

FAA

Safety

BRIEFING

January/February 2017

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PAVEing the Way to Safety

Say Ahh ... P 11

A Pilot's Guide to Self-Assessing Risk

Is My Aircraft Right for Flight? P 16

The Importance of Preflight Prep

The Wild (Not So Blue) Yonder

Mitigating Risks in the Environment P 20

Are We There Yet?

How External Pressures Can Affect Your Flight P 23

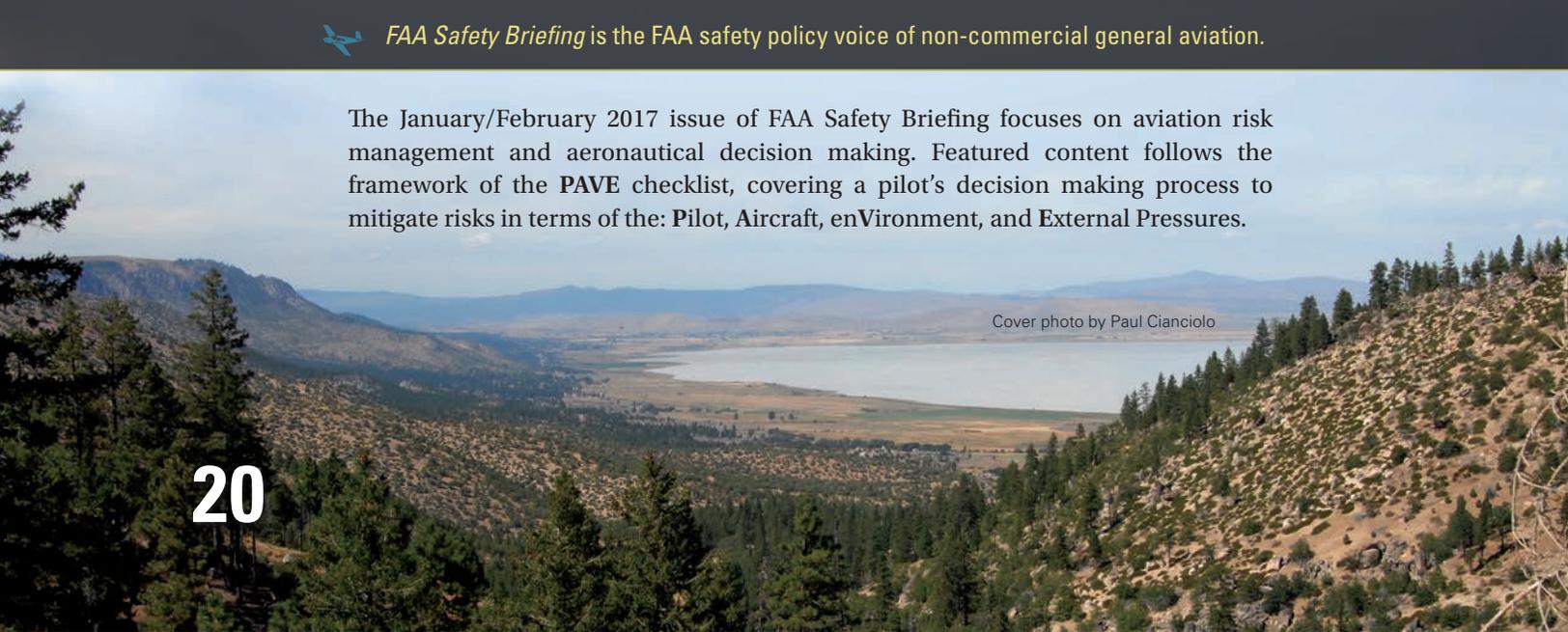


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The January/February 2017 issue of FAA Safety Briefing focuses on aviation risk management and aeronautical decision making. Featured content follows the framework of the PAVE checklist, covering a pilot's decision making process to mitigate risks in terms of the: Pilot, Aircraft, enVironment, and External Pressures.

Cover photo by Paul Cianciolo



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Mistakes (Don't) "Just Happen"

In the November/December issue of *FAA Safety Briefing*, I wrote about the cultural and structural changes that the FAA Flight Standards Service is making to improve the way we operate.

To support our cultural changes, members of my senior staff and I are reading a book called *Turn the Ship Around*, by David Marquet. If you aren't familiar with the book or the excellent ten-minute summary you can find on YouTube, here's the short version.

As an upcoming first-time nuclear submarine captain in the U.S. Navy, Captain Marquet spent a year preparing to take command of a specific vessel. Just two weeks before the change of command ceremony, he was assigned to take command of a completely different sub, one whose rock-bottom reputation and performance posed an endless number of daunting challenges. The book — a compelling and interesting read that I highly recommend — details the innovative leadership techniques that Captain Marquet used to "turn the ship around."

Deliberate Action

For the purposes of the risk management/decision-making theme of this issue, I want to focus on a chapter called "Mistakes Just Happen." Lots of things can go (badly) wrong on a nuclear submarine, and Captain Marquet begins this chapter with the story of a potentially deadly mistake. The responsible crewmember and his supervisor fessed up and, based on traditional Navy practices, they expected the worst in terms of punishment. However, Captain Marquet recognized — as the FAA does with Compliance Philosophy — that finding and permanently fixing the problem was the most important thing he could do. The responsible parties were willing and able to comply, and they freely offered information about what happened. So the focus turned to figuring out why it happened, and how the crew could prevent a recurrence of this particular mistake.

In the course of the analysis, one officer observed that the crewmember "was just in auto. He didn't engage his brain before he did what he did; he was just executing a procedure." As Captain Marquet tells the story:

I thought that was perceptive. We discussed a mechanism for engaging your brain before acting. We decided that when operating a nuclear-powered submarine we wanted people to act deliberately, and we decided on "take

deliberate action" as our mechanism. This meant that prior to any action, the operator paused and vocalized and gestured toward what he was about to do, and only after taking a deliberate pause would he execute the action. Our intent was to eliminate those "automatic" mistakes. Since the goal of "take deliberate action" was to introduce deliberateness in the mind of the operator, it didn't matter whether anyone was around or not. Deliberate actions were not performed for the benefit of an observer or an inspector. They weren't for show. Our mechanism to prevent recurrence of the problem was to implement the taking of deliberate actions on board.

As with any culture change, it took some time for deliberate action to sink in. Like some in aviation, submariners seemed to take pride in operating as quickly as possible. By the time of the submarine's next inspection, when the ship ultimately earned the highest grade anyone had ever seen on its reactor operations, the senior inspector noted that: "Your guys made the same mistakes — no, your guys tried to make the same number of mistakes — as everyone else. But the mistakes never happened because of deliberate action.

Either they were corrected by the operator himself or by a teammate."

I'm sure I don't have to spell out the relevance and application of deliberate action to anyone in aviation. In fact, many of you are likely familiar with the classic advice to use a "wind your watch" interval before reacting to an abnormality or emergency. Whatever phrase you use, though, deliberate action that requires you to stop, look, and think before you actually do anything is an excellent way to practice sound aeronautical decision-making and risk management. As Captain Marquet concludes in his video, "Now go forth and be great!"

We discussed a mechanism for engaging your brain before acting. We decided that when operating a nuclear-powered submarine we wanted people to act deliberately, and we decided on "take deliberate action" as our mechanism. — David Marquet

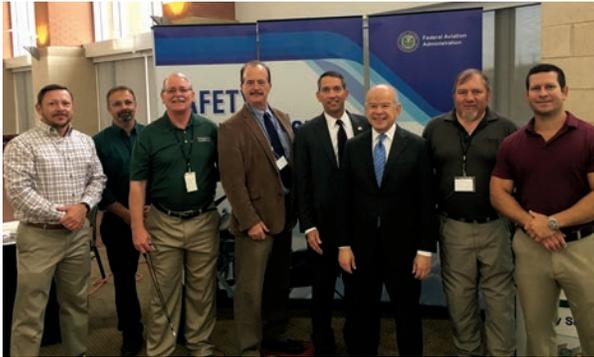
Learn More

FAA's Compliance Philosophy page

www.faa.gov/go/cp



FAA Urges Retrofit of Helicopters to Increase Crash Safety



FAA Administrator Michael Huerta and GA & Commercial Division Manager Jim Viola along with several FAA Safety Team Program Managers.

FAA Administrator Michael Huerta called on operators and manufacturers during the 2016 FAA International Rotorcraft Safety Conference to retrofit helicopters by installing equipment or changing aircraft designs to help prevent post-crash fires.

Huerta noted during his October speech at the second annual conference that only 16 percent of U.S. registered helicopters meet all federal regulations for post-crash fires.

“If an industry has a genuine focus on compliance and on preemptive risk management, it shouldn’t wait for new regulations before taking action,” Huerta said. “Both government and industry should look at the data and collaborate on solutions. We should implement changes as soon as we can.”

“Whatever can be achieved by manufacturers, operators, and pilots today will be instrumental in eliminating these fatalities tomorrow,” Huerta said.

FAA data shows that when a post-crash fire occurs in fatal helicopter crashes, it contributes to fatality 20 percent of the time in the United States. Blunt force trauma contributes to the other 80 percent of fatalities.

In the 1980s and 1990s, the FAA changed its rotorcraft regulations to add occupant protection rules that cover emergency landing conditions and fuel system crash resistance. However, the rules did not require a retrofit of the existing fleet. Also, newly manufactured rotorcraft were only required to comply if they were built under a new type certificate. Decades later, the net result is that only a small

percentage of rotorcraft are equipped with the added protection. The anticipated improvement in safety wasn’t recognized to its fullest extent.

Advocacy groups, crash survivors, and relatives of people that died in helicopter accidents have been pushing the government to ensure more helicopters are required to meet the more stringent occupant protection requirements.

The FAA’s Aviation Rulemaking Advisory Committee’s working group on Rotorcraft Occupant Protection has submitted recommendations for changes to existing federal regulations to better prevent post-crash fires and blunt force trauma. Until changes are made, however, the FAA continues to urge voluntary compliance as it has the most immediate impact on safety.

GA Remains on NTSB Most Wanted List



The National Transportation Safety Board (NTSB) released its 2017-2018 Most Wanted List of Transportation Safety Improvements last November. On the top 10 list is Prevent Loss of Control in Flight in General Aviation. Although commercial airline accidents have become relatively rare in the U.S., accidents involving inflight loss of control (LOC) in GA, while trending downward, still occur at an unacceptable rate. From 2008 to 2014, nearly 48 percent of fatal fixed-wing GA accidents resulted from pilots losing control of their aircraft in flight. During this time, LOC in flight accounted for 1,194 fatalities.

The NTSB has also moved to a two-year cycle for the list instead of issuing it annually. The change allows more time for the transportation industry, safety advocates, regulatory agencies, and individuals to effect the changes necessary to address the ten issues on the Most Wanted List.

You can download the NTSB fact sheet about LOC at <http://bit.ly/2fOuzX5>.

IACRA Updates to Online Processing

FAA's Integrated Airman Certification and Rating Application (IACRA) is the web-based certification/rating application at <https://iacra.faa.gov> that guides the user through the airman application process. IACRA helps ensure applicants meet regulatory and policy requirements through the use of extensive data validation. It also uses electronic signatures to protect the information's integrity, eliminates paper forms, and prints temporary certificates.

Some of the recent updates to the system include the minimum age being lowered to 13 years old; applicants at least 13 years old may now begin the Student Pilot application process, though the application can't be completed until 90 days before their 14th birthday; temporary certificates will now be issued for student pilots, and will be available for printing after FAA internal processing is complete and the applicant is at least 14 years old; and remote pilot certificate processing for small unmanned aircraft systems (sUAS) is available.

NASA Releases New Ice Induced Stall Pilot Training



The information in the new NASA ice-induced stall training video (<https://youtu.be/NBX84bF2d4U>) supersedes, supplants, and replaces the instruction in all previous NASA tail stall icing training videos. This training aid is intended to help pilots understand the phenomenon of tailplane and wing stall while flying in icing conditions. The training also explains icing certification rules and recommends cockpit procedures to mitigate ice induced stall in order to maintain controlled flight during unexpected icing encounters.

Airplane Flying Handbook Update

The FAA's Airplane Flying Handbook has a new version online. You can download it and sign up for email updates from the Airman Testing page at www.faa.gov/training_testing/testing.

FAA Issues Part 107 Waivers, Authorizations

The FAA began issuing part 107 waivers and airspace authorizations to drone operators on August 29, 2016, the effective date of the new rule. However, the agency has found that many applications have incorrect or incomplete information. Many applicants request multiple sections to be waived, which makes the application more complex, or request authorizations for flights in types of airspace for which the FAA is not yet granting approvals. As a result, the agency has had to reject many waiver requests and airspace applications.

It's important for applicants to understand the information needed to make a successful safety case for granting a waiver. Refer to the performance-based standards PDF at www.faa.gov/uas/request_waiver.

