

September/October 2019

FAA **BRIEFING** *Safety*

EMERGENCY!



**Federal Aviation
Administration**

8 Keep Calm and Carry On -
Staying Cool When Things Get Hot

**10 Engine Failure! - What
to Do if it Happens to You**



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ABOUT THIS ISSUE...



The September/October 2019 issue of FAA Safety Briefing focuses on emergencies in aviation and how we react to them. Feature articles focus on the kind of events that can cause an emergency in flight and how we might prevent and react to them. These topics include: engine failures, the startle effect, smoke and fire, and balloons and power lines.

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FAA **BRIEFING** Safety

The FAA safety policy voice of non-commercial general aviation

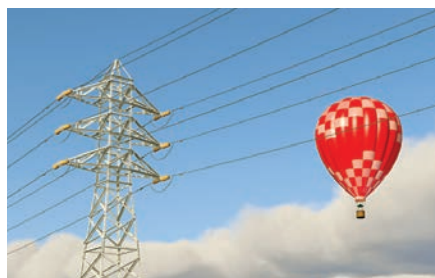
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EVALUATING, EVOLVING, EMERGING



“The most important skill you need is the ability to learn how to change and grow.”

— Scott Cook

Normally I use this space to tee up the focus area for each new *FAA Safety Briefing*. I’ll get to that, but first let me talk about the new cover and interior design that debuts here.

The Only Thing Constant Is Change!

Regular readers will know that, along with other parts of the FAA, the Flight Standards Service I now lead has been immersed in change. We continue to work on evolving our organizational culture to be more agile, efficient, and consistent in how we perform our safety assurance mission to serve the ever-changing aviation community. Just over two years ago, we complemented the cultural work — which is inevitably continuous — by completing a major transition from our legacy geography-based structure to one organized around major functions.

“Change can be frightening, and the temptation is often to resist it. But change almost always provides opportunities — to learn new things, to rethink tired processes, and to improve the way we work.”

— Klaus Schwab

The change to the *FAA Safety Briefing* design is not directly connected to the Flight Standards Service transition, but the philosophy behind it is the same. As economist Klaus Schwab notes in the quote above, it was time to learn new things and rethink how we work in terms of this publication.

The team certainly wanted to freshen up the look and feel of how we present content, but the real driver for the redesign is the massive change in how we all consume content these days. Many of us now use eReaders of various kinds; in fact, I have colleagues who actively disdain paper as “sooooo last century.” The magazine team introduced multiple format options for downloading each publication some time ago, but the legacy format wasn’t as friendly as we want it to be.

The rise of social media is another of the change drivers for the new design. I have always been proud that the *FAA Safety Briefing* team has been at the forefront of FAA social media presence, contributing directly and substantially to accounts for Facebook, Twitter, and Instagram. Because so many people today use social media channels as the primary source for content, we needed a design that would be more adaptable to this method of dissemination.

“Those who initiate change will have a better opportunity to manage the change that is inevitable.”

— William Pollard

Just as the Flight Standards Service structural change was meant to support the organization’s cultural change, the magazine’s new design is also intended to support the evolution of how we offer information. It’s a busy world, and we all know that everyone’s reading time is more limited than ever before. We also recognize how the Internet and social media have conditioned us all to expect, even demand, content in shorter and punchier packages. There is still a place for longer pieces, and you will continue to see “feature-length” articles. But the new design, which includes more readable fonts, better supports the team’s goal to offer more material that is easier to read and absorb in the kind of time you have available.

In This Issue ...

Speaking of material: in view of our rationale for the new design, it is very fitting that it frames this issue’s focus on handling aviation emergencies. We’ll take a look at some of the obvious varieties, but articles in this issue also emphasize managing your own reactions. As always, we hope you will read, heed, and let us know what you think.

AVIATION NEWS ROUNDUP

Reminder on IFR Clearances

As part of a continued effort to streamline service delivery, the FAA recently published phone numbers for pilots to obtain or cancel IFR clearances directly from Air Traffic at non-towered airports. The phone numbers to obtain clearance delivery are listed in the communications section of the *Chart Supplement, US*.

Many airports have direct communications outlets to Air Traffic. If a clearance delivery phone number is not listed, use one of the communications outlet options available for your airport.

- Remote Communications Outlet (RCO) frequency for Flight Service or Remote Transmit Receive Outlet (RTR) frequency for Air Traffic.
- Ground Communications Outlet (GCO) connection to Air Traffic. If the GCO only connects to Flight Service, contact Air Traffic via the telephone number provided (currently available via NOTAM until published).

This initiative does not affect pilots requesting clearances from locations in Alaska. Find the information for your local airport at bit.ly/ChartSupps.

Please email Flight Services at 9-AWA-ATO-SYSOPS-FS@faa.gov if you have any questions.

Reminder on ADS-B Rebate Rules

For general aviation (GA) operators taking advantage of the FAA's Automatic Dependent Surveillance – Broadcast (ADS-B) rebate program, rebate reservations must be made within 90 days of the installation of the appropriate equipment.

If the 90 days pass without a reservation being made, the rebate expires and will be made available to others.

In May, the FAA issued the last of the 20,000, \$500 rebate reservations offered to GA aircraft owners. Since then, returned or expired reservations are made available each Wednesday at 1 p.m. Eastern Time on a first-come, first-served basis.

For information, and to process your claim for the FAA's ADS-B rebate program for GA, visit bit.ly/claimADSB.

