C veils around major U.S. airports.

FOR MORE INFO VISIT
faa.gov/go/equipadsb

Federal Aviation Administration

ADS-B
SEE AND BE SEEN

JENNIFER CARON

STAY SHARP, STAY SKILLED

Your Tools for Continued Learning

Aviation maintenance technicians (AMTs) work in a challenging field. Doing the job requires AMTs to not only master the mechanical skills and knowledge needed to maintain older aircraft, but to also learn new technical skills to troubleshoot, diagnose, and repair the composites and complex electronic equipment found in more modern aircraft. Although AMTs primarily acquire job skills through a combination of initial training, certifications, and on-the-job experience, recurrent training is essential.

You will be happy to learn that there are valuable, no-cost resources available online that AMTs can use to enhance their skills, knowledge, and proficiency. Take a look at, and take advantage of, the information in the following websites.

1. FAASafety.gov

FAASafety.gov is a premier source for free AMT continuing education programs and recurrent training. On the homepage under Maintenance Hangar, you'll find everything from safety presentations and online courses, to safety tips, references, and regulatory resources. Check out the accredited AMT Awards Program where you can earn an AMT Certificate of Training in a bronze, silver, or gold phase by completing training hours and coursework. The program also awards AMT Employers who support their employees' initial and recurrent training.

On the Maintenance Hangar page, you'll also find a list of approved Inspection Authorization (IA) Renewal Courses. Click the 'Toolbox' link to see safety tips, maintenance alerts, AMT training courses, and AMT events in your area.

There are 175 instructor-led training activities offered in the Activities tab. You'll see courses on a variety of topics. Some courses require a small fee, but the majority are free of charge and offer AMT credit and/or WINGS credit. To view the list of available courses, click on the Activities, Courses, Seminars, Webinars tab on the homepage. Select Activities from the drop down menu. Next, select Other Activities, AMT, and click Perform Search.

2. Human Factors in Aviation Maintenance

Since human factors directly cause or contribute to many aviation accidents, the FAA created a website (bit.ly/HumanFactorsMaint) to provide a place where you can learn more about how to recognize and mitigate these challenges in aviation maintenance. The site also has a link to www.mxfatigue.com, another online resource to review practical tips about sleep and fatigue management strategies.

3. FAA.gov/mechanics

This link goes to an A-Z web page for overall information on useful topics such as maintenance schools plus A&P test guides, licensing, certification, regulations and technical data, advisories and alerts, and those all-important 337 forms.

Click the link for aircraft safety alerts to get the latest ADs and Special Airworthiness Information Bulletins (SAIBs). Here you can create a malfunction/defect report on a system component or part. If you see something, say something! Your report helps our maintenance community to spot trends and address emerging safety issues.

Other valuable AMT resources include aircraft type clubs and aviation maintenance-related associations like the AMT Society, the Aircraft Electronics Association (AEA), and the Professional Aviation Maintenance Association (PAMA). These organizations offer a host of information on IA renewal, career opportunities, online Q&A forums, training videos, as well as many free webinars. AOPA also offers several maintenance-related safety briefs and reports, as well as some high-quality interactive courses.

Aviation safety begins on the ground and in the hangar. It is important for every AMT to take a personal interest in continued learning to improve safety, enhance your skills, and maintain your proficiency in today's aviation maintenance industry.

Jennifer Caron is *FAA Safety Briefing*'s copy editor and quality assurance lead. She is a certified technical writer-editor in aviation safety and flight standards.

HOW'S YOUR WEATHER KNOW-HOW?

In this weather technology-themed issue, we cite numerous examples of how advancements in technology are providing pilots with access to more and more aviation weather data, both before and during flight. That's a good thing. For example, pilots who have opted to reap the benefits of ADS-B In get free, graphical, near real-time weather information in their cockpits or via electronic devices. And how about some of today's weather briefing and flight planning tools with interactive maps, text message updates from ATC, and automated voice services where you can "Ask Alexa" for the latest TAF (Terminal Aerodrome Forecast) before you head out the door.

Unfortunately, despite this increased availability of weather data, Mother Nature remains a major contributor to general aviation fatal accidents. Weather data is only helpful if you're able to distill it into what you really need to make sound aeronautical decisions. The good news is that with a greater variety of mediums and methods of obtaining weather information — many boasting unparalleled fidelity and accuracy — you're more likely to find the source that suits your needs. The challenge is finding what weather resources work for you and knowing how to properly leverage the information they provide. Here are a few tips.