Without a detailed description of how the applicant intends to meet these standards, the FAA can't determine if a waiver is possible. Operators should select only the part 107 regulations that need to be waived for the proposed operation. Applicants also should respond promptly to any request we make for additional information. If the agency does not receive a response after 30 days, it will disapprove the waiver application.

Operators must apply for airspace authorizations on the same web page. The required information is spelled out in the waiver/airspace authorization instructions document. As the FAA previously announced, operators who want to fly in Class G (uncontrolled) airspace do not need FAA authorization.

The part 107 regulations provide a flexible framework for unmanned aircraft operations. Waivers and airspace authorizations are an important part of making the new rule work as intended. Applicants can help speed the process by making sure they make a solid, detailed safety case for any flights not covered under the small drone rule.

FAA Receives Recommendations from Flight Service User Group

The FAA hosted a two-day meeting with the Flight Service NAS Efficient Streamlined Services (FSNESS) User Group in September. FSNESS is part of the Administrator's initiative to transform to a more efficient NAS with increased safety and user benefits.

The meeting focused on a data-driven approach to determine whether to sustain, modify, discontinue or add new services to improve efficiency of



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flight services within the Continental United States, Hawaii, and Puerto Rico. Possible changes in Alaska will be considered in an upcoming analysis.

The FSNESS User Group includes representatives from the Aircraft Owners & Pilots Association, Air Line Pilots Association, National Business Aviation Association, Helicopter Association International, National Association of Flight Instructors, National Association of State Aviation Officials, Department of Defense, Experimental Aircraft Association, and the National Air Traffic Controllers Association.

FAA participants supported the meeting as subject matter experts and provided an overview of each service, answered questions regarding existing services, and helped to identify implementation considerations.

The 15 recommendations fell into one of these service categories: Preflight Services and Pilot Briefings; Broadcast Services; Flight Plan Filing and Activation/Closure; Inflight Services; Online Web Portals; and Pilot Education and Guidance.

The User Group reached consensus on all of the recommendations and will continue to work in partnership with the FAA to implement the changes. Some of the recommendations are short-term and easy; others are more complex and require a multi-step solution. The team will work to determine next steps, identify other affected FAA organizations, go through the safety management process, and develop or update policy, procedures, and contract language.

A recurring theme in many recommendations is the need for education and targeted outreach to increase awareness among pilots for automated services while continuing to leverage technology to improve those services.

How Risk Based Decision Making Helps Us Help You

If you've been following these pages, you're probably aware of my long standing goal to get as many airmen as possible safely into the air. When I first became the Federal Air Surgeon, I set an ambitious goal of having 95 percent of airmen leave the Aviation Medical Examiner's (AME) office with a medical certificate in hand. Historically, that number had been around 90 percent. I'm excited to report that as we closed out fiscal year 2016, we achieved a result of 97.7 percent of airmen walking out with a medical certificate in hand. This is tantalizingly close to my dream goal of 98 percent.

How Did We Get Here?

One of the things that helped push us so close to our goal was the use of Risk Based Decision Making (RBDM). RBDM, when applied to medical certification, allows us to look at where there is risk in our system and determine how we might be able to mitigate it. We started by looking at deferred airmen with specific conditions and cross-referencing that information with accident and incident data. In many cases, we found no relationship between the two.

Based on this information we made a decision, using RBDM, to focus more on conditions that could cause sudden or subtle incapacitation instead of general health threats. While your AME could still note these general health conditions, they wouldn't be grounds for deferral. We also began to rewrite the AME Guide to leverage the experience of our AMEs and allow them greater freedom to issue certificates without FAA intervention. Some of the changes to our AME Guide and procedures included the Conditions AMEs Can Issue (CACI) and AME Assisted Special Issuance (AASI) programs, which both give AMEs more tools to prevent deferrals.

We also learned to apply mitigating strategies that allow us to issue certificates that previously would not have been possible. Sometimes those mitigations are part of our Special Issuance (SI) process and other times they are through our normal certification process (i.e., CACI). In the case of SI, one of those mitigations is shorter duration certificates (one year as opposed to two). Other mitigations might be a requirement for additional information or tests, or some other strategy that we can use to reduce that risk. This could apply to either process.

How Are We Moving Forward?

When we started the process of updating the AME Guide, we knew it would be an uphill task. Our goal was to make as much of the AME Guide as accessible as possible not only to our AMEs, but also to airmen. This process is continuous. It will never end, nor should it. As technology, medicine, and treatments advance, we will have more opportunities to certificate even more airmen.

One area we've opened up more recently is depression. It wasn't long ago that depression was a condition we didn't certify. After much consideration and research, we have developed procedures that allow some pilots receiving certain treatments to be certificated under specific conditions. That's a huge step, one that wouldn't be possible without RBDM.

We realize that sometimes these risk mitigation strategies can seem onerous or difficult to comply with. One of the most frequent complaints is that insurance won't cover the test you want at the time you want it. We do understand that these tests can be expensive. Overall, we have reduced the number of tests we require, and we will continue to look for such opportunities.

The reality is that there will still be times when some tests are required. In that case, please work with us and your AME to see how we can resolve the issue. Maybe we can use a different test or move the timing to better align with insurance requirements. If we can find a way to mitigate that risk, we can probably work it out.

Farewell

As these pages go to press, I will be retiring from the FAA. I want to take this opportunity to say what an honor it has been to serve as your Federal Air Surgeon. I also want to thank those who took the time to write or attend one of my presentations. Your feedback has been an important part of getting us so far in our goal of certificating as many airmen as safely possible.

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



Q1. Is A-fibrillation a reason to reject a 3rd class medical?

A1. Atrial fibrillation, also known as “AFib,” is a heart condition where the heart beat is irregular. Some people have no symptoms at all, and others may have a sense of fluttering heart, fatigue, and even loss of consciousness. AFib also greatly increases the risk for stroke. While it can be disqualifying, a vast majority of airmen with AFib can be effectively treated and granted special issuance medical certificates.

Q2. Hello, I have a medical question I would like to ask anonymously regarding the implications of an aortic aneurysm on my Class III medical.

I am a 72 yr old white male, 5’10”, 213 lbs who has been flying under a special issuance for high blood pressure for 40+ years.

I went in for the annual Medicare Wellness checkup and my primary care doctor noted elevated blood pressure. He immediately adjusted my medications (all on FAA approved list) and brought it back down to an average of 135/53 mmHg and a heart rate averaging 57 bpm. He then ordered a CAT abdomen scan to check for kidney damage.

The findings include:

“...Ultimately extensive urinary arterial calcification involving all three coronary arteries. The heart is enlarged with concentric left ventricular hypertrophy and mild left ventricular dilatation. There is dilatation of the aortic root, measuring 4.6 cm at the sinuses of Valsalva. Dilation of the proximal ascending aorta, maximum diameter 4.3 cm.”

The reading doctor’s impression is:

“Extensive calcified coronary artery disease. Concentric left ventricular hypertrophy with mild left ventricular dilation. Dilatation of aortic root and mild maximum 4.3 cm aneurysmal change seen in the visualized portion of the ascending aorta ...”

My doctor inquired about symptoms such as chest or arm pain/discomfort. I am NOT experiencing chest or arm pain/discomfort. He did perform a treadmill stress test which I passed. Currently, he has me on a one year follow up for a stress test and CAT scan. All blood test is within normal limits.

I did request a consultation with a cardiovascular surgeon. The conversation started out with him asking “What are you doing here? I do not want to see you until you are a 5.5, or maybe a 5...”

Is this condition within the limits for a Class III medical? If not, can the AME do a complete record review and exam and if satisfied, do a special issuance from his office, or, will he have to refer it to Oklahoma City?

A2. Based on the information you have provided, there are three concerns: calcified coronary artery disease, concentric left ventricular hypertrophy, and a dilated ascending aorta, all three of which would need to be addressed. Since your question is specifically about the aorta, 4.3 cm is within limits, but should be followed annually by echocardiogram. AMEs are not allowed to grant special issuances. I recommend that you take your records to your AME well in advance of expiration of your medical certificate (60-90 days), so that if you need a special issuance, the decision can be made without any lapse in your certification.

Q3. I am 58 years old and I have type two diabetes. I have kept my A1C numbers good with diet and metformin. Can I get a medical?

A3. With the information provided here, assuming you have no diabetes-related organ disease, it sounds as if your chances for special issuance are good.

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

Send your questions to SafetyBriefing@faa.gov. We’ll forward them to the Aerospace Medical Certification Division, without your name, and publish the answer in an upcoming issue.

A safety improvement program that has paid big dividends for the scheduled airlines and other large fleet operators for nearly 20 years is now available for small and medium size part 135 and part 91 operators.

ASAP Expands

Under a Memorandum of Understanding (MOU), the FAA has approved the Air Charter Safety Foundation (ACSF) as a third-party Aviation Safety Action Program (ASAP) manager. ASAP enables employees of charter operators and flight departments to file reports when they are involved in situations with safety implications or possible violations of FAA regulations.

These reports are analyzed by an event review committee (ERC) comprised of the FAA, company management, and participating employee group representatives (pilots, mechanics, etc.). After carefully reviewing the circumstances surrounding each report, the ERC decides on the appropriate course of action to mitigate or eliminate similar occurrences.

The U.S. aviation community spends billions of dollars annually training pilots, mechanics, and other employees in the interest of safety. Operators invest resources in developing standard operating procedures (SOPs) to provide a safety roadmap for employees to follow. The FAA encourages the use of safety management systems to identify and manage risks. Despite all these efforts, mistakes still happen, procedures are not followed, and safety is compromised. That's where ASAP can help.

"The whole premise behind the program is determining root cause of errors and mistakes," said Bryan Burns, ACSF president. Most ASAP pilot reports involve things like altitude deviations, navigation errors, or speed restriction violations. "So, you just had a deviation. What was going on in the cockpit, what was happening?" said Burns.

Filing an ASAP report provides crewmembers with immunity from the FAA for inadvertent, or unintentional, violations of the regulations to encourage people to speak up when something goes wrong.

"Being forthright and honest leads to better procedures, better training," Burns said, "and helps prevent the same mistakes from being repeated. That makes the operating environment safer for everyone."

Such reporting programs have been used by the employees of major airlines and other large-fleet

operators for nearly 20 years, generating tens of thousands of reports that alert the carriers and the FAA to problems that can be addressed by changes in training and procedures.

ACSF officials wanted to provide a way for smaller operators to gain the benefit of similar feedback, and began working closely with the FAA in 2012. With encouragement from FAA senior management in Washington, officials of the agency's Great Lakes Region headquarters got the ball rolling. ACSF signed an MOU with the Great Lakes Region, and operators who wanted to participate in ASAP then had MOUs signed with their local Flight Standards District Offices (FSDOs).

The ACSF-managed ASAP program is now approved in the contiguous United States including the FAA Eastern, Central, Great Lakes, Southern, Southwest, Western-Pacific, and Northwest Mountain regions.

As of late-summer 2016, there were 55 operators enrolled in the ACSF-administered ASAP — 27 part 135 charter operators and 28 part 91 corporate flight departments. Over the past four years, employees of those 55 operators have generated nearly 650 ASAP reports. Another 15 operators are in various stages of signing the MOU/employee training process.

The program is structured so ACSF, not the FAA or the operator, shoulders 90 percent of the administrative burden. "In all respects, it's a win-win for all parties involved," Burns said.

In addition, ACSF members can now participate in the FAA's Aviation Safety Information Analysis and Sharing (ASIAS) program. ASAP participation results in a lot of de-identified information sharing among companies and safety administrators. After all, safety isn't competitive. 

Being forthright and honest leads to better procedures, better training, and helps prevent the same mistakes from being repeated. That makes the operating environment safer for everyone.

Learn More

Air Charter Safety Foundation

www.acsf.aero

FAA's Aviation Safety Information Analysis and Sharing (ASIAS) program

www.asias.faa.gov

Risky Business

The What, How, and Why of Risk Management

A ship is always safe at the shore — but that is NOT what it is built for.
— Albert Einstein

Once upon a time, pretty much everyone involved in aviation took an “accidents happen” view of the world. From time to time in my pre-internet youth, I would pick up the newspaper or turn on the TV news to learn about a major airline accident. The photos were always grim. The details of each accident differed, but the result was the same. The investigation would reveal some human, mechanical, or meteorological flaw. Government and industry would come up with a way to address the issue, and off we’d go until the cycle repeated with the next accident.