Enhanced Runway Safety Pilot Simulator

This past summer, the FAA released an enhanced runway safety pilot "simulator." The program was initially released last year as an interactive, self-guided resource designed to assist

with teaching pilots surface safety best practices. The new and improved version is based directly on valuable feedback from airmen like you.

Based on public recommendations, this website is now compatible with mobile devices and features a new 3-D animation called "Use The Airport Diagram." Check out the runway safety simulator at RunwaySafetySimulator.com.

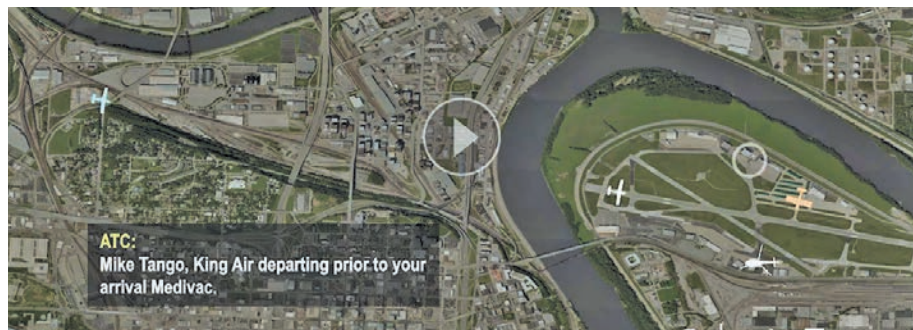
New Requirements for Recreational Drone Operators

The landscape for recreational operators is drastically changing as the FAA is taking several measures to adjust to the realities of a new world where over a million drone operators are entering the National Airspace System (NAS) in the U.S. alone.

These new steps are consistent with the requirements of Section 349 of the FAA Reauthorization Act of 2018, and they will make the NAS safer, institute an aeronautical knowledge and safety test for recreational fliers, and open the Low Altitude Authorization Notification Capability (LAANC) for this expanding user group.

While recreational drones can still fly below 400 feet in uncontrolled airspace without specific certification or permission from the FAA, drone operators must still register their aircraft with the FAA. Operators are responsible for complying with all FAA airspace restrictions and prohibitions.

Under Section 349, recreational operators must obtain an airspace authorization to fly in controlled airspace. ATC facilities will no longer accept requests to operate recreational drones in controlled airspace on a case-by-case basis. The FAA has recently upgraded LAANC to



Screenshot of the newly enhanced Runway Safety Pilot Simulator.



Know Before You Fly is a joint educational campaign by the FAA, AUVSI, and AMA to promote safety in the drone community through education and information exchange.

enable recreational flyers to obtain automated authorization for controlled airspace flights. Go to faa.gov/go/laanc for updates. Additionally, the FAA is exploring upgrades to FAADroneZone.faa.gov to enable access to recreational flyers.

The 2018 Act also requires recreational flyers to pass an aeronautical knowledge and safety test before accessing the NAS. The agency is currently consulting with various UAS stakeholders to develop that test, which will be administered electronically.

For more details on these new changes, go to faa.gov/uas/recreational_fliers.

PEGASAS Holds 2019 Annual Meeting

On June 5 and 6, the FAA's Center of Excellence (COE) for general aviation,



the Partnership to Enhance General Aviation Safety, Accessibility, and Sustainability (PEGASAS) held its annual meeting on the campus of Ohio State University. The event kicked off with keynote speaker Jaime Figueroa, deputy director of the FAA's William J. Hughes Technical Center, who helped explain the important role COEs play in advancing aviation safety.

Following the opening remarks, a student-led poster session and a series of project presentations gave students and faculty a chance to discuss updates on the many exciting and cutting-edge GA research projects underway at PEGASAS. The annual meeting provides a collaborative environment for the FAA and PEGASAS faculty,

students, affiliates, and partners to exchange information on strategies that aim to improve GA safety.

For more information, go to pegasas.aero or see our May/June 2018 issue in the archives at bit.ly/FAASB-Arc.

\$478 Million in Infrastructure Grants to 232 Airports in 43 States

The Department of Transportation will award \$478 million in airport infrastructure grants to 232 airports in 43 states, the Pacific Islands, and the District of Columbia. This is the fourth allotment of the total \$3.18 billion in FAA Airport Improvement Program (AIP) funding for airports across the U.S.

Selected projects include runway reconstruction and rehabilitation, construction of firefighting facilities, and the maintenance of taxiways, aprons, and terminals. The construction and equipment supported by this funding increase the airports' safety, emergency response capabilities, and capacity, and could support further economic growth and development within each airport's region.

SAFETY ENHANCEMENT TOPICS

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



SEPTEMBER

Preflight After Maintenance

What items should you focus on and/or add to your preflight inspection checklist after maintenance?



OCTOBER

Pilots and Medications

Learn more about the possible side effects of medications (prescribed or over-the-counter) and whether they may be hazardous to flight operations.

WHEN IS “GOOD ENOUGH” REALLY GOOD ENOUGH?



Am I fit to fly today? That's a question every aviator faces before every flight. A medical certificate means you were fit to fly the day it was issued and that you are expected to remain so for the certificate's duration apart from short term illness or injury. It does not mean that you are okay each and every day the certificate is valid.