Before your next flight, make a conscious effort to ensure you thoroughly understand the weather data at your disposal. Does a 15-knot crosswind or 3/4 mile visibility in fog align with your personal minimums and aircraft capabilities? If it's been a while since you last assessed your personal weather minimums, consider what red-flag items would give you pause and how you would address them. Don't wait until you're in the thick of it to figure out how you would handle a weather emergency. Rerouting or diverting is much easier — and less stressful — when you have some wiggle room and pre-decided alternates to choose from.

In reviewing weather data, always consider its shelf life. Some weather products could be hours old when you receive them. Note the observation times in any particular report and/or the product validity time span so you always know if you have the latest and greatest versions. Comparing forecasts with more current weather information is also a good way to see the "big picture" and if weather is developing as expected. Don't overlook the value of area forecast discussions too. These plain language discussions cover conditions that that will create expected weather.

It also helps to think of how three basic elements of weather (temperature, wind, and humidity) can combine to impact a flight in terms of visibility, turbulence, and aircraft performance. This approach can help you assess whether both pilot and plane are up for the challenge. See this issue's Postflight department for more.

Don't rely too much on in-cockpit weather displays. Yes, they are excellent tools to improve your weather situational awareness, but the information they relay may not tell the whole story, no matter how sophisticated they are. Bottom line: Don't fixate on a NEXRAD display to the exclusion of your other flight management tasks — and that includes looking out the window. Weather displays should be used strategically, not tactically.

Finally, strive to continue learning about weather and get familiar with as many available resources as possible (see Learn More). A little extra weather know-how can go a long way towards a safe flight!

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

LEARN MORE

Personal Minimum Checklist for Weather
bit.ly/PersMins

"I've Got Weather – Now What Do I Do With It?" Mar/Apr 2015, *FAA Safety Briefing*, page 26
bit.ly/SBMar15

GA Pilot's Guide to Preflight Weather Planning, Weather Self-Briefings, and Weather Decision-Making
go.usa.gov/xptrr

IF THE WEATHER LOOKS TRICKY, LAND AND LIVE

Every day, FAA Rotorcraft Standards Branch employees review accident reports. One thing is clear. We could substantially cut the accident rate if pilots stopped flying into bad weather.

This fact has not been lost on the helicopter community. The Helicopter Association International (HAI) has been promoting its Land & Live campaign since 2013. It's a simple concept: land your helicopter if you face hazards that jeopardize safety.

"As pilot in command, only you can decide if you should continue the flight," states HAI's Land & Live web page. "Will you make the promise to always land when safety's at stake?"

The FAA Rotorcraft Standards Branch promotes a similar message through this column, safety forums, and meetings with industry and advocacy groups. If the weather looks tricky, delay takeoff or land.

Industry-government teams such as the International Helicopter Safety Foundation (IHSF) and the United States Helicopter Safety Team (USHST) participate as well with weather-related videos, essays, and reports at ihst.org and ushst.org respectively. In September 2017, the USHST released 22 helicopter safety enhancements (H-SEs) to improve safety. Four H-SEs were related to visibility or unintended flight in instrument meteorological conditions (UIMC) and are available at ushst.org.

This message is getting through to the helicopter community. FAA records show that about 19-percent of the 104 U.S. fatal accidents from 2009 through 2013 were caused by UIMC, icing, wind shear, or thunderstorms. That number dropped to about 15-percent for the 94 fatal accidents recorded from 2014 through 2018.

UIMC is when a pilot inadvertently flies from visual flight rules into IMC, losing visual reference to terrain because of clouds, fog, thunderstorms, haze, or other conditions. If pilots consequently fly closer to the ground, they can encounter wires, trees, or towers.

Experts involved in the FAA Weather Technology in the Cockpit (WTIC) program are researching ways to improve the presentation of weather information in the cockpit, weather technology and information, weather-related pilot training, and pilots' ability to interpret weather information. Recommendations are expected this fall.

Additional work is underway to enhance the Helicopter Emergency Medical Services (HEMS) tool that runs as a desktop application. According to Ian Johnson, FAA WTIC human factors lead, the tool is designed for low-altitude operations and can provide information on ceiling, visibility, flight category, winds, relative humidity, and temperature.

As Johnson notes, "WTIC looks at how weather information is rendered and its parameters (accuracy, update rate, forecast/nowcast, etc.). It also includes identifying issues with weather sources and procedures. Helicopters fly/land in areas that frequently do not have weather sensors or weather cameras. If pilots are forced to rely on information from a more distant sensor, it may not represent current weather conditions at the landing site."