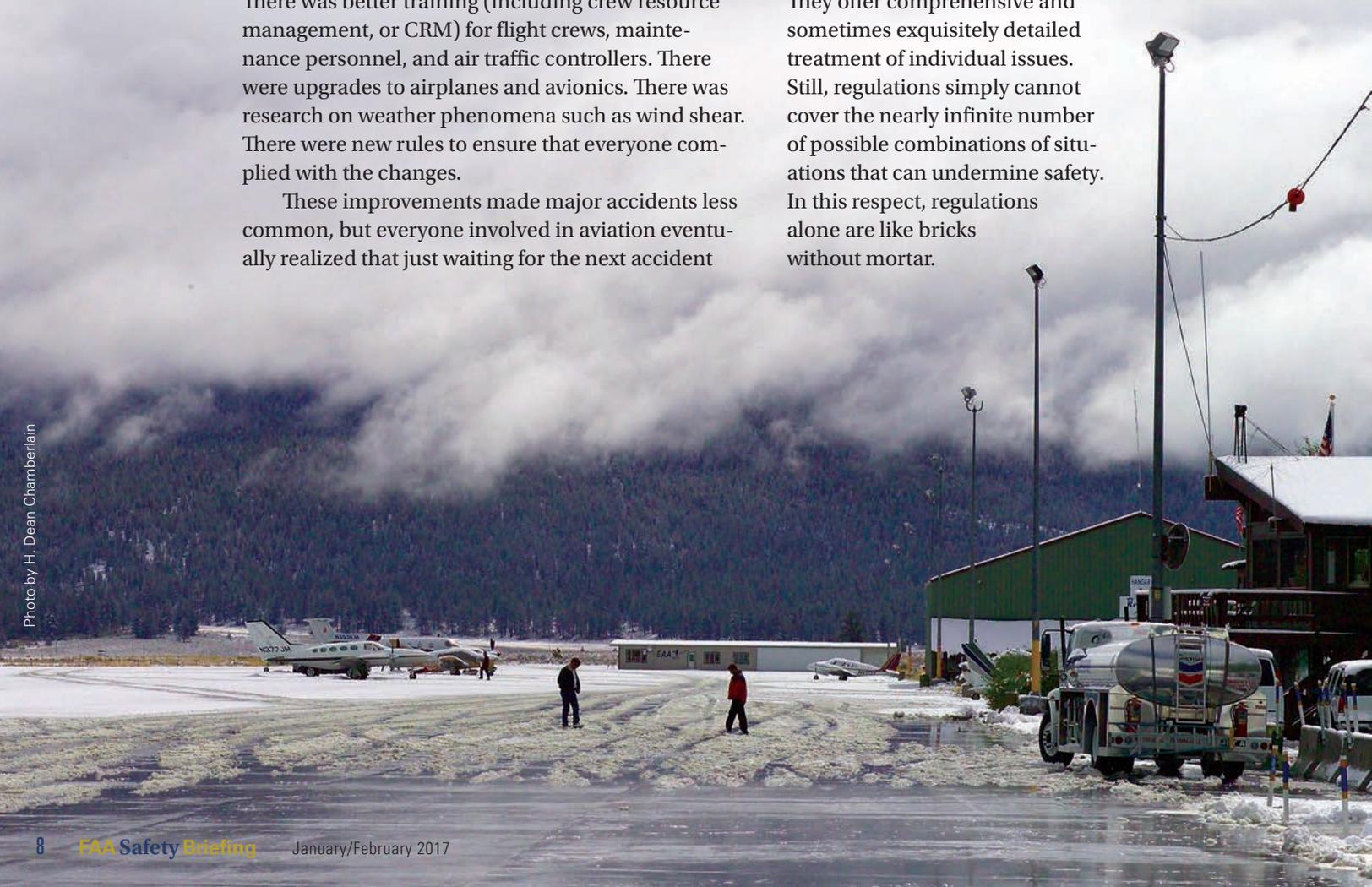
The “find, fix, and fly” approach resulted in a number of safety enhancements over the years. There was better training (including crew resource management, or CRM) for flight crews, maintenance personnel, and air traffic controllers. There were upgrades to airplanes and avionics. There was research on weather phenomena such as wind shear. There were new rules to ensure that everyone complied with the changes.

These improvements made major accidents less common, but everyone involved in aviation eventually realized that just waiting for the next accident

to put a spotlight on some heretofore undiscovered flaw was not the best way to improve aviation safety.

The community — to include government as well as all segments of the industry — also came to understand that even the most faithful adherence to rules and regulations will not prevent the next accident. There is no question that following regulations is a vital part of aviation safety risk management. The rules provide an essential foundation for aviation safety. They are meant to direct the pilot’s path toward practices that contribute to safe operation and away from activities that undermine it.

The problem is that while regulations are necessary, they are not sufficient in and of themselves. They offer comprehensive and sometimes exquisitely detailed treatment of individual issues. Still, regulations simply cannot cover the nearly infinite number of possible combinations of situations that can undermine safety. In this respect, regulations alone are like bricks without mortar.



System Safety

Enter the discipline of risk management, and the concepts of system safety. The terms are admittedly abstract and they have a formal (and somewhat formidable) official definition. But, as the characters repeatedly assert in the slapstick Airplane! movies, “that’s not important right now.” To make the concept more concrete, think of system safety as the mortar needed to bind individual regulatory bricks together and build a sturdy barrier to accidents.

You know about the regulatory “bricks,” so let’s focus on the “mortar.”

A system can be defined as a combination of people, procedures, equipment, facilities, software, tools, and materials that operate in a specific environment to perform a specific task or achieve a specific purpose. GA flight operations clearly constitute a complex system with many variables:

- Pilots have different levels of knowledge, skill, experience, ability, and discipline.
- Procedures, such as instrument approaches, can be very complex.
- Equipment, airframes and avionics, is changing rapidly.
- Services, such as those provided by airports and air traffic control, vary widely and are already changing as NextGen technologies are deployed in the National Airspace System.
- The flight environment, including weather, is a critical factor in the safety of every flight.
- External factors can have a substantial impact, especially if the pilot doesn’t consciously recognize them.

Risk Management

A key part of the system-safety approach is risk management, a decision-making process designed to methodically identify hazards, assess the degree of risk, and determine the best course of action. To put risk management to work in your personal aviation safety system, you need to be familiar with some of the basic concepts:

- A *hazard* is a present condition, event, object, or circumstance that could lead or contribute to an unplanned or undesired event. For example, a ¼-inch nick in the propeller is a hazard.
- *Risk* is the future impact of a hazard that is not controlled or eliminated.

A risk-assessment matrix shows that the level of risk posed by a given hazard is measured in terms of *severity* (extent of possible loss), and *probability* (likelihood that a hazard will cause a loss). *Exposure* (number of people or resources affected) can also be considered in assessing risk.

Here’s a practical illustration of both the “rule gap” and the hazard/risk relationship.

A few years ago, I sent a primary student out to do the preflight inspection. As required by school rules, he carefully checked the Cessna 152’s maintenance and airworthiness records before heading out to the airplane. All paperwork was in apple-pie order.

Reaching the plane, my student discovered a sheen of oil on the nosewheel fairing. When he bent down for a closer look, he noticed that it was fresh, and steadily increasing with the steady drip-drip-dripping of oil droplets escaping from somewhere in the engine compartment.

While he had established compliance with the paperwork and maintenance and airworthiness service requirements, my student correctly concluded that a bleeding airplane

was not in a condition for safe flight. In terms of hazards and risks, the Cessna 152 oil leak was a hazard, but it would become a risk only if

the airplane had been flown. So we went back inside for coffee, and wound up using the scheduled lesson time to discuss safety rules, safety realities, and the concept of safety risk management.

Even the most faithful adherence to rules will not prevent the next accident, because regulations simply cannot cover the nearly infinite number of possible combinations of situations that can undermine safety.

Practical (Easy) Risk Management

To make system safety and risk management practical for real-world GA operations, the FAA Safety Team (FAASafetyTeam) promotes a simple three-step process:

1. *Perceive*, or identify, the possible hazards associated with each category in the well-known PAVE checklist:
 - **Pilot** — e.g., experience, recency, currency, physical and emotional condition
 - **Aircraft** — e.g., fuel reserves, experience in type, aircraft performance, aircraft equipment
 - **enVironment** — e.g., airport conditions, weather (VFR and IFR requirements), runways, lighting, terrain
 - **External factors** — e.g., impact of delays and diversions



The four elements of the PAVE risk assessment checklist.

2. Process, or analyze, by evaluating the severity, probability, and/or exposure of the risk posed by the hazard(s) you identified in step one.
3. Perform by finding ways to eliminate or mitigate the severity, probability, and/or exposure of each of the identified hazards.

With consistent use, cycling continuously through the three-P cycle can become a habit that is as smooth and automatic as a well-honed cross-check, interpret, and control scan taught in instrument flying.

Risk Management in the Airman Certification Standards (ACS)

The FAA Risk Management Handbook (FAA-H-8083-2) observes that:

Learning how to identify problems, analyze the information, and make informed and timely decisions is not as straightforward as the training involved in learning specific maneuvers.

Learning how to judge a situation and “how to think” in the endless variety of situations encountered while flying out in the “real world” is more difficult. There is no one right answer

in Aeronautical Decision Making (ADM); rather each pilot is expected to analyze each situation in light of experience level, personal minimums, and current physical and mental readiness level, and make his or her own decision.

That’s why the new FAA Airman Certification Standards (ACS), which began replacing the Practi-

cal Test Standards (PTS) in June 2016, explicitly incorporate risk management into the certification standards for an airman certificate or rating.

While the PTS has long required the evaluation of knowledge and risk management elements in both the ground and flight portions of the practical test, it offers little more than a statement of the requirement and, in the case of “Special Emphasis” items, a list of subjects the Designated Pilot Examiners (DPEs) must evaluate. The ACS provides better guidance to applicants, instructors, and evaluators because it provides specific risk management and ADM procedures and behaviors associated with each Task, and it incorporates Special Emphasis items in the risk management section of the appropriate Area of Operation/Task. This presentation helps instructors make stick and rudder skills more meaningful by teaching them in the context of what the applicant must know and consider while demonstrating flight skills. On the practical test, it allows the evaluator to see and assess an applicant’s judgment and decision making in the context of actual flight operations. The ACS thus discourages the use of abstract and potentially subjective methods of testing these important skills.

Consistent with the 3-P risk management model, the ACS is also intended to communicate and demonstrate that risk management is a continuous process that includes identification, assessment, and mitigation of task-specific hazards that create risk. The risk management element identifies the circumstantial issues that aviators must consider in association with a particular task.

Because the level of risk that is acceptable to one pilot may not be the same for another, some have expressed concern that testing of risk management

A key part of the system-safety approach is risk management, a decision-making process designed to methodically identify hazards, assess the degree of risk, and determine the best course of action.



elements in the ACS will be too subjective. It is true that risk management is unique to each and every individual, but the ACS defines the circumstances, conditions, or risks applicable to each Task, not to the specific individual. Applicants will thus be tested on their awareness and mitigation of the risks associated with the Task at hand, which includes the applicant's consideration of these elements in the context of the maneuver but taking account of the pilot's experience and ability, the aircraft used, and the operating environment.

Why Bother with Risk Management?

Aviators love to argue, and social media is full of lively debate about the "real" cause of GA accidents.

Some threads focus on deficiencies in so-called stick-and-rudder skills, and suggest — incorrectly — that the addition of risk management diverts attention from airplane handling skills.

In fact, most accidents have multiple causes. Some of the most persistent factors in fatal GA accidents are maneuvering flight, continued VFR into IMC, and loss of control on takeoff. All imply some degree of deficiency in the pilot's knowledge, skill, and risk management abilities. Even the world's best stick-and-rudder pilot is at risk for loss of control if he or she has an inadvertent flight into IMC because of deficiencies in weather knowledge or risk management ability. Safety is not served by emphasizing just one of these three abilities; on the contrary, each supports the others. To paraphrase the familiar "all available information" regulation (14 CFR section 91.103), we need to use "all available means," including risk management, to fly safely. ✈️

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Learn More

FAA Risk Management Handbook (FAA-H-8083-2)

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

Airman Certification Standards

www.faa.gov/training_testing/testing/acs

Safety Enhancement Topics

January: Single-Pilot CRM

How to manage a crew of just you.



February: Personal Minimums & Weather Cameras

Understanding how to establish, maintain, and adhere to personal minimums when flying.



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

Say Ahh ...

*A Pilot's Guide to
Self-Assessing Risk*

TOM HOFFMANN

In the grand scheme of aviation risk management, it is easy to focus on the more tangible and black-and-white realities of flying. For example, will my airplane clear that 50-foot obstacle at the end of the runway with full fuel? Or, is my aircraft properly equipped for night flight in instrument meteorological conditions (IMC)? A few performance calculations, handbook references, and preflight checks can usually affirm a clear go, or no-go, decision.

Where it can get fuzzy and gray is assessing the level of risk that you, as the pilot, bring to the equation. Instead of relying on calculations and hard numbers to measure risk, it requires a more internal assessment of your readiness to fly, as well as being honest with yourself and your abilities. It boils down to three basic questions you should ask yourself before any flight: *Am I healthy? Am I legal? And am I proficient?* This article will explore how to assess and address pilot risk in each of these areas.

Am I Healthy?

I'm a visual person. The more of something I can visualize, the better I can understand it and tuck it away in my memory banks. I'm also a firm believer in the power of acronyms and mnemonics, those memory-jogging abbreviations that are engrained in

aviators' everyday operations. While some aviation acronyms don't always give us a good sight picture of what we're expected to do, the "I'MSAFE" acronym is one that I believe hits the proverbial nail on the head. It offers a simple and easy-to-remember way of checking your health before every flight. Let's break it down.