The decision not to fly is easy on days when simply getting out of bed is difficult. It's harder when an illness is developing or resolving: you feel okay, just not 100 percent. Let's look at some guidance on when “good enough” really is good enough. Remember that 14 CFR section 61.53 requires all pilots — including sport, glider, and balloon, and those using BasicMed — to make this self-assessment.

Common Causes

The short term effects of an acute illness can range from annoying to incapacitating. Gastro-intestinal (GI) illness is a common cause of temporary impairment.

GI illness, aka a “stomach bug,” can arise from a viral infection that

causes nausea, vomiting, and diarrhea. Symptoms can be distracting at best and incapacitating when severe. Most pilots recognize their impact on flight safety and do not attempt to fly until they are resolved. Less obvious is that even when symptoms are resolved on the ground, gas expansion occurring with increased altitude can rapidly turn “good enough” into incapacitation. Dehydration, common in an acute GI illness, can also lead to

impaired judgment.

Food poisoning is another GI illness, one that can be hard to prevent since any lapse in proper food handling can create risk. Food poisoning can present suddenly with little warning, but it generally develops over hours to days and usually includes abdominal discomfort (queasiness, cramps). If you have these symptoms, especially if they become progressively worse, a precautionary landing is advisable if you are flying and certainly do not take off. The best prevention is to be very careful about the source of your food and water, but remember that only one person with an improper food handling technique can cause food contamination.

The cure? Fortunately, just waiting until the symptoms have been

resolved for at least a day or two and ensuring proper hydration (keep your urine clear) should restore you to flight fitness.

Cutting recovery short is not advisable. In my days as an Aviation Medical Examiner, I was working with a professional helicopter pilot. The night before a flight he was awake all night with severe abdominal cramping and diarrhea. He thought he was better, but since he was still queasy just before the noon flight, he took a couple swigs of Kaopectate. During flight, he had severe abdominal cramping and he lost consciousness. The result was a crash landing.

It is best to be off of all medicines before returning to flight status. Don't fly if a medication is necessary prior to flight. If you don't return to normal within a few days, see your physician to make sure there is not some other cause. Stay hydrated, eat a healthy diet, and be well rested prior to flight.

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

IT IS BEST TO BE OFF OF ALL MEDICINES BEFORE RETURNING TO FLIGHT STATUS. UNDER NO CIRCUMSTANCES SHOULD YOU FLY IF A MEDICATION IS NECESSARY PRIOR TO FLIGHT.



WHERE THERE'S SMOKE ... THERE'S TROUBLE!

No doubt about it: smoke and fumes in the cockpit create an acute medical emergency for pilots and potentially for their passengers. Here's what you need to know.

Carbon Monoxide

Smoke is a direct irritant for the eyes, mucous membranes of the nose and mouth, and lungs. Carbon monoxide (CO) is present in both smoke from fires and in engine exhaust gases (incomplete combustion), so a leak in the manifold can surreptitiously introduce CO into the cabin air. This is particularly problematic in single engine aircraft as exhaust gases are the source of cabin heat. Burning plastics also release CO at high levels. Regardless of the source, you should know that CO is odorless, colorless, and dangerous. A CO detector is a worthwhile investment and standard in many new aircraft.

If there is a fire, take the necessary steps as outlined in the AFM/POH to avoid exposure. Even low levels of CO are dangerous as CO binds to hemoglobin over 200 times greater than oxygen does. This means that CO effectively blocks the hemoglobin molecule, to which it is bound, from transporting oxygen from your lungs to the rest of your body. With continued exposure to CO, less and less hemoglobin is available for oxygen transport and your breathing becomes less and less effective. CO poisoning causes headaches, nausea, dizziness, fatigue and eventually mental impairment and death.

The immediate remedy is to remove yourself from the source as soon as possible. However, symptoms can persist even when the cabin has been vented or source isolated. While

fresh air helps, more rapid clearing is accomplished by increasing the oxygen percentage of the air you inhale. A nasal cannula will help, but a full face mask with 100 percent oxygen is preferable.

Please note that this advice is not intended to teach you how to treat yourself, but rather to provide self-aid steps pending definitive medical

**NO DOUBT ABOUT IT:
SMOKE AND FUMES IN THE
COCKPIT CREATE AN ACUTE
MEDICAL EMERGENCY.**

care. Once on the ground, call 911 for assistance. In the case of severe CO poisoning, you might need hyperbaric treatment. The 911 operator can help or you can call the Divers Alert Network at either (919) 684-2948 or (800) 446-2671. A hospital emergency room should also be able to assist you.

Carbon Dioxide

Fumes can be a product of combustion or can result from cargo contents. A common and potentially dangerous gas is carbon dioxide (CO₂). CO₂ is a product of complete combustion and is nearly odorless and colorless. It is also a product of respiration and will build up if the ventilation is poor.

Another source is "dry ice," which is frozen CO₂. Dry ice is often used for long distance transport when items must be kept frozen. Cargo airliners have made emergency evacuations when CO₂ levels rose in the aircraft from sublimation. Be extra cautious if

you are using dry ice for cooling, such as for meat and/or fish obtained on a vacation trip. When possible, carry it in a baggage compartment outside the cabin and always ensure good ventilation.

As with CO, symptoms of CO₂ poisoning include fatigue, headache, and cloudy thinking. You need to remove yourself from the source as quickly as possible. Recovery is rapid as, unlike CO, CO₂ does not have a high affinity to hemoglobin, and clears rapidly once removed from the source.