Until we determine better ways to address weather issues, the FAA recommends that pilots follow IHSF's eight golden rules:

1. Always obtain an aviation forecast
2. Expect conditions to be worse than forecast.
3. Check actual conditions against the forecast.
4. Identify alternative routes and suitable diversion airfields just in case.
5. Always carry enough fuel for unexpected situations.
6. Scan the sky and horizon for possible problems and note local surface winds.
7. Check weather reports while flying.
8. Be prepared to divert, turn around, or land. Make sure you have an alternative course of action should weather conditions preclude the completion of the flight as planned.

In other words, don't be afraid to land — and live.

Gene Trainor is an FAA communications specialist. He was previously a technical writer for the FAA Rotorcraft Standards Branch in Fort Worth, Texas.

Here's a handy tip and some feedback from members of our new GA Safety Facebook Group!

Facebook.com/groups/GASafety

If you're not a member, we encourage you to join in on the discussions and post relevant GA content that makes the National Airspace System (NAS) safer.

Piping Up on Piper Predicaments

I had an issue today with a rented Piper Arrow and am wondering what is "normal." On the ground, the trim wheel turned freely and the electric trim worked fine. Once airborne, the electric trim became ineffective and the trim wheel became very difficult to turn manually. Can anyone shed light on the cause and whether or not this condition should be considered "normal?"
— John

Certainly not "normal." You should let the place you rented from know what you encountered. They may be unaware of any issues.
— Bob

The airflow over the elevator makes it harder to move in flight. I use the electric trim switch and help move the trim wheel with my right hand. I agree with David, have maintenance take a look at it.
— Mike

Please remember that John is renting the Piper Arrow not maintaining it. No it is absolutely not normal. If you have to ask if something is normal then it's probably not normal. Trust your judgement and turn in the keys anytime you don't feel comfortable with something. Your comfort level, if listened to, can save your life.
— Steve

John's Reply:
Thanks to all who have contributed their thoughts on this problem. I've taken your suggestions and forwarded them to the maintenance department for consideration.

Single Pilot Specifics

Susan,

I just read "You Never Roam Alone" [in the *FAA Safety Briefing* Nov/Dec 2019 issue], and I really enjoyed it. But I wanted to be slightly more specific.

1.) Your personal story sets the stage brilliantly and captured my attention. (It took me back to some of my earliest single pilot IMC days ...)

2.) You built a credible bridge between your story and FAA principles and documents.

3.) You link to FAA resources that are helpful for the reader.

All of those things I mentioned above stand out to me as a professional peer — someone in the business of aviation and safety as well as writing and editing. So I'm saying these things as one "critical eye" to another. Well done.
— Mark

Thank you very much for the detailed feedback. I am always glad to know a particular piece has hit the mark, but you certainly went the extra mile by providing specifics.

*The use of specifics in aviation is something I learned in my very first flight lesson. Starting with preflight and including pretty much everything else, my instructor would never allow me to get away with saying "**that** looks okay." I was required to be quite specific about what I was inspecting or doing, why I was doing it, and what made it "okay" (or not). I have tried to use that technique myself in flight instruction as it builds critical thinking skills along with real understanding. Thank you again for the thoughtful feedback.*

*Let us hear from you! Send your comments, suggestions, and questions to **SafetyBriefing@faa.gov**. You can also reach us on **Twitter @FAASafetyBrief** or on Facebook **facebook.com/FAA**.*
We may edit letters for style and/or length. Due to our publishing schedule, responses may not appear for several issues. While we do not print anonymous letters, we will withhold names or send personal replies upon request. If you have a concern with an immediate FAA operational issue, contact your local Flight Standards Office or air traffic facility.

MINING DATA FOR INFORMATION

Early bird gets the worm? I believe Commander Shelby erred. There is no evidence of avian or crawling vermicular lifeforms on Jouret IV.
— Commander Data, Star Trek: The Next Generation

Image courtesy of Garmin.

Thanks to tablets, apps, and panel-mounted avionics that make the bridge of even the more recent versions of Star Trek look outdated, GA pilots now have anytime, anywhere capability for all the weather data we could possibly want. But there are downsides. Data's glossy appearance easily deludes us into taking it literally, rather than regarding it as raw material that requires refinement before we can safely use it. Second, the sheer volume of incoming bits and bytes can complicate even the most determined efforts at refining data into *information* — that is, data placed in some level of context or analysis.

Here's where critical thinking becomes, well, critical. Like the human cliché that so puzzled Star Trek TNG's android Commander Data, taking weather data without context distorts its meaning.