Illness — Am I Sick?

While the average 9-to-5er may bristle at the thought of calling in sick from a simple case of the sniffles, that same act of fortitude can prove problematic when deciding to fly. In addition to dealing with the distraction of pain and/or discomfort, even common maladies like a cold are often accompanied by a regiment of over-the-counter (OTC) medications that can wreak havoc on a pilot's ability to stay focused and clear-headed during flight. We'll cover more on meds next, but the bottom line here is quite simple: if you're not well, don't fly.

Let's say you knew in advance that your engine was only going to give you 80 percent of its best possible performance on a given day. Would you still fly? It's the same expectation you should have for yourself — nothing less than running on all cylinders should be acceptable.

The regulations have something to say about this as well. Title 14 Code of Federal Regulations (14 CFR) section 61.53 outlines operational prohibitions for pilots when they know, or have reason to know, of any medical condition (whether it's a chronic disease, or a 24-hour bug) that would make them unable to meet the requirements for the medical certificate necessary for the pilot operation, or — for those not requiring medical certification — make them unable to operate an aircraft in a safe manner. Although vague in design, the rule prompts pilots to use good judgment and voluntarily ground themselves when they're not feeling up to the task of aviating.

Medication — Have I Taken Any Prescription/OTC Meds?

As we noted earlier, medications can have a clear impact on a pilot's ability to perform. While some effects are obvious, others can be deceptively detrimental and may vary according to an individual's tolerance level. Among the top offenders are sedating antihistamines, in particular, diphenhydramine (aka *Benadryl*). In addition to being an active ingredient in many cold medications, diphenhydramine is also used as an OTC sedative and is the sedating agent in most PM pain meds.

Evidence of rising antihistamine use (as well as other OTC medications) was at the forefront of a 2014 NTSB study, in which the percentage of pilots with potentially impairing drugs found in their system after an accident was greater than 20 percent in 2012. That was more than double the rate found at the outset of the study in 1990. The most common potentially impairing drug found in this study of nearly 6,600 aviation accidents: you guessed it, diphenhydramine.

A good way to ensure the medications you use don't impair your flying is to first check the labels. Thankfully, the U.S. Food and Drug Administration (FDA) has strict labeling standards for all OTC medications so it's easy to make comparisons and spot any potential side effects. The FDA also has a handy, online label checker you can use too (<http://labels.fda.gov/>). For medications that have a warning about using caution when driving a vehicle, the FAA recommends using the "Rule of 5" — waiting at least five times the longest recommended interval between doses before flying.

Labels won't always answer all your questions so contact your Aviation Medical Examiner if you're



unsure about a particular drug or would like to know more about safer alternatives. For more information, go to <http://go.usa.gov/xkMvh>.

Stress — Do I Have Any Job, Money, Family, or Health Issues?

We may not always think about it, but we're under some level of stress with almost everything we do — whether on the job, with family, or even during what's supposed to be a relaxing backcountry camping trip. Stress can affect people differently, so it's really important for you to have a way of gauging a clear head and a sound state of mind before taking that flight.

A brief quarrel with your spouse, while seemingly insignificant, can easily cloud your thoughts and cause you to be distracted during flight. (Been there, done that, and learned a valuable lesson!) A more severe event, like the loss of a job, or a loved one, requires even more attention and self-examination to assess whether or not you've been able to properly come to terms with your situation and your emotions. It may not always be the easiest thing to



do — especially if others are counting on you to fly them somewhere — but delaying or postponing a flight due to stress is always a good call.

There are several ways to help manage stress and prevent it from accumulating. For starters, try maintaining a regular exercise regime and make relaxation a priority in your daily schedule; have you actually ever tried yoga? It's a great way to combine

Stress can affect people differently, so it's really important for you to have a way of gauging a clear head and a sound state of mind before taking that flight.

the two. Sharpening your time management skills can also help reduce stress by meeting deadlines and keeping those honey-do lists from growing too large. Finally, an FAA study in 2000 on the impact of stress in aviation found that the top ranked stress coping strategy among participants was a stable relationship with a partner, so don't be afraid to bend your spouse's ear!

To learn more about how stress can affect your performance, watch this FAA video (www.faa.gov/tv/?mediaid=450) and check out the article "Stress in Flight" in the Jan/Feb 2009 issue of *FAA Safety Briefing*.

Alcohol — Have I Had a Drink in the Last 8 Hours? 24 Hours?

For many, "throwing back a few" can be an effective way to relax and unwind after a tough day. But if flying is on your horizon, you'll want to reconsider

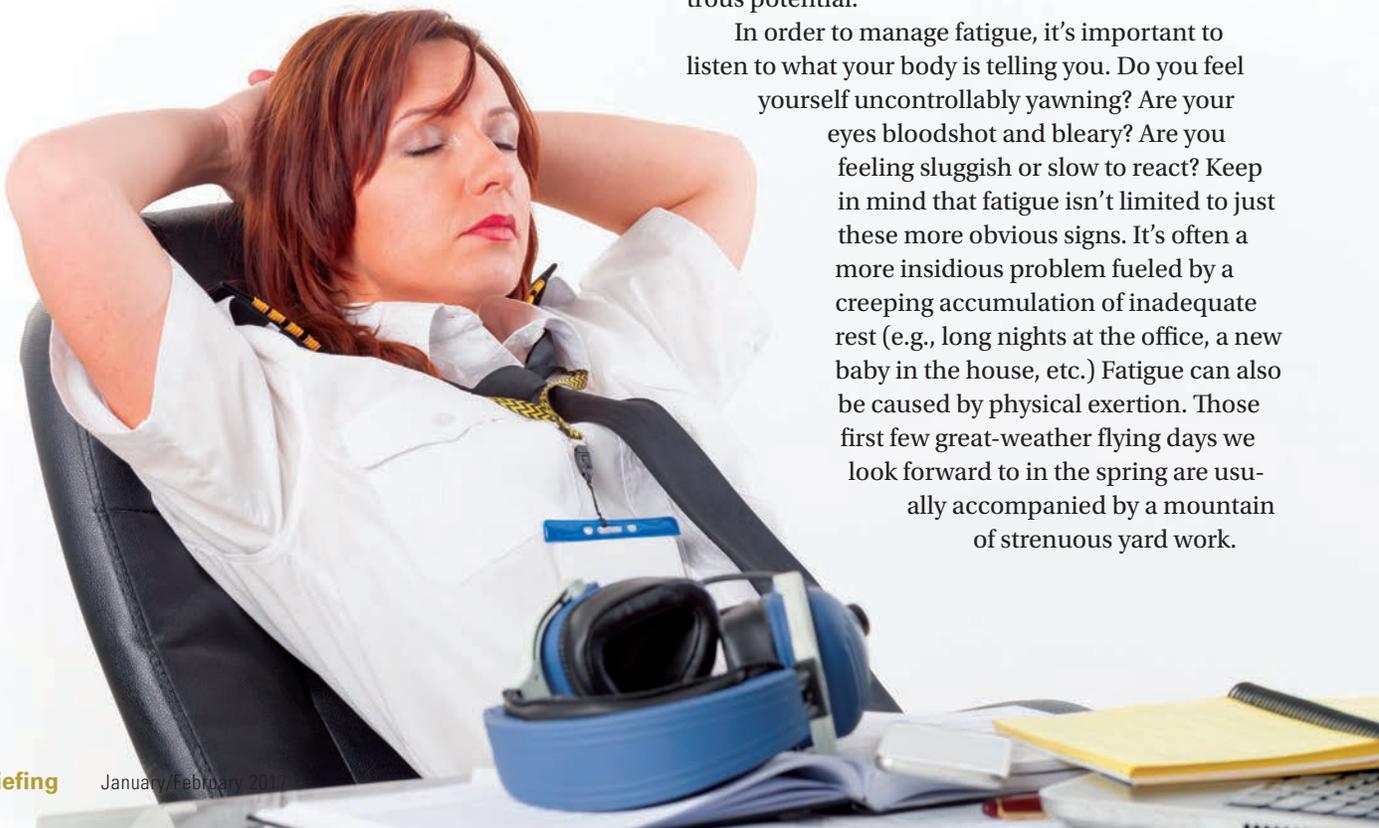
your actions. Like beer and wine, the two just don't go together. The regulations (14 CFR section 91.17) say you may not operate an aircraft within eight hours of having consumed alcohol. Given the lingering effects alcohol can have on the human body, it's best to pad that time and wait 24 hours before flying. And if you were really in a "celebratory mood," keep in mind that the damaging effects of booze can last 48 to 72 hours following your last drink in the form of a hangover and well after your body has eliminated all alcohol. Add in night conditions or bad weather to any of these scenarios, and the negative effects on flying can be magnified greatly.

For more information, have a look at the FAA's brochure "Alcohol and Flying — A Deadly Combination" at <http://go.usa.gov/xkFJd>.

Fatigue — Am I Properly Rested?

The impact of fatigue in the aviation industry is an all-too-common phenomenon. Although it's rarely the singular cause of a fatal accident, the term pilot fatigue is riddled throughout NTSB probable cause reports in all segments of aviation. It's more commonly the ugly precursor to many poor last decisions (or indecisions). As to why a simple lack of rest is not mitigated more often, some might say it's because it can be easily remedied with coffee or an energy drink, or that it's just something they feel is a nuisance they can power through. Both are false narratives that gravely underestimate fatigue's disastrous potential.

In order to manage fatigue, it's important to listen to what your body is telling you. Do you feel yourself uncontrollably yawning? Are your eyes bloodshot and bleary? Are you feeling sluggish or slow to react? Keep in mind that fatigue isn't limited to just these more obvious signs. It's often a more insidious problem fueled by a creeping accumulation of inadequate rest (e.g., long nights at the office, a new baby in the house, etc.) Fatigue can also be caused by physical exertion. Those first few great-weather flying days we look forward to in the spring are usually accompanied by a mountain of strenuous yard work.



And while you may not typically be exposed to the long duty days and time zone shifts that a commercial pilot might have, you do have to deal with the stress of a single-pilot workload with no one to catch your mistakes.

Regardless of what causes fatigue, the important thing to know is how it can affect your performance in the cockpit and how to prevent it in the first place. The antidote here is simple: get more sleep. You may have heard it a thousand times before, but strive for eight hours of sleep per night. Easier said than done, I know. But one thing that I find helpful in measuring the quantity and quality of sleep, is wearing a wristwatch activity tracker to bed. Many are able to provide a full report of your sleep cycles, including periods of restlessness and time awake. Arming yourself with this kind of data can go a long way to more accurately assessing your fatigue level before a flight.

For more tips on combatting fatigue, see the FAA brochure at <http://go.usa.gov/xkMwc>.

Eating — Have I Had Enough to Eat or Drink?

Now, I know many versions of I'MSAFE use Emotion for "E," but I think that is something we covered adequately under our discussion about Stress. Instead, we'll use "E" to cover a subject more near and dear to my heart: eating. Eating healthy, well-balanced meals is the best way to achieve your body's peak performance levels. Unfortunately, not every airport has a Joe's Diner conveniently nearby. In fact, GA pilots can often go several hours past their normal mealtimes without eating thanks to weather delays or unexpected diversions. It's always a good idea to pack a lunch just in case, or at the very least, a few healthy snacks that will tide you over. The same goes for hydrating. Drink whenever you get the chance. Dehydration can cause dizziness, confusion, and weakness and can seriously impair your ability to fly. I never fly without at least one bottle of water in my flight bag, and I always hit the water fountain anytime I see one.

Am I Legal/Proficient?

Now that we've reviewed some of the physical and mental hurdles an airman can face, it's time to cover some of the legal and experiential aspects of completing a pilot risk assessment. Let's start by addressing the fact that being legal or current is by no means an indication of being proficient when it comes to flying. The FAA sets clear standards when it comes to what's required in your

logbook before you can fly as pilot in command, within a certain time period. For a complete list of these requirements, see 14 CFR section 61.57 (<http://go.usa.gov/xkM7t>) as well as 14 CFR section 61.56 (<http://go.usa.gov/xkMHP>) for flight review requirements. However, just meeting these requirements alone is unlikely to make you a fully competent and proficient pilot. That takes additional effort.

A good start towards fine-tuning proficiency is to use a flight review as an opportunity to go outside your comfort zone. Weak on crosswind landings? Been a while since you did a short field grass takeoff or simulated an onboard fire? Then make these priority items to work on with an instructor and/or during a flight review. A review that just substantiates all the things you already have a good grasp on is not exactly time (or money) well spent. The key to proficiency is practice. And then more practice.

There's lots of resources, and the FAA can help you become proficient. If you haven't already signed up to be a part of the FAA Safety Team's WINGS Pilot Proficiency Program, I highly encourage you to do so. The program is specifically designed to help pilots become more proficient by attending safety seminars, completing training courses, and performing various flight activities. Go to FAASafety.gov for complete details.