Smoke and fumes in the cockpit have caused many cases of impairment/incapacitation. Do not forget that in an emergency you can request priority handling from ATC. Just make sure you request assistance promptly as symptoms can progress rapidly.

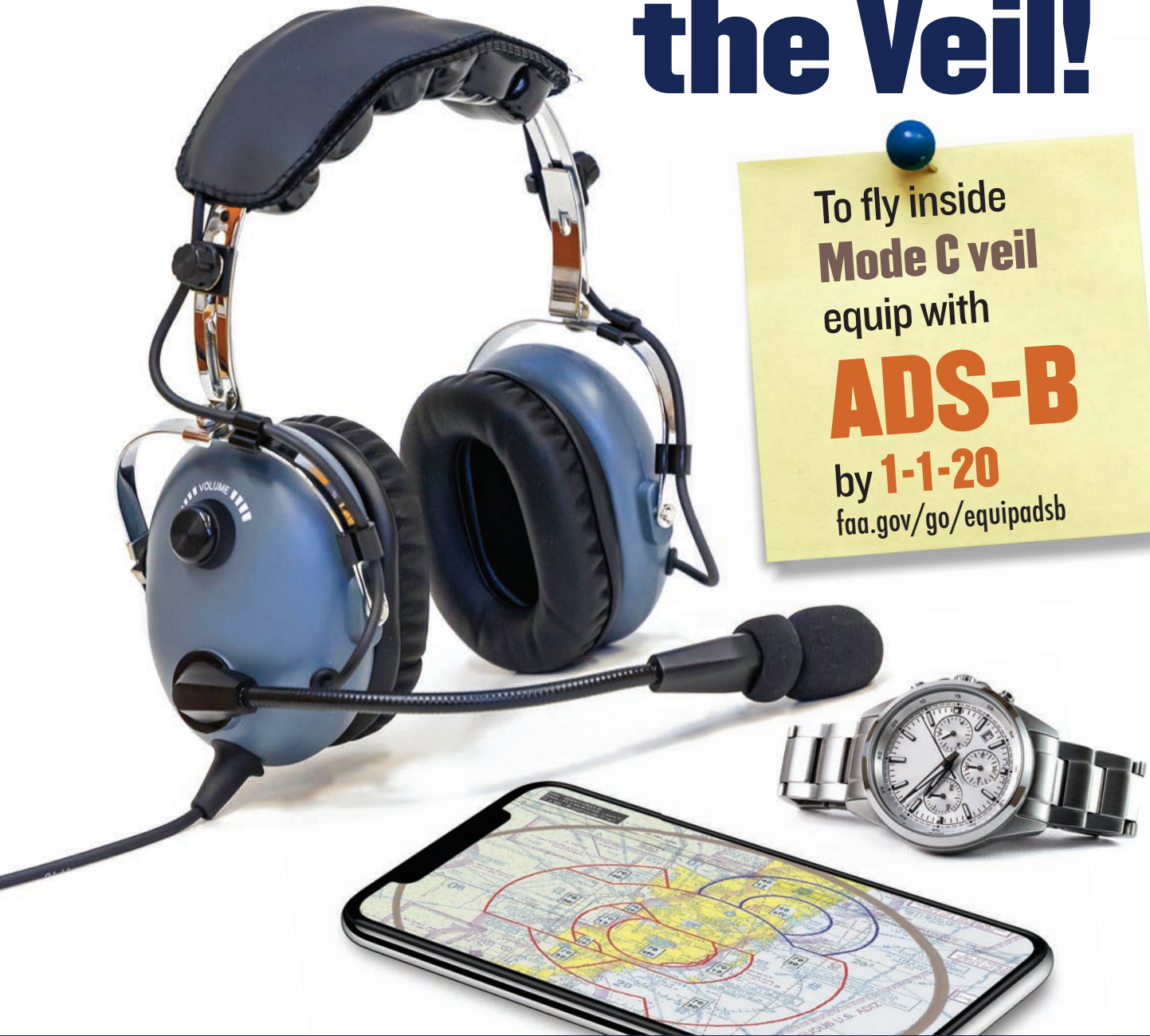
Finally, do not ignore the problem: the best place to sort out CO/CO₂ symptoms is on the ground. Once you have landed, you should have a bias toward seeking medical attention, as your judgment to determine the need for it is frequently impaired.

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

— ADS-B —
EQUIP NOW!
faa.gov/go/equipadsb

Don't Fail the Veil!

To fly inside
Mode C veil
equip with
ADS-B
by **1-1-20**
faa.gov/go/equipadsb



Federal Aviation
Administration



KEEP CALM AND CARRY ON!

*On Staying Cool
When Things Get Hot*

BY SUSAN PARSON

You have possibly never heard of Harvard professor Walter Bradford Cannon — I confess I had not — but it's a sure thing that every human being has at some point experienced the "fight-or-flight" response he first named in 1915.

Just to get the definitions out of the way, the more formal names for fight-or-flight include “hyper-arousal” and “acute stress response.” All of these terms describe a physiological reaction that occurs in response to a perceived threat or harm.