Ask, Answer, Analyze, Apply
The good news is that you don't have to be a meteorologist to apply the context and analysis that transforms data into information. Weather observation and reporting technology have changed dramatically over the years, but nothing has changed the fundamental ways that weather can affect any aviator. So, Robert N. Buck's *Weather Flying* is still one of the "go to" resources in my aviation library. Buck notes that weather can do three things: (1) Create wind or turbulence; (2) Reduce ceilings and visibility; and (3) Affect aircraft performance through conditions like icing, density altitude, or convection.

The process of transforming weather data into useful information requires asking and answering a few questions, then analyzing and applying the responses. For example:

Wind Direction and Velocity:
For takeoff or landing, analyze these numbers in terms of both the pilot and the airplane. If you aren't comfortable with the crosswind component, or if it is beyond the airplane's maximum demonstrated crosswind capability, apply that information by deciding whether to stay on the ground, hiring an instructor to help scrub the rust or, if already en route, diverting. For cruise, analyze and apply these numbers in terms of effect on groundspeed and fuel requirements.

Ceiling and Visibility:
Regardless of how it is equipped, the airplane itself is not affected by the presence of clouds and precipitation. Consequently, weather decision-making in this area most logically focuses on the pilot. Are you instrument rated, current, and proficient? Remember that maintaining just the legal minimums may not be enough for proficiency and confidence. If you haven't flown in IMC recently, or if you have any doubts about your proficiency level, get some practice with a safety pilot or dual refresher training with an instrument instructor.

Performance:
Like all machines, airplanes have performance limits. Even the best pilots cannot overcome such performance-reducing elements as icing, high density altitude, or thunderstorm activity. Weather data provides facts about likely freezing level(s), temperatures and density altitudes, and location/likely intensity of convective activity. Ask yourself where these conditions exist in terms of your route. Can you avoid them? If not, does your airplane have the required capability? Since even newer airplanes may not make "book" numbers, analysis and application means taking your calculations with a big grain of salt and adding a safety margin.

Bottom line: it may be a "data-driven" world, but don't let data drive you into trouble!

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

LEARN MORE

"When the Wind Blows," (page 18) *FAA Safety Briefing* – Mar/Apr 2018
bit.ly/FAASBMarApr2018

PAUL CIANCIOLO

IAN JOHNSON

Engineering Psychologist, FAA Weather Research Branch

Ian Johnson's first inkling of a career in aviation came as a teenager after an eye-opening flight in a Douglas DC-3. After migrating to the United States from Guyana, a small country on South America's north Atlantic coast, he took on several jobs to pay for lessons toward his private pilot certificate. He then enrolled at Embry-Riddle Aeronautical University in Daytona Beach, Florida, with aspirations of becoming an airline pilot.

During Ian's second semester studying aeronautical science, he became enthralled with human factors in aviation after taking a course on the subject. He changed his plans and switched his degree program so he could dive deeper into human factors psychology.

Ian continued his education, eventually earning not only a master's degree of aeronautical science in human factors in aviation systems but also a second master's in aviation/aerospace safety systems. The research required for these advanced degrees aligned well with Ian's new aeronautical career aspirations.

That research, along with his 19 years of industry experience (ranging from lead human factors engineer, technical contributor, and staff human factors engineer of the presidential helicopter program) and his piloting expertise (mostly in single-engine Cessna and Piper aircraft and multi-engine Piper aircraft) provided the perfect foundation for Ian's current job as an engineering psychologist in the FAA's Weather Research Branch.

Ian is also the human factors lead and general aviation subject matter expert in the FAA's NextGen Weather Technology in the Cockpit (WTIC) program.

The purpose of the WTIC program is to ensure that weather information, in any format that is available to pilots in the cockpit, is effective. WTIC program research looks at how pilots interpret the weather information and associates that information with safety risks of encountering potentially hazardous weather conditions. For more about the program, read the article "What is WTIC?" in this publication.

Ian explains that one of the most important aspects of using weather technology during flight is being cognizant of its capabilities and limitations. An especially important point: never assume that a graphical display of "current" weather is in real time. In fact, there could be a 20 minute delay in what you are seeing due to processing and transmission lag time. There's no way to safely "shoot the gap" between thunderstorm cells with this limitation.

Ian also notes that as a pilot you need to be aware of personal capabilities and limitations, not just those of the aircraft you are flying.

With great technology, comes great responsibility. That responsibility is up to you — the pilot in command — to truly understand the tools you are using in the cockpit to make safe decisions.

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

U.S. Department
of Transportation

**Federal Aviation
Administration**

800 Independence Ave., S.W.
Washington, D.C. 20591

FORWARDING SERVICE REQUESTED

Official Business
Penalty for Private Use $300