It's Personal

Flying is an inherently risky business. However, learning how to identify and mitigate the potential risks that a pilot brings to a flight is a significant step towards improving your odds of a safe outcome. I hope the information presented here can give you a better understanding of what to look out for and what to question before each and every flight. It can be difficult, as assessing pilot risk is a very personal process and one that requires intimate awareness of your limitations. You have to be upfront with yourself mentally, physically, and experientially. Here, honesty is not the best policy — it's the *only* policy. 

Pilot risk assessment is a very personal process and one that requires intimate awareness of your limitations. You have to be upfront with yourself mentally, physically, and experientially.

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

JENNIFER CARON

Is My Aircraft Right *for* Flight?

The Importance of Preflight Prep

What's that weird noise? I think to myself as I prepare for departure. I just finished my run-up, ready for take-off, and there it is again — that deep knocking sound — three times now — “knock, knock, knock.” But I just shut this airplane down 30 minutes ago — quick stopover, I needed a break. Now I'm running late, so I skipped the preflight check completely. But I always do a full run-up on every start-up, so it should be good to go without a preflight check, right? Don't leave anything to chance.

Last year, 384 people died in 238 general aviation accidents. Powerplant system and component failure was, and is, the third most common event for fatal accidents, and maintenance errors were not to blame. Inadequate preflight preparation was cited as a contributing factor in many of these accidents.

“A” in PAVE

Preflight preparation of your aircraft is one of the most important steps you can take to ensure that your aircraft is fit for flight. It is a critical function of the “A” in the personal minimums PAVE checklist of **P**ilot, **A**ircraft, **E**n**V**ironment, and **E**xternal Pressures. It is one of the tools pilots use to assess the risk of a flight by evaluating the presence of risk factors in each of these four areas.

The PAVE Checklist works like any checklist that you would use in your aircraft. You should expand the use of the PAVE to your flight planning as well, and take special consideration on each line item before your final decision to fly.

To help with the “A” in PAVE, I've highlighted some simple steps you can take to evaluate your aircraft prior to takeoff.

Step One — Is it Airworthy? To be airworthy and safe to fly, the aircraft must meet two primary conditions. First, it must conform to a type design. Second, it must be in a condition for safe flight.



Photo by H. Dean Chamberlain

Type Design

An aircraft must conform to its type design, which includes not only its equipment but also *documented* compliance with all required maintenance inspections. The Type Certificate Data Sheet (TCDS) for the aircraft provides a formal description of the aircraft, engine, or propeller, along with limitations and information on items such as airspeed, weight, and performance limits.

Condition for Safe Flight

To be in a condition for safe flight, all required and installed equipment must be in good working condition. Any repairs and modifications must be correctly documented. Your aircraft needs an FAA Form 337 any time it has undergone a major repair or major alteration, as any changes to type design require approval through a supplemental type certificate (STC) that documents the FAA's approval of a product (aircraft, engine, or propeller) modification.

Additionally, your aircraft must meet the requirements of certain inspection cycles. You should be able to find aircraft maintenance log entries for completion of the annual or (if applicable) 100-hour inspection, which includes verification of any applicable airworthiness directives and any required equipment checks, for example, the VOR and altimeter/pilot-static system, the transponder, and the emergency locator transmitter (ELT) battery strength.

After maintenance, check systems thoroughly, or ask qualified maintenance personnel to help reinspect the aircraft to ensure all systems are a go.

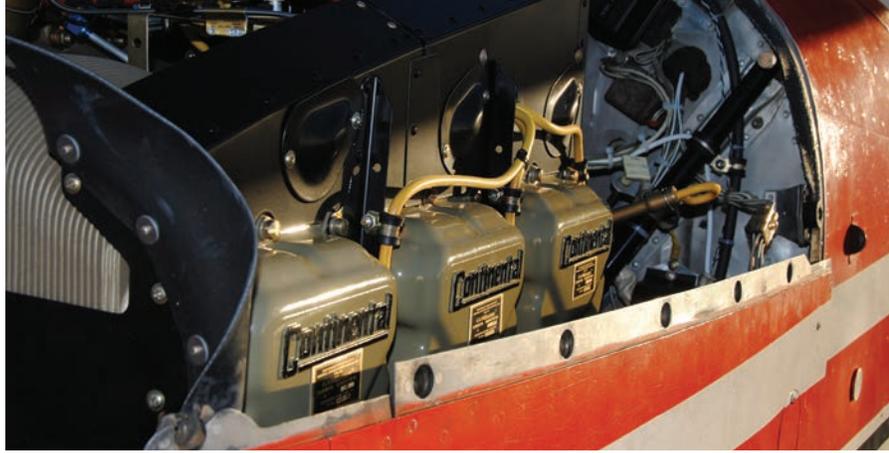
Step Two — Is it My Type? Know your experience level flying that particular aircraft type, and know your aircraft's performance abilities and limitations.

Step Three — Gas in the Tank? Know your fuel reserves. For more detail, see "Fuel Gauge Systems" in this issue of *FAA Safety Briefing*.

Step Four — Checklist Checked? Preflight checklists are your friends — use them! It is important for you, as a safety-minded pilot, to make use of a physical preflight checklist. Never work from memory. In this way, you can ensure that you do not skip or misevaluate the items you are checking. Always exit the aircraft and move around it methodically, avoiding interruptions and distractions during your external inspection.

Go one step beyond the official checklist items and develop an additional items checklist to be used in conjunction with the aircraft's preflight checklist.

Photo by Tom Hoffmann



Take a look at the FAA Safety Team's (FAASteAM) Advanced Preflight pamphlet for guidance on developing an additional items checklist to add to your preflight arsenal. It's available on their website at <http://go.usa.gov/x8CkF>.

Preflight preparation begins and ends on the ground, and is one of the most important steps you can take to ensure that your aircraft is fit for flight.

Bring Your "A" Game

Another way to check your "A"ircraft, and to proactively assess risk for a given flight, is with a Flight Risk Assessment Tool (FRAT). A FRAT helps pilots make better go/no-go decisions by asking a series of questions that generally follow the PAVE checklist. There are an abundance of FRAT options to choose from, they are simple to use and many are available as apps on your smartphone or tablet. Check out "Assessing Risk in the Palm of Your Hand" in this issue's Angle of Attack department for more details.

Remember This

With safety in mind, following proper preflight procedures plays a critical role to ensure the airworthiness of your aircraft prior to takeoff. The steps you take before your aircraft leaves the ground will pay huge dividends towards your piece of mind while in the air.

And that weird knocking sound we heard earlier? Well, that was just your aircraft reminding you to do a thorough preflight check. Fly safe! 

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

Learn More

FAA Safety Briefing Mar/Apr 2012, "Advanced Preflight, Take Your Preflight Inspection to the Next Level"

<http://go.usa.gov/x8CAK>

Advanced Preflight after Maintenance Flyer

<http://go.usa.gov/x8CAJ>

Link to FAASteAM Safety Materials

<http://go.usa.gov/x8CsZ>



BRING THE HEAT

How to Avoid Induction Icing

DR. DAVE SWARTZ

In addition to long nights, cold temperatures and high energy bills, winter also brings with it a more insidious foe specific to aviators; induction icing. As air temperatures drop, high relative humidity occurs more frequently, especially around bodies of water creating prime conditions for carburetor (carb) or fuel induction system ice.

Revelations of Recent Wrecks

The Alaska Office of the National Transportation Safety Board (NTSB) determined that induction ice likely caused four accidents in Alaska last year.

The common thread in all four accidents was a failure to use carb heat when appropriate. Their mistakes should serve as important lessons for all of us, so let's have a closer look at what carb icing is, how it forms, and how to prevent it.

Induction Ice, ID-ed

Carb icing can happen to any carburetor under the right atmospheric conditions. When there is humid air, water vapor in the venturi can freeze and collect on the throat of the carburetor and throttle plate, blocking airflow to the engine. In the case of fuel injection systems, the impact tubes can ice up, resulting in either an incorrect fuel air mixture or no fuel at all.

Conditions Conducive to Carb Ice

Most airplanes do not have a relative humidity indicator, which is very important for knowing if you are likely to get carb ice, and at what power setting. So how does a pilot, without an on-board meteorologist, know when they are in these conditions?

The first step is understanding when carb icing conditions are likely to occur, and then being vigilant in using induction heat when they do occur. Take a moment to study the chart on the next page. The data is from a NASA study of carb ice accidents back



An example of carburetor icing from a real incident that affected power significantly.

in the 1980s. Note that the temperature and humidity range covers a lot of the kinds of conditions we fly in throughout a good part of the year.

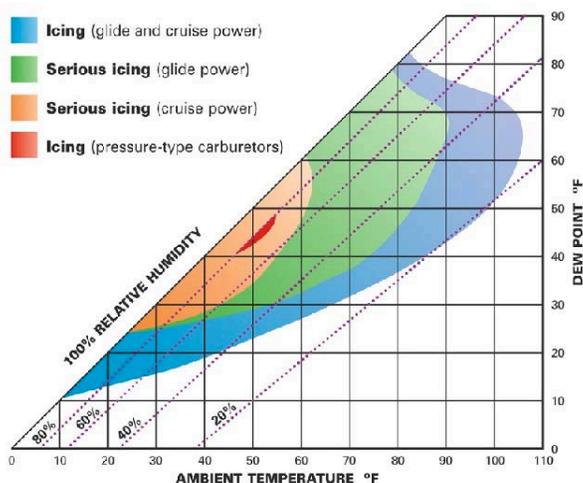
The worst conditions for carburetor ice are also the wettest, where the temperature and dew point are equal at 100-percent relative humidity (RH). Now, think about where we fly when we have a cloud ceiling. As VFR pilots, we tend to fly as high as we can without going into the clouds or busting minimums. In a stable atmosphere, the RH climbs with altitude until you hit the cloud base where it is, by definition, saturated (i.e., 100-percent RH).

Carb Heat Systems

The primary way to avoid having engine problems due to induction icing is to use carb heat. In most airplanes, when you pull the carb heat knob, a flapper door opens and the engine pulls warm air through a heat exchanger (also called the carb heat muff) that surrounds your exhaust system. The standard that has served us well for testing a new carb

Photo by Angelo DeSantis

Photo by Dennis Gerstung



heat system is a 90 F heat rise, at 75-percent power, at 30 F outside air temperature.

This heat rise test is done fairly frequently as part of the new Supplemental Type Certificates for exhaust systems, and often fails because the system hasn't been well maintained. Typically when we dig into the causes, a leak in the air box is revealed, which allows cold ram air coming through the air filter to leak around the flapper valve, diluting the hot air and thereby cooling down the heated air from the carb heat muff.

Some airplanes have an automatic spring-loaded door that opens by engine suction in the event that the air filter becomes plugged. When you are flying through snow, it's common for the air filter to become plugged with impact snow (especially wet snow). The condition of the door is important because if it doesn't open, the engine will quit (this happened to me personally in the clouds over the Cascade mountain range). When the door opens, you'll notice a slight power loss due to the intake air being warmer and sheltered inside the cowling. It's possible the door can stick, so it's a good thing to check it periodically, especially at annual to make sure it opens properly.

Bring the Heat!

Far more issues arise from *not* using carb heat, especially on descent at lower power settings, than using it too often. Using carb heat doesn't hurt the engine, except in truly rare conditions. The only exception might be in extremely dusty conditions with severe visibility restrictions, or if you get caught flying through volcanic ash where the air filter is very important and is bypassed by most carb heat systems.

If you are pulling your carb heat knob and not seeing a significant rpm drop, the system could be leaking, or your cable could be broken. Leaky air boxes are remarkably common. One frequently asked question is, "how much drop should I expect?" The manual is the best place to start for answers, and many say to expect a drop between 75 and 150 rpm.

If I was getting less than 75, I would probably have a chat with my mechanic.

If you are burning auto fuel, some research has caused Transport Canada to advise extra caution regarding picking up carb ice. It appears that aircraft burning auto fuel may be more susceptible to carb ice than aircraft burning 100LL, due to increased evaporative cooling caused by the higher vapor pressure in auto gas.

Set your power deliberately at a specific rpm or manifold pressure and keep those gauges as part of your scan. It also helps if you choose a specific altitude for cruising, so you can tell if an rpm drop is due to ice or because you are climbing.

If you wait to pull carb heat until the engine has actually quit, it will be too late for the heat exchanger to melt the ice. That means the likelihood of getting power back is pretty low if you don't catch the ice buildup early. Sometimes descending to a lower altitude where the air is warmer works, but terrain has to allow for that. The bottom line is if you think you might be getting ice, pull carb heat, watch for an rpm drop, which is followed by a rise. The engine might run rough for a little bit.

If you are in the temperature and humidity envelope in the chart, you are in induction icing conditions, even if it isn't raining or snowing. That means you should suspect carb ice, and take the steps necessary to prevent an engine failure. Based on accident reports and information from pilots and flight instructors alike, there may be a lack of knowledge about how prevalent icing conditions are. As a result, pilots aren't using carb heat downwind in some airplanes when power is reduced, even when they are in the blue area of the chart.