The Challenge: Fight-or-Flight Response

Given the nature of aviation, I venture to guess that every past and present pilot on the planet has experienced the fight-or-flight reaction — at least once! — while in actual flight above the earth. It could be that little hiccup you heard from the “hood” section of your aircraft. Or maybe it was the oil pressure gauge whose needle just dipped below the comforting green-is-good range ... or the ammeter that is twitching in a very wrong direction. But mechanical glitches are not the only reason for those adrenaline surges common to the fight-or-flight condition. Maybe you find yourself flying VFR in weather that has developed into no-kidding instrument-meteorological conditions. You could have a sick passenger whose condition not only affects him or her, but also creates a potentially dangerous distraction from your duties as pilot-in-command. Or ... okay, you get the idea. The possible causes of an aerial emergency are as varied as the number of aircraft and the pilots who fly them.

The Antidote: Keep Calm and Carry On

Given that infinite range, it’s not possible to have a set procedure for every single bad thing that could happen. Even if we did, the limits of human memory would keep us from knowing them all.

That’s not to say that pilots should not strive to constantly develop knowledge and regularly practice procedures to deal with some of the more common emergency scenarios. On the contrary, knowledge and skill are crucial, and you can never go wrong by striving to be mentally and physically prepared for the proverbial “anything.”

For any incipient or full-blown emergency, though, step one always has to be keeping your wits about you. There is simply no place on the flight deck for the fight-or-flight response to become a panic-stricken, freeze-or-flail flurry of unfocused activity.

In that connection, the direction to “keep calm and carry on” is, or should be, the first item on your emergency checklist. While globally popular now, this deft little phrase originated in Britain circa 1939. His Majesty’s Government had warned the populace to expect mass aerial attacks on major cities, and some clever bureaucrat (yes, they do exist!) came up with the now-famous phrase

There is no place for fight-or-flight to become a freeze-or-flail flurry.

for placards and posters. As Wikipedia observes, the phrase is “evocative of the Victorian belief in British stoicism — the ‘stiff upper lip’ of self-discipline, fortitude, and remaining calm in adversity.”

Thankfully, you don’t have to be British or have Spock-like British stoicism to benefit from the advice to remain calm in adversity. In this emergency-focused issue of *FAA Safety Briefing* magazine, we’ll review tips for managing and mitigating the startle effect you have to quell in order to keep calm. In other articles, we will look at practical tips to help you carry on in a disciplined, orderly, and productive manner. Also, since the best way to avoid dealing with an emergency is to avoid having that emergency in the first place, we’ll offer some reminders on prevention of the most common (and most easily avoided) scenarios.

So buckle up and join us as we keep calm and carry on through this vital topic. ▶

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ENGINE FAILURE!



**Why it Happens,
How to Prevent It,
and What to Do if
it Happens to You**

BY TOM HOFFMANN

consider myself extremely fortunate to have never experienced an engine failure in flight (knock on wood — or at least the dull grey particle board serving as my desk.) That said, I know more than a few pilots who have endured that misfortune, and with varying degrees of success. Some escaped completely unscathed, both plane and person, while others suffered significantly worse consequences.

It's sobering to think how these magnificent aerial steeds that routinely whisk us off to places near and far can give up the ghost and leave us literally between a cloud and a hard place. But since a majority of engine failures arise from human error, there's a lot we can do to minimize the chances of our engines going silent in flight. Sound procedures and preparation can also help assure a safe outcome in the event your engine decides to call it quits.

Why it Happens

In a study that analyzed general aviation (GA) accidents from 2001-2010, the FAA determined system component failure – powerplant (SCF-PP) to be the third highest accident category behind loss of control and controlled flight into terrain. More recent data indicates a continuation of this trend, which got the attention of the General Aviation Joint Steering Committee (GAJSC) and spurred creation of a SCF-PP working group in 2014. Their task was to perform a deep dive examination of accidents related to powerplant failure and develop educational outreach and mitigation strategies. Their study helped identify some of the more prevalent problems. Not surprisingly, human foibles — not malicious mechanical gremlins — caused most problems.

Much of this research mirrored the findings of Designated Pilot Examiner (DPE), Master Instructor, and Wisconsin FAAS Team Lead Rep Woody Minar, who looked at 700 engine failure related accidents from 2001-2017. In his study, Minar narrowed the reasons for engine failure to six key areas: fuel exhaustion, maintenance/mechanical issues, unknown, carburetor ice, water/debris in fuel, and simulated engine failures. Pilot error still contributed to 49% of the engine failures.

How to Prevent It

Notable preflight oversights that lead to engine failure include loose fuel caps, unsumped fuel tanks, and clogged fuel vents. All these mistakes could be easily identified before even starting the engine. The takeaway: never underestimate the importance of a good preflight inspection and briefing.

During flight, stay engaged with the health and status of your systems, regularly check your oil pressure and

temperature, and listen for abnormal engine sounds. Passengers can help with these monitoring tasks.

Staying engaged also means monitoring fuel. Fuel

During your flight, stay engaged with the health and status of your systems.

management (or mismanagement, to be more precise) is a predominant factor in engine failures. While fuel lines and filters can become clogged and cause a shutdown, fuel starvation is primarily an operator error. Failure to verify



(top) The end result of a catastrophic engine failure.

(right) It's important to check engine performance *after* maintenance has been completed. Mechanics can make mistakes; loose oil and fuel fittings and fuel selector valves installed backwards are just a few of the maintenance-related errors that have appeared in accident reports.





Never underestimate the importance of a good preflight inspection and briefing.

fuel levels in the tank(s), underestimating head winds, and forgetting to inspect fuel with your eyes and nose can all lead to you receiving an unexpected glider lesson. The same tips apply to inflight fuel management: keep tabs on fuel burn rate and the position of the fuel selector.