Some pilots suggest that applying carb heat at low power on approach may impact the power needed for a go around, especially on off-field landings. Based on the accidents and the science, however, the bigger risk is not having **ANY** power due to carb ice on the go around. You get 95-percent of the power with the heat on anyway, and it only takes a second to push the heat closed. ✈️

Dave Swartz is the Senior Engineer at the Anchorage Aircraft Certification office and an active general aviation pilot and airplane owner.

Learn More

NTSB Safety Alert on Carb Ice

<http://go.usa.gov/x8Ce4>

FAA Special Airworthiness Information Bulletin on Carburetor ice SAIB CE-09-35

<http://go.usa.gov/x8CMh>

THE WILD (Not So) BLUE YONDER

Mitigating Risk in the Flight Operating Environment

The enVironment portion of the PAVE (Pilot, Aircraft, enVironment, External Pressures) risk assessment checklist addresses one of the pilot's most critical risk assessment and decision making responsibilities. It's a huge area, because it includes so many permutations and combinations.

The most obvious risk element is weather, a powerful and often fickle factor in the equation for assessing environmental risk for flight. But wait — there's more. Other environmental factors include terrain, obstacles, lighting, airspace, airports, traffic and probably more. On its own, each factor has an impact on flight, but it is also essential to assess their combined impact. It's a daunting, but very necessary, task. Let's take a look at how to do it.

The Whither and Whether of Weather

Nowhere is our human difficulty in dealing with probabilities on better display than when it comes to understanding and assessing weather. By its very nature, weather forecasting is all about probabilities. What will happen where, and with what certainty?

FAA Safety Briefing Editor Susan Parson addresses the application of this topic to GA flying in detail in a previous issue that is well worth your time ("The Whither and Whether of Flying in Weather," July/August 2010 at <http://go.usa.gov/x8T9M>). Parson presents the framework developed by Robert Buck in *Weather Flying*. To recap, Buck lists three ways in which weather affects an aviator:

1. Weather can create wind.
2. Weather can reduce ceiling and visibility.
3. Weather can affect the aircraft performance.

Parson recommends evaluating each of these factors in terms of both the pilot and the aircraft to be flown. The specific pilot-airplane combination is a team that, like any team, is only as strong as the weakest link. When it comes to weather flying, even the best-equipped airplane cannot make up for a pilot with deficient knowledge or skill, and even the world's best pilot cannot overcome the performance limitations of a given airplane.

Making the evaluation that Parson suggests starts with getting solid weather information. To get tips on that critical process, I contacted Monica Bradford, the Flight Service Safety and Operations Manager of the FAA's Flight Service Directorate. This office manages the contract with Leidos (formerly known as Lockheed Martin).

The world has changed since the days when a telephone call to Flight Service was your only option for a weather briefing. You can now visit a number of government and commercial websites to get a briefing. "Our data shows pilots primarily use web-based tools to obtain flight services, with 95-percent of FAA-provided preflight briefings done via web services," Bradford explained. "Regardless of what website they use, pilots should verify the weather sources. It is helpful to ensure that the website logs briefing activity and that it can provide an alert when the data is no longer valid. Pilots are not required to use FAA-contracted websites, but www.1800wxbrief.com and www.duats.com both have FAA oversight." She also urges pilots to take advantage of the expertise Flight Service can offer: "If you are unsure about things you see online, contact a Flight Service specialist."

More Than Just a Map

The terrain, or lack thereof in the case of water, is more than just a pretty scene to enjoy from aloft. It may or may not impact your thinking and planning. Is the terrain rough or flat? Is it wooded or open? Is it densely populated or uninhabited? All of these things play a role in safely traversing the environment of your flight. They also potentially impact factors in other areas of the PAVE checklist, like equipment or pilot skills. These impacts may be regulatory in nature, like supplemental oxygen requirements to get over high terrain. Or they may be more practical, like ensuring that you have survival gear when flying over desolate areas or floatation gear when crossing large bodies of water.

Terrain can also put your piloting skills to the test. Mountain and bush flying are skills generally not taught at most flight schools. Along the east coast, mountains can generally be avoided by simply flying over them — not a problem for most GA aircraft. The western part of the country, though, boasts peaks that are beyond the operating capability of most GA aircraft.

Clearly, these factors create additional risk if you don't have the appropriate training or experience, not to mention currency and proficiency.

Obstacles are another potential hazard in the flight environment. Most of us have seen thickets of "airplane stickers," aka antennas and cell phone towers which can appear anywhere — including near airports. When flying in an unfamiliar airport environment, be sure to study a current chart to note the location of these obstacles.

The Regulatory Rainbow

Another aspect of the GA operating environment is airspace and ATC. Here in the nation's capital, we have a rainbow of restricted and controlled airspace. Between Mode C, Class B, Restricted, and Prohibited airspace combined with a Special Flight Rules Area (SFRA) and Flight Restricted Zone (FRZ), flying in the nation's capital may have you thinking our Terminal Area Chart (TAC) is something out of an Onion story.

Another example of complex airspace is the area surrounding New York City.

When it comes to weather flying, even the best-equipped airplane cannot make up for a pilot with deficient knowledge or skill, and even the world's best pilot cannot overcome the performance limitations of a given airplane.

New York's collection of very busy airports, both GA and air carrier, means that the controllers in center and approach control need to work and talk very quickly. This reality can present a problem for pilots who are less comfortable with the pace of operations. We provided some tips to help with this in "Don't Cower from the Tower," in our Jan/Feb 2012 issue available at <http://go.usa.gov/x8q8K>.

Remember that airspace "gotcha" factors can exist anywhere, or appear in the form of temporary flight restrictions (TFRs).

Once on the ground, more risk management opportunities appear at unfamiliar airports, especially "big airline" facilities with multiple runways and taxiways.

Careful study reveals that it is all quite manageable but, again, risk management and decision making require that you do your homework.

Mitigating Factors

When it comes to environmental risk mitigation strategies, preparation is key. A great place to start is with educating yourself at FAASafety.gov. You can find online courses on a variety of topics from airspace to weather. You can also search for local seminars or webinars. In the case of the Washington, D.C. area, you can also find the required training course for the SFRA.

There's another way the FAA Safety Team (FAASTeam) can help you. The FAASTeam is made up of volunteers and FAA employees across the country, all dedicated to helping improve GA safety. You can tap into the network of local experts through the FAASTeam directory on FAASafety.gov. This directory allows you to search for FAASTeam leaders in your area or in future destinations. The FAASTeam Program Manager (FPM) for a certain area is usually your best point of contact. Be aware that there are FPMs for both Operations (pilots) and Airworthi-

ness (aviation maintenance technicians). These FAA employees can help with advice or direct you to resources that will be helpful.

I got firsthand experience of this valuable local knowledge when I contacted FPM Mike Yorke of Anchorage. "One of the things most visiting pilots don't know about is the Alaska Weather Camera program," explains Yorke. "The cameras allow pilots and briefers to get a first-hand look at exactly what the weather is doing at many airports and mountain passes. It's a really great resource and I'm always surprised how many pilots aren't aware of it,"

Another thing you can do to assess, manage, and mitigate risk in the flight environment is to develop personal minimums. For a short primer on this topic, check out "Your Safety Reserve" in the March/April 2015 issue (<http://go.usa.gov/x8T9d>) of *FAA Safety Briefing* or, for still more detail, "Getting the Maximum from Personal Minimums" in the May/June 2006 issue (<http://go.usa.gov/x8T97>).

Another environmental risk assessment aid is coming soon. Be on the lookout for the FAASTeam's forthcoming Flight Risk Assessment Tool (FRAT).

It's a big world out there — and GA is a great way to explore it. Just be sure that you carefully evaluate the flight operating environment before you launch into the wild blue yonder. 

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

Learn More

FAASTeam FRAT

<http://go.usa.gov/x8mcH>

Weather Briefings

www.1800wxbrief.com

www.duats.com



The condition of your runway, whatever it is made of, is an important factor.



PAUL CIANCIOLO

Are We There Yet?

Exploring External Pressures

If you won't put up with a backseat driver, then why would you be influenced by a backseat flyer? The external or social pressures associated with completing a flight have been associated with a number of general aviation (GA) accidents. There is almost always pressure on the pilot to launch, and pressure to continue. Even the drive to the airport itself can create pressure to avoid wasted time.

The "E" in PAVE

When you fly with non-pilot passengers, prepare yourself; they may not say it, but they are thinking it. *Are we there yet? Are we there yet? Are we there yet?* If you just rolled your eyes at those words, you were affected by the "E" in PAVE (the risk assessment checklist of *Pilot, Aircraft, Environment, External Pressures*). The "E" here is the external pressure of "get-there-itis" — or "get-home-itis" depending on the destination.

"Simply put, get-there-itis is a pilot killer!" observes Allan Kash, an aviation safety inspector (ASI) in the FAA's General Aviation and Commercial Division. "It's a classic behavioral trap, which is an accident-inducing, operational pitfall a pilot may encounter as a result of poor decision making." (For more about this topic, check out "Get-Home-Itis" in the March/April 2013 issue of this magazine.)

Get-there-itis is often a result of the influence of your passengers. They tend not to understand the intricacies of GA flying.

"The biggest external pressures that I've experienced are non-pilot passengers," notes Kevin Clover, an ASI and FAA's national FAA Safety Team (FAAS-Team) operations lead. "Their general expectation is that an airplane ride is going to go like a car ride. They can become irritated and even bored by all the things that have to be done or considered to get the airplane in the air."

What else is one to do without cell service or WiFi, right? Some people cannot handle the pressure of being away from their Internet connection, so that pressure can migrate to the pilot while in the air. This doesn't just apply to kids or spouses either. Those high-powered business types used to making decisions and taking risks can create a pressure on the pilot to complete the flight.

"When you tell them there is a safety issue, they still want to make the decision to go," explains Clover, who is a former part 135 charter pilot. "They can't seem to separate making a business decision that involves the loss of money to that of a flight decision that could involve the loss of life."

You're the pilot-in-command, so the responsibility of a safe flight rests with you, not your passengers. Motivation to meet a set schedule not under the pilot's control will cause pressure on the pilot, even if flying solo. Significant family events like family reunions, weddings, funerals, graduations, athletic events, connecting travel arrangements, and



Newly certificated pilot BJ Lange (right) prepares his non-pilot passenger and comical colleague Rocco Marrocco on flight expectations starting with this preflight selfie. Non-pilot passengers are a major external pressure that can affect a pilot's decision making if not adequately handled in advance.



Lt. Col. J. Jerusha McLeod takes aerial photos of flood damage from the backseat of a Civil Air Patrol Cessna 182 soon after Hurricane Sandy devastated the New Jersey coast in 2012. Getting these photos to FEMA without delay puts an external pressure on the pilot to complete the mission, which is a risk that must be managed to ensure a safe flight.

vacations can cause the perfect internal storm that pushes you out of your comfort zone.

"In this scenario, pilots can be compelled to take unnecessary flight risks when making the go, no-go, decision for that particular flight," states Marcel Bernard, an ASI and FAA's aviation training device national program manager. "An example would be departing on a flight in marginal, or forecast marginal weather conditions when they would otherwise not go." Bernard has personally experienced pressure from his family (passengers) to get home that day. "I resisted and found a hotel room for the night. Making the no-go decision was the right thing to do."

Mission Mentality

Family is easier to say "it's a no-go" to because it's not your job to get to the destination. Your clear job is to keep your family safe. However, helicopter emergency medical service (HEMS) pilots have a unique external pressure due to the critical nature of their overall mission. The pilot is driven by the goal — to get a critically ill patient to the hospital. In order to reduce the effect of this pressure, HEMS operators do not notify the pilot of the patient's condition. This narrows the pilot's decision making role to one question: "Can the pickup and transportation to the medical care center be made safely?" Risking the life of the entire HEMS aircrew in an attempt to save one life is not a safe practice.

If you have made the technology leap and are using a new *skysaring* app to legally rideshare in the skies, you have another external pressure to think about. The goal here is to complete the flight to make money, which is why a commercial pilot certificate is required. It provides an added level of safety to counter external pressures among other things. (For more about this topic, check out "Why Can't I Uber My Airplane?" in the November/December 2016 issue of this magazine.)

Flying for nonprofits can also influence your risk-based decision making. Flying to save a dog, transport a veteran, or search for a missing person puts the pilot in a mission-first mentality. Civil Air Patrol (CAP) has recognized this risk to pilots, which is why the organization requires the completion of an "Operational Risk Management Matrix" worksheet before every mission flight. This paper-based flight risk analysis tool, or FRAT worksheet, assigns a point value for each hazard that corresponds to its risk factor. A low risk flight has a worksheet total of 75 points or less. As the risk value increases, the flight can be released only by a higher-level officer in the chain-of-command, which is a valuable control to prevent accidents.

The CAP worksheet doesn't strictly follow the PAVE checklist — the external pressures are the *Mission* broken down into two hazards.

1. Operations Tempo: The more aircraft involved, the greater the chance for collision.
2. Search Complexity: High workload caused by unfamiliar tasks can add to distractions.