Of course there are still days when your magnificent flying machine misbehaves. Although uncommon, parts and components do fail. Hidden problems could lurk in cylinders, pistons,

valves, crankshaft, or fuel lines, for example. Be on the

Every flight should be an opportunity to hone your emergency skills.

lookout for warning signs like irregular oil pressure and temperature fluctuations, excessive RPM drops during a magneto check, or an excessive cylinder head temperature. If something seems odd, have a mechanic take a look.

Stay on top of your aircraft's maintenance needs and required inspections. That includes annuals, applicable airworthiness directives, and time-in-service intervals for life-limited parts or systems. It's also important to check engine performance *after* maintenance has been completed. Mechanics can make mistakes; loose oil and fuel fittings and fuel selector valves installed backwards are just a few of the maintenance-related errors that have appeared in accident reports. In addition to verifying all fasteners are present and accounted for, do a thorough run-up and a few circuits in the pattern after any work has been performed.

If it Happens to You ...

Now let's take a look at what to do if your engine does decide to fly west.

First and foremost, stay calm. Panic will only waste two of your most precious commodities at this moment — time and altitude. Fly the airplane and rely on your training and procedures. Start with memory items and if time permits, follow the engine failure checklist which should always be in reach, and may lead to a successful restart. Your priori-

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
Loss of rpm during cruise flight (non altitude engines)	Carburetor or induction icing or air filter clogging	Apply carburetor heat. If dirty filter is suspected and non-filtered air is available, switch selector to unfiltered position.
Loss of manifold pressure during cruise flight	Same as above	Same as above
	Turbocharger failure	Possible exhaust leak. Shut down engine or use lowest practicable power setting. Land as soon as possible.
High oil pressure	Cold oil	Warm engine in prescribed manner.
	Possible internal plugging	Reduce power. Land as soon as possible.
Low oil pressure	Broken pressure relief valve	Land as soon as possible or feather prop and stop engine.
	Insufficient oil	Same as above
	Burned out bearings	Same as above
Rough running engine	Improper mixture control setting	Adjust mixture for smooth operation.
	Defective ignition or valves	Consult maintenance personnel.
	Detonation or preignition	Reduce power, enrich mixture, open cowl flaps to reduce cylinder head temp. Land as soon as practicable.
	Induction air leak	Reduce power. Consult maintenance personnel.
	Plugged fuel nozzle (fuel injection)	Same as above
	Excessive fuel pressure or fuel flow	Lean mixture control
Loss of fuel pressure	Engine-driven fuel pump failure	Turn on boost pumps.
	No fuel	Switch tanks, turn on fuel

Commonly experienced in-flight abnormal engine instrument indications, their possible causes, and corrective actions. For a full list, see chapter 17 of the Airplane Flying Handbook bit.ly/AFHch17.

ties include establishing best glide speed, finding a place to land, and declaring an emergency.

According to Larry Bothe, DPE, Master Instructor and FAASTeam Rep in the Indianapolis area, one of the biggest mistakes pilots make is not checking fuel early enough in an emergency. “After an engine failure, switch tanks and flip on your boost pumps,” says Bothe. “Many times that will get your engine purring again. You can chastise yourself later for being dumb.” Be sure to check your Pilot’s Operating Handbook for any specific instructions on managing fuel after engine failure.

It’s as Easy as ABC (and DEFG)

One helpful checklist you can use with an engine emergency is ABCDEFG.

- **Airspeed:** establish the correct speed and maintain it.
- **Best field or landing option:** pick it and head for it.
- **Cockpit Checks:** do your flow checks; you might be a switch flick away from a non-emergency. If time permits, use the emergency checklist.
- **Declare Emergency:** use current frequency or 121.5 and squawk 7700.
- **Exit Preparation:** adjust your seats/seatbelts, brief your passengers, and prep for landing.
- **Fire Prevention:** fuel off and turn off the 3 Ms: mags, mixture, and master.
- **Ground Plan:** have an egress plan and make use of first aid equipment as needed.
(Please see this issue’s Checklist department for details and other emergency checklists.)

It’s probably fair to say that the most demanding part of any engine-out checklist is selecting a safe landing site. It requires you to rapidly assess glide distance, landing roll, micrometeorological conditions, landing hazards, and minimizing risk of injury to persons or property on the ground, not to mention yourself. Bothe urges pilots to be keenly aware of wind direction. “You need to land into the wind,” he says, warning that pilots sometimes get lulled into choosing the closest part of a field. “[Landing upwind] can make a huge difference in the amount of energy you need to dissipate and reduce the chance of severe injuries.” If you haven’t been monitoring the wind during flight, you can pick up clues from smoke, tree limbs, or wind lines on water.

Bothe is also a strong advocate for getting ATC help during an emergency. “Outside people who see the big picture on radar and know exactly where you are is a really big help,” says Bothe. He recalls during one engine failure ATC provided directions to the nearest airport before he even had a chance to check GPS. If an off-airport landing

is necessary, ATC can also help first responders get to your location more quickly.

To Succeed, Prepare to Fail

“By failing to prepare, you are preparing to fail.”