More than four aircraft in the search area is considered high risk with a 20 point value. The combination of complex tasks for the aircrew to perform and the use of technology not routinely used by the aircrew are considered high risk with a 20 point value.

If everything else on the worksheet is low risk and these two high risk items are at 40 points, the flight is still within the low risk threshold of 75 points.

Pressure Popping Principles

Now that you understand what can cause external pressures and influence a pilot's decision making skills, let's look at how to mitigate those risks. The use of personal standard operating procedures (SOPs) is a way to manage it whereas a FRAT worksheet helps you make the go, no-go decision. According to the FAA's *Risk Management Handbook* (<http://1.usa.gov/18ioRba>), the goal with an SOP is to supply a release for the external pressures with procedures that can include, but are not limited to:

- Allow time on a trip for an extra fuel stop or to make an unexpected landing because of weather.
- Have alternate plans for a late arrival or make backup airline reservations for the must-be-there trips.
- For really important trips, plan to leave early enough so that there would still be time to drive to the destination.
- Advise those who are waiting at the destination that the arrival may be delayed. Know how to notify them when delays are encountered.
- Manage passenger expectations. Ensure passengers know that they might not arrive on a firm schedule, and if they must arrive by a certain time, they should make alternate plans.
- Eliminate pressure to return home, even on a casual day flight, by carrying a small overnight kit containing prescriptions, contact lens solutions, toiletries, or other necessities on every flight.



Photo by Paul Cianciolo

The key to managing external pressure is to be ready to accept delays. As Bernard puts it: "What good is it if you die trying to get there?" Clover notes that the "key is to reset your passengers' expectations early." Let them know it will take some time to get the preflight done. Let them know that you may not get to your intended destination today if the weather changes.

"I mitigate the pressure from my family and friends through education," explains Bernard. "I explain the limitations of flights accomplished in GA aircraft in advance. — *I'm not the airlines, and the aircraft I fly have significant limitations compared to the major air carriers using turbojet aircraft.* — By educating potential passengers, in advance, much of the pressure disappears."

Remember this: management of external pressure is the single most important key to risk management, because it is the one risk factor that can cause a pilot to ignore all others. It places time-related pressure on the pilot and figures into a majority of loss of control accidents, especially on base to final. So manage your "E" before you take off. ✈️

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

GA SAFETY ON THE GO



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Info Sharing

One of the things my boss likes to say in speeches is that no matter how competitive the commercial aviation industry is, we are all on the same team when it comes to safety. That idea is certainly one of the foundational principles for Aviation Safety InfoShare, a semiannual meeting of over 500 air carrier, government, and manufacturing safety professionals in a protected environment that facilitates sharing of safety issues and best practices.

InfoShare is also connected to the Aviation Safety Information Analysis and Sharing (ASIAS) program, which now has access to 185 data sources that include voluntarily-provided safety data. ASIAS partners with the Commercial Aviation Safety Team (CAST) and General Aviation Joint Steering Committee (GAJSC) to monitor known risk, evaluate the effectiveness of deployed mitigations, and detect emerging hazards.

Flight Data Monitoring

To get the benefits of data, though, the first requirement is to get data — a more challenging concept in the GA world. As you may have read in the Jan/Feb 2016 Compliance Philosophy-focused issue of *FAA Safety Briefing* magazine (see Tom Hoffmann’s “In Data We Trust”), the FAA partnered with industry last year on a Flight Data Monitoring (FDM) demonstration project for the GA community. The GA Demonstration Project Team included members of government, industry, academia, and the GA community, and the work was conducted in the Phoenix area given Arizona’s diversity in landscape and its mix of commercial, corporate, and private flight operations. The idea was to ask volunteers to upload de-identified data from their flights, while giving participating pilots the ability to reanimate recorded flight track data for post-flight review.

As a next step, the GA Demonstration Project Team seeks to increase GA participation in the FDM program by creating a public education campaign on the safety benefits, assessing the GA community’s perception and understanding of FDM, and determining the incentives required to generate a meaningful level of GA participation in a national FDM program. As the GAJSC web page notes, the hope is to develop voluntary GA FDM programs similar to the airline industry’s Flight Operations Quality Assurance (FOQA).

Another idea is to hold an InfoShare-like conference for GA, so as to facilitate communication of best practices. Stay tuned.

What You Can Do

One of the most important things you can do to further the safety benefits of information sharing is to contribute to the Aviation Safety Reporting System (ASRS). Colloquially known as “NASA forms” since NASA administers the system on behalf of the FAA, this program collects voluntarily submitted aviation safety incident/situation reports from pilots, controllers, and others. The ASRS database is a public repository serving the needs of the FAA, NASA, and organizations world-wide which are engaged in research and the promotion of safe flight. Using this information, ASRS identifies system deficiencies and issues alerting messages to persons in a position to correct them.

Too many pilots think of ASRS only in terms of its sanctions relief benefit in the event of an enforcement action. While this benefit provides a strong incentive to contribute to the system, the point of ASRS is to contribute to a safety culture by collecting, analyzing, and sharing information on issues and events affecting safety. You can, and you should, submit a report to ASRS anytime you observe or experience a safety issue in the National Airspace System. Online submission makes the ASRS system easier than ever to use, and speaking up when you see a safety concern is definitely part of good aviation citizenship.

ASRS also educates through its *CallBack* newsletter, its *Directline* journal, and through research studies. To benefit from the extensive shared safety information, you can subscribe to an electronic version of *CallBack* at no charge.

So please, do your part for the aviation safety team by both contributing to, and benefiting from, this valuable data.

Learn More

Aviation Safety Reporting System

<http://asrs.arc.nasa.gov>

FAA Safety Enhancement Fact Sheet on FDM

<http://go.usa.gov/x8mxT>

FAA Fact Sheet on ASIAS Program

<http://go.usa.gov/x8mxZ>



Assessing Mechanical Risks: An Aircraft with Inop Items

If you are an aviation maintenance technician (AMT), can you return to service an aircraft that has inoperative items? The quick answer is yes — and MEL will explain why.

What is a MEL?

If you're the typical AMT, you are very familiar with MEL. MEL is the Minimum Equipment List for an individual operator's inoperative items, non-essential for safe flight. It derives from the Master MEL, and is specific for a particular make and model aircraft by serial and registration number. MEL lists all the equipment on an aircraft type that can be inoperative at the time of flight, and is the regulatory authorization that permits operation of the aircraft with certain inoperative equipment.

The anatomy of MEL is found in Title 14 of the Code of Federal Regulations (14 CFR) part 91, wherein the FAA considers the MEL as a supplement to the aircraft's type design. This supplement, called a Supplemental Type Certificate (STC), is the approved modification to the aircraft's existing type certificate by which an aircraft is considered airworthy. It is a major change in type design not great enough to require a new application for a type certificate. An example of this would be the installation of a powerplant different from what was included in the original type certificate.

Under part 91, the FAA considers the MEL as an STC. Therefore, under an approved MEL, the aircraft may be operated under all applicable conditions and limitations contained in the MEL.

Bottom line: a mechanic can return to service an aircraft with inoperative items under an approved MEL.

Can I Fly?

And it's the owner/operator, not the mechanic, who is responsible for determining the aircraft's maintenance status. However, this in no way reduces the responsibility of certificated mechanics or repair stations for maintenance functions or tasks they per-



Photo by Tom Hoffmann

form or supervise. Especially when it comes to any additional or repetitive maintenance that is required under the MEL.

And although the pilot in command is ultimately responsible for determining the condition of the plane as safe for flight, the AMT shares in that responsibility and makes decisions and choices about maintenance, as does the pilot on go/no-go scenarios.

Ultimately

The satisfactory accomplishment of all maintenance procedures, regardless of who performs them, is the responsibility of the owner/operator. But all in all, the AMT is the central figure in aviation maintenance, and along with the owner/operator, plays an equally important role in aviation safety.

Learn More

Advisory Circular (AC) 91-67, Minimum Equipment Requirements for GA Operations

<http://go.usa.gov/x89tk>

See the Master Minimum Equipment List by Manufacturer here:

<http://go.usa.gov/x8mxR>



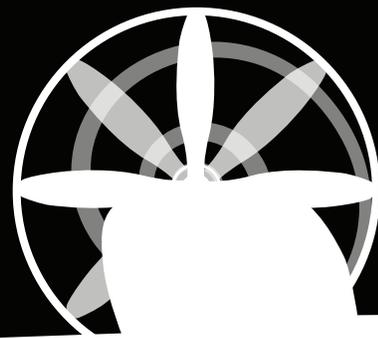
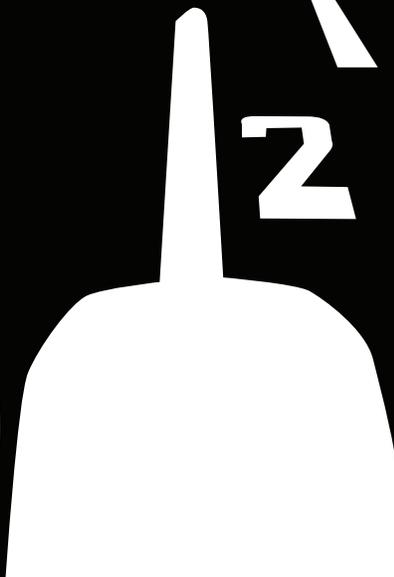
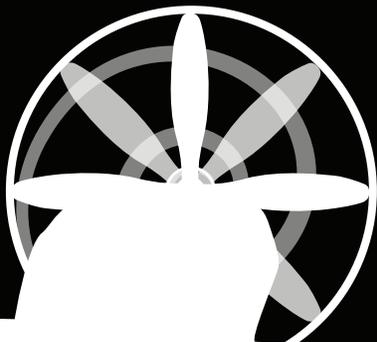
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Look Listen Focus

LIVES ARE AT STAKE!

- **IT CAN HAPPEN TO YOU:** You may accidentally takeoff without a clearance by confusing an ATC instruction such as "Call when ready for departure" or "Roger" to mean "Cleared for takeoff."
- **THE FIX:** Write down ATC clearances or make a mental note to only act on a departure when you hear "Cleared for takeoff."



Federal Aviation
Administration

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



Assessing Risk in the Palm of Your Hand

One of the most effective ways for a pilot to proactively assess risk for a given flight is with a Flight Risk Assessment Tool, or FRAT. They're simple to use and many are available as apps on your smartphone or tablet.

How It Works

Although designs can vary, FRATs generally ask a series of questions that help identify and quantify risk for a flight. The FAA Safety Team's current FRAT tool (an automated spreadsheet available at go.usa.gov/xkhJK) follows the PAVE checklist, covering questions on the Pilot, Aircraft, enViroment, and External Pressures. For example, you may be asked how much rest you've had, how much time you've had in the aircraft, and what the weather conditions are for your destination. Based on the answers you supply, a total risk score is calculated. The score will fall within one of three risk categories: Green (low), yellow (medium), and red (high).

With a clear in-the-green score, you might be tempted to blast off with unabated zeal. Not so fast. A FRAT is not meant to make your go/no-go decision for you. It is merely a tool to help you plan your flight and think through a more complete range of hazards and risks. When using a FRAT, it's a good idea to create numerical thresholds that trigger additional levels of scrutiny prior to a go/no-go decision for the flight. For example, a score that's on the high end of the green scale may still warrant further analysis. The pilot should discuss what the highest scoring risks are and attempt to mitigate those risks.

If your score falls in the yellow, try to mitigate some of the higher scoring items. That might entail waiting for the weather to improve or switching to an aircraft you have more experience with. If the score is still in the yellow, bring in the opinion of a designated "contact" person such as a flight instructor or an FAA Safety Team (FAASTeam) Representative. They may be able to help think of ways to further mitigate some of the risks for your flight.

If your score falls in the red zone, you should seriously consider cancelling the flight unless the risks involved can be safely mitigated. It's important to not allow the external pressures involved with carrying on with the flight (e.g., attending your son's graduation ceremony) interfere with your go/no-go decision. You (and your passengers) may be disappointed, but it's always better to be wishing you were in the air than wishing you were on the ground!

Introducing the FAAST FRAT

No FRAT can anticipate all the hazards that may impact a particular flight, but there are some common hazards that GA pilots encounter regularly. "Unfortunately, most FRATs are operationally specific to commercial flying," says J.B. Williams, a FAASTeam Operations subject matter expert in the FAA's General Aviation and Commercial Division. "They can be

used by a GA pilot, but since they're not targeted to that type of operation, they offer a more generic risk assessment." That's precisely why Williams worked alongside with National FAASTeam Product Manager John Steuernagle to produce an easy-to-use FRAT specifically targeted at single pilot GA operations. "Our goal was to make the FRAT time investment for pilots short, but still provide all the tools they need to effectively identify and manage risk," said Williams.

Among the FAAST FRAT's standout features is the ability to capture and send an email of the risk assessment. This may prove valuable for student pilots who want to send their instructor a copy before a flight. Williams is also working on adding a 180 degree zoom feature that would present an overhead view of the pilot's location. This would help a pilot become more aware of the terrain and obstacles at an unfamiliar airport. Another unique element of the FAAST FRAT is a safety resource feature that automatically pulls safety discussions and notices from FAASafety.gov.