— Benjamin Franklin

Mr. Franklin’s adage on an ounce of prevention being worth a pound of cure is equally fitting here. Losing an engine in flight can be a scary and downright gut-wrenching experience. As we’ve pointed out, though, vigilance and preparation will substantially improve your chances for a successful outcome. On every flight, use every opportunity to hone emergency skills. Plan what you would do if you lost an engine at regular intervals of a flight, from takeoff to landing. Rehearse flow checks and memory items so they become instinctive and methodical. In summary, don’t rely on luck; count on training and preparation to keep your motor running. ➤

Editor’s note: The FAA Safety Briefing staff is sad to report that Woody Minar, one of the FAASTeam Representatives who contributed to this article, passed away in July. We offer our condolences to Woody’s family and friends, with gratitude for his lifelong commitment to aviation safety.

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



Although it doesn’t involve an engine failure, check out the cool-as-a-cucumber reactions of the Grumman *Avenger* pilot in this video during an inflight emergency at the 2015 Arsenal of Democracy flyover in Washington, D.C., youtu.be/HkvcwXqBJDQ. He reacted to what he perceived as an onboard fire and immediately broke formation to make an emergency landing at Reagan National Airport. It turned out to be a hydraulic system leak and thankfully all aboard were safe. Pilots participating in this event meticulously planned for contingencies all along the route of flight and this foresight directly contributed to a safe outcome. Strive for this level of planning and preparation during your next flight.

WHY DO I “LOCKUP” IN THE COCKPIT?



Strategies to Help You Overcome Your Startle Response

BY JENNIFER CARON

It's perfect flying weather — the air is still, the skies are blue, and the ride is silky smooth. Nothing could spoil this perfect flight. But wait, what's that clanking sound? Suddenly there's a bang. “My engine's dead! *This can't be happening!* Not to me! What do I do?! What do I do?!”

When you're in the middle of an unexpected event, it's tough (*but not impossible*) to react calmly, rationally, and remember your training. It may help to recognize that there's a scientific reason why it's not so easy for human beings to keep calm.

Knee Jerk Response

Humans are wired to react instinctively to powerful stimuli, like the pain of touching a hot stove, or the shock of hearing loud bangs on what was an otherwise picture-perfect, textbook flight. Your instinctive reaction to unexpected events is called the Human Startle Response. It is a

deep-seated, reflexive action initiated by the limbic system, the most ancient part of the brain. For billions of years, it's been key to evolutionary success because it instantly prepares us for flight, to fight, or to freeze when faced with an unexpected event.

The startle response is physiological in nature. It's that sudden kicking motion you experience when the doctor whacks your knee with that little rubber hammer. That's an evolutionary mech-



Keep calm and navigate on.

anism your body uses to automatically and unconsciously sustain balance and posture. So “knee-jerk reaction” has become the shorthand for any immediate, unthinking response.

Hollywood filmmakers and Halloween enthusiasts are notorious for taking advantage of our startle response. By means of terrifying visuals and high-pitched, unexpected sounds, they trigger our instinct for flight, to fight, or to freeze, in response to the perceived, yet non-existent danger before us. That’s fine, and can be fun when it happens on the ground, but the flight, fight, or freeze response is not helpful during an aviation emergency.

From Denial to Acceptance

Pilots are susceptible to the startle response when faced with unexpected events such as a partial/full loss of power on takeoff, landing gear extension/retraction failures, bird strikes, or control problems/failures. The heart starts to race, the adrenaline increases, breath quickens, and stress levels go up. A certain amount of stress is good, since it keeps us alert and can improve our performance. But when stress levels exceed our ability to cope, problem-solving gets sluggish, decision-making skills are impaired, and situational awareness gets fuzzy. Chances of making a mistake, or initiating an inappropriate response to rectify the situation, increase dramatically. Some pilots will freeze and essentially do nothing all the way to an eventual crash. The “freeze” component of the startle effect is usually the one that gets most GA pilots in trouble. Other pilots will fight and forcibly yank on the controls when the autopilot, for example, is trying to initiate the opposite reaction. And some pilots will experience a range of emotions from denial to acceptance, as illustrated in the Kubler-Ross aviation equivalent of the five stages of grief.

Kubler-Ross Model AKA The Five Stages of Grief	
Grief Stage	Aviation Equivalent
Denial	This can't be happening.
Anger	I can't believe this is happening!
Bargaining	If you'll just get me out of this
Depression	What's the use? We're doomed.
Acceptance	This is happening. I'll take action!

The five stages of common reactions to an unexpected aviation emergency.



Manage your perception of the event.

I'm Not Surprised

There are several things that you can do to efficiently accept and act. First, you can manage your perception of the event. Evidence shows that your perception of a problem (and the stress it creates) is directly related to the environment in which it occurs. So push yourself to stop, think, and analyze the situation before you reach a conclusion or act.

Here's an example. Let's say it's your birthday and a group of friends and family are crouched just inside the front door. As soon as you enter, they all jump out and yell,

Manage your perception of the event. Stop, think, and analyze before you act.

“Surprise!!” Your startle response kicks in: your heart races, your adrenaline goes up, and you jump from the shock of the unexpected. But once you stop, think, and realize there is no danger, your mind eases, your stress levels decrease, and your

next thought is, “where’s my cake?”

But let's say you're in mid-flight. The passenger-side cabin door on your *Bonanza* suddenly opens as you're climbing through 1,500 feet on a clear sunny day. Of course you'll have a jolt, but your stress level decreases significantly if you stop, think, and realize that this situation is under your control. If the cabin door opens in instrument meteorological conditions (IMC), your stress levels might be a lot higher, but your reaction should be the same. Remember too that everything *seems* worse at night. Mechanical problems magically intensify in the dark but, again, the key is to stop, think, and analyze before you act.