The FAAST FRAT is now in the final stages of development and testing. We hope to make it available on a smartphone or tablet near you later this year!

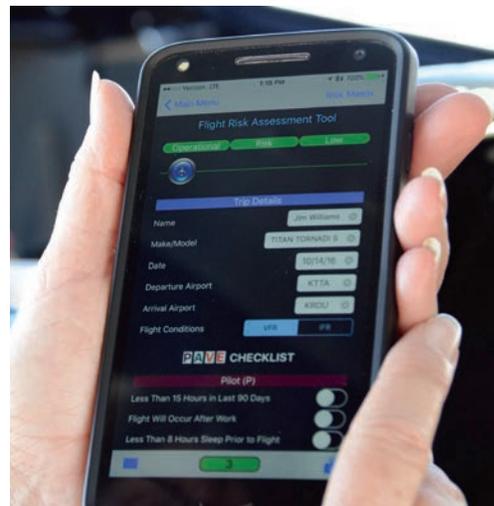


Photo by Paul Cancio

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

Rotorcraft Safety Continuum

As the aerospace industry continues to rapidly expand and emerging aviation technologies take hold, the FAA Aircraft Certification Service continues to maintain its commitment to the FAA's safety mission — to provide the safest, most efficient aerospace system in the world. Fulfilling this commitment is a continual challenge and requires new ways to manage people and resources to meet industry's demands. A guiding principle transforming the way the Service does business is the Safety Continuum. This principle acknowledges that there needs to be a balance between determining the appropriate level

as helicopters with the less sophisticated reciprocating engines," said Andy Shaw, a Rotorcraft Standards Staff engineer and an architect of the new policy.

"Most U.S. helicopter accidents occur in Normal Category aircraft, particularly in the least expensive, smaller single reciprocating engine models," said Shaw. The new policy will facilitate the incorporation of new equipment that can improve safety, such as autopilots, into more of those helicopters. It also intends to help to reduce the cost of buying and installing the new equipment, especially equipment that can enhance safety.

"Technological advancements and business innovation are challenging our old 7,000 pounds or below weight based regulatory discriminations," Shaw said. "We need to find a means to encourage, practical economic installations of equipment and innovative production."

The Aircraft Certification Service is evaluating a proposal to classify Normal Category helicopters into four areas: Class I would cover helicopters with reciprocating engines and five or fewer occupants, including the crew. Class II would cover helicopters with single turbine engines, space for five or fewer occupants, including crew, and a maximum gross weight of up to 4,000 pounds. Class III would cover helicopters with single turbine engines, six or more occupants, including crew, and a maximum gross weight over 4,000 pounds to 7,000 pounds. Finally, Class IV would cover helicopters with twin turbine engines.

Each class would have its own set of standards and level of scrutiny. For example, Class IV would undergo a higher level of scrutiny because these helicopters are the most sophisticated. The goal will be to have regulations that make installing additional safety equipment more affordable.

The public will get a chance to view and comment on the Rotorcraft Safety Continuum for Systems and Equipment Policy which is expected to publish via a notice of proposed policy statement in the U.S. Federal Register later this year. After comments are considered, the FAA will release the final policy.

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



Photo by Lynn A. Jensen

of rigor in standards, policies, and processes and the public's demand and expectations for safety.

The Fort Worth-based Rotorcraft Standards Staff is embracing the safety continuum principles and is developing the Rotorcraft Safety Continuum for Systems and Equipment Policy. The continuum sets forth a plan to focus our resources into those areas that present the greatest risk of an accident and in areas that the public cares about the most.

Currently, the FAA divides helicopters into two aircraft types: Normal Category (up to nine passengers and 7,000 pounds) and Transport Category (More than 7,000 pounds to 20,000 pounds and with some additional requirements over 20,000 pounds.)

We have no regulations that treat Normal Category helicopters differently from one another. "More sophisticated and expensive helicopters with twin turbine engines have the same safety requirements



Flight Forum

Drone Test Prep

I am pre-registered to take the part 107 Aeronautical Knowledge test for UAS unmanned aircraft. Specifically, I wish to fly a drone commercially. The question I have is how do I prepare for the exam? What specifically should I be studying? Is there a study guide or otherwise recommended course of study? Can't seem to find this anywhere, thank you.

— Jay

Thanks for your questions, Jay. On the FAA's website you can find test prep materials, sample questions, and study guides for the Remote Pilot Knowledge Test. Visit www.faa.gov/uas (or click on the drone icon on faa.gov) to access the Part 107 Knowledge Test Prep page. Suggested study materials include the Airman Certification Standards (ACS) for remote pilot, a remote pilot study guide, knowledge test sample questions, and the Small Unmanned Aircraft Advisory Circular 107-2. Visit the FAQ page at www.faa.gov/uas/faqs/#kcp for answers to the most commonly asked questions on aeronautical knowledge testing and remote pilot certification. I would also recommend taking the part 107 training course on www.FAASafety.gov. A link to the course is posted on the home page. Finally, for more information on flying your commercial drone, see "How to Fly a UAS for Your Work or Business" at www.faa.gov/uas/getting_started/fly_for_work_business.

Where are the Safety Seminars?

Hello — we used to have a lot of safety seminars. Now — almost nothing. When will you renew it?

— Ziva

Hi Ziva, thank you for your question. The FAA Safety Team sponsors aviation safety seminars and webinars throughout the country each year. To find a safety seminar near you, visit www.faasafety.gov/SPANS/events/EventList.aspx.

Over and Out

Just got a copy of the July/August Safety Briefing. On page 2 it says I can go to <http://1.usa.gov/1T1uR8v> to get a listing of frequencies that are being changed. When I try that it takes me to www.faa.gov/about/office_org/headquarters. I still can't find the affected frequencies. What am I doing wrong?

— Larry

Hi Larry, you are clicking correctly, but here's a direct link to the list of frequencies affected by the radio frequency modification — <http://go.usa.gov/x8aHV>. And here's a link to the MITRE briefing on the effects of radio reduction by area — <http://go.usa.gov/x8a6c>.

A Return to PIC

Thank you for the Safety Briefings. I am a 72 year old pilot getting back into flying after a 22 year hiatus. Just completed a satisfactory flight review. Your articles are a great refresher for me. Thanks and keep up the great work!

— Benatech

Welcome back to the skies, Benatech, and congratulations on your flight review! The FAA Safety Briefing team works hard to help educate airmen, and we are very happy to know that our publication helped in your return to flight. We wish you continued success!

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I love this magazine and think that every pilot or future pilot should read it cover to cover. Excellent information.

— Wilfredo

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

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



Reflection, Refraction, and Reaction

By three methods we may learn wisdom: First, by reflection, which is noblest; Second, by imitation, which is easiest; and third by experience, which is the bitterest.

— Confucius

No doubt you have at some point marveled at the beauty of a rainbow. If you're really fortunate, you might have even seen one from the sky. As you might remember from elementary school science class, a rainbow results from the reflection, refraction, and dispersion of light in water droplets. It allows us to see all the colors in the spectrum that normally appear as just plain white light.

As we close this issue on risk management and decision-making, I'd like to suggest that we, as pilots, can use the processes of reflection and refraction to be better, safer aviators. We can use them in any phase of flight, but I want to focus here on the benefits they have in the postflight phase. When

you land after a flight, especially one that involved weather or other challenges, your first inclination is to relax. That impulse is natural, because after

Reflection — the kind you do in your head — provides the different, slower velocity needed to refract the completed flight into its full spectrum of “teachable moments.”

all, the flight is over, right? Ah, but as the late Yogi Berra famously said, “it ain't over til it's over.” The immediate postflight period is the best time to learn lessons. Just as a reflection and refraction allow us to see the full range of colors in the light spectrum, they also allow us to see the full range of hazards we faced, decisions we made, and risks we mitigated during the flight.

Follow effective action with quiet reflection. From the quiet reflection will come even more effective action.

— Peter Drucker

For rainbow-producing refraction to occur, a light wave has to pass obliquely through a medium with different velocity. For us humans, reflection — the kind you do in your head — provides the different, slower velocity needed to refract the completed flight into its full spectrum of “teachable moments.”

The FAA *Aviation Instructor's Handbook* (FAA-8083-9A) suggests a simple process for guiding the postflight analysis. Let's take a look.

Replay. As a first step, mentally replay the flight from start to finish. Use a camera, an app, or even old-fashioned pen and paper to capture memories and perceptions while they're still fresh. In addition to capturing pilot performance perceptions, this activity is also a great way to record all the personal and aesthetic observations you want to remember.

Reconstruct. The next step is to identify things you would have, could have, or should have done differently. I can recall occasions where I wasn't as prepared as I should have been. I can also think of flights that, in hindsight, I should not have taken at all. The point, though, is not to beat yourself up. The goal is to make an honest assessment of gaps in knowledge or skill.

Reflect. Reflection is nothing more complicated than asking yourself questions about perceptions and experiences and answering them as honestly as you can. For example, what was the most important thing you learned from this flight? What part of the experience was easiest? What aspect part was the hardest, and why? Did anything make you uncomfortable? If so, when, how, and why did it occur? How would you assess your performance, and your decisions?

There are three principal means of acquiring knowledge ... observation of nature, reflection, and experimentation. Observation collects facts; reflection combines them; experimentation verifies the result of that combination.

— Denis Diderot

Redirect. Now comes the time to react — to consider how the lessons learned on this flight can be applied to the next trip you make. What lessons can you use to mitigate risk, or perform better, in the next cross-country flight? Do you need to adjust your personal minimums? Did this flight indicate a need for deeper knowledge, or for sharper skills? If so, how and when will you take action to close the gaps?

Perhaps more than any other human endeavor, flying offers endless opportunities for learning and improving. Use the postflight reflection and refraction to make the most of them!

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

J.B. Williams

FAASTeam Helicopter SME, General Aviation and Commercial Division



Soon after J.B. Williams earned his private pilot wings at the age of 18, he enlisted in the Air Force as an air traffic controller. During the next four-plus years in military service, he used his GI Bill benefits to earn his commercial pilot and flight instructor certificates, instrument and multi-engine ratings, and complete his bachelor's degree. That allowed J.B. to attend Officer Training School and obtain a slot in Air Force pilot training.

"My first assignment after graduating was to act as an enemy intruder flying the T-33 *Shooting Star* as part of fighter pilot/combat controller training," J.B. explains. He then went on to train cadets at the Air Force Academy. "I completed my Air Force career flying the HH-53 *Jolly Green Giant* recovering reconnaissance satellites after they splashed down in the Pacific Ocean."

After 10 years of Air Force service, J.B. flew for Trans Colorado Airlines, and later Continental Airlines, where he flew the DC-10, DC-9, and MD-80. In 1990, he joined the FAA as an air carrier operations aviation safety inspector.

"I joined the FAA to broaden my aviation career," he notes. "I wanted to see the other side of aviation and get involved with aviation safety." J.B. now works with the national FAA Safety Team (FAASTeam) as the helicopter subject matter expert (SME) and is the SharePoint manager who links FAASTeam representatives to current training documents. He also serves on the FAA's Compliance Philosophy Focus Team as the SME for remedial pilot training.

As the educational outreach arm of the FAA, the FAASTeam is committed to serving the GA community and making our skies even safer. It promotes

safety through many different outlets — in-person seminars, webinars, online education through FAASafety.gov, and production of safety brochures, videos, and this magazine. One of J.B.'s projects is the development of a free Flight Risk Assessment Tool (FRAT) smart phone application to easily allow any pilot, especially those just flying for fun, to better assess the risks before their flights.

"Our mission is safety and reducing the GA accident rate. The best way to do that is to educate pilots on safety and risk management."

The FAASTeam has also been involved in providing education on small unmanned aircraft system (sUAS) operations as well as providing certificated pilots the means to qualify for the Remote Pilot Certificate by completing the part 107 Remote Pilot Training Course on FAASafety.gov. Educational outreach about NextGen and the 2020 ADS-B mandate is also ongoing; pilots need to understand the importance of upgrading their equipment to be ADS-B Out compliant.

J.B. notes that one of the biggest challenges the FAASTeam faces is reaching the pilots and mechanics who do not usually participate in or read FAA safety outreach material. If you are reading this magazine and have an idea on how to reach those not reading it or attending safety seminars, send us an email or a tweet. We all fly in the same airspace, so help us reach out to our fellow pilots.

"Every pilot is involved in risk management whether they know it or not," explains J.B. "Our advice to GA pilots is to use an organized and repeatable risk-based decision making process before you fly to ensure that you are operating at the highest safety standard."

If you fly the skies over Cary, North Carolina, keep a lookout for J.B. He is either working on or flying his experimental Titan *Tornado S* every Sunday. He also volunteers with his local EAA chapter. You can bet he completes a flight risk analysis before every flight, even with all that flight experience. So should you.

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



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