Build Your Muscle Memory

You can greatly improve your chances of a safe outcome if you plan and memorize proper reactions to an unexpected event. Success may depend on how well you are prepared.

Take out the aircraft's pilot operating handbook (POH) and review the Emergency and Abnormal Checklist (EAC). If unexpected events occur close to the ground or during a transition phase, there isn't much time to use a checklist. Memorize the steps for each emergency so you can react quickly and effectively. Since the startle effect can cause a



delay, you need to have procedures already set in your muscle memory so you can act to do the right thing without losing much time or altitude.

For abnormal events that are not immediately life threatening, you have time to consult the checklist. But it's still a great idea to familiarize yourself with those procedures.

Take a look at the Checklist column in this issue for more on emergency checklists.

Drill and Practice

Practice can improve reaction time and help manage the startle effect. In a safe environment, train and memorize your response to unexpected events. Review “what if” scenarios in your head and know your personal minimums by heart. Visualize a situation and say aloud what you will do. Reach out and touch the control or instrument you just mentioned — the more senses you engage, the better you will remember. Mental drills in a non-stressful environment (like your favorite chair at home, or for added realism, your airplane while parked safely on the ground) will help you develop a pre-planned course of action and test your mastery of abnormal and emergency checklists. “Table talking” through potential emergency scenarios with other pilots, at your aircraft type club for example, is another good idea. You can also hire an instructor to help you train. Comprehensive upset recovery training by a qualified training provider can build confidence and enhance aircraft control in unexpected situations.

Flight simulation is another great preparation tool. For example, a qualified instructor can simulate the experience of an engine failure after takeoff, or let you practice dealing with an electrical failure. Flight simulation software on



Tips for Pilots

- Think about abnormal events ahead of time. Practice your plan. Brief your plan prior to takeoff, even when flying solo!
- Work with a flight instructor to train and plan for emergencies.
- Review emergency procedures for your aircraft on a regular basis – don't wait until you need a Flight Review.
- Sit in your aircraft or a properly equipped Aviation Training Device and practice abnormal and emergency procedures, touch the controls, and visualize your aircraft's cockpit.
- Review and practice “what if” scenarios.
- Vocalize takeoff, approach, and landing expectations: aircraft configuration, airspeed, altitude, and route emergency options.
- Sign up for the WINGS Pilot Proficiency program. Your hours with your flight instructor count toward a WINGS level!

your home computer or electronic device can also help. One of the biggest benefits of such practice is learning to overcome the natural, and human “this can't be happening to me” effect.

To test new and/or revised procedures, hire a flight instructor and practice on a training flight. If you sign up for the WINGS pilot proficiency program, those hours can count toward a WINGS phase.

Practice both power-on and power-off stalls with a flight instructor to understand flight scenarios in which a stall could occur and sharpen your recovery technique. An added benefit is becoming familiar with the range of stall warnings.

Looking Ahead

The FAA's Center of Excellence (COE) Partnership to Enhance General

Aviation Safety, Accessibility, and Sustainability — PEGASAS — is researching the types of problem solving and decision-making skills that pilots should use in unexpected events, and developing procedures for pilots to follow (bit.ly/2O0hrmm).

Almost anything can happen during a flight. But if you prepare in advance to manage the startle response and correctly deal with an unexpected event, you will come out ahead. ▶

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

LEARN MORE

WINGS Pilot Proficiency Program
www.faasafety.gov/WINGS

Advisory Circular 120-111, *Upset Prevention and Recovery Training*
go.usa.gov/xy8Rc



(UN) HOLY SMOKE!

THE NIGHTMARE OF SMOKE, FIRE, AND DEADLY GAS

BY JAMES WILLIAMS

Confession time: What's the one thing in general aviation (GA) that scares you, I mean *really* scares you? For me it's always been fire. Just the thought of an aircraft fire unnerves me. Luckily these incidents are not common, but they happen enough to be a concern. When you look at the National Transportation Safety Board (NTSB) aviation accident files, you'll find that there is a significant overlap among three dangers: smoke, fire, and carbon monoxide (CO).

Bad Things Come in Threes

The danger from fire requires no detailed explanation. Smoke, on the other hand, not only obscures your vision but also irritates your eyes and lungs while choking you with a mixture of tiny particulates (some still burning), hot vapors, and toxic gases. That's why smoke inhalation causes most fire deaths according to the National Fire Protection Association. CO is the most insidious. CO is found in smoke, as well as exhaust, and contributes significantly to

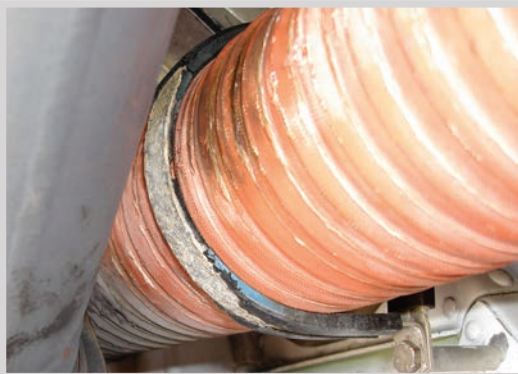
smoke inhalation's deadly effects. You'll find more information on CO in this issue's Condition Inspection department, but suffice it to say if you were looking to design a deadly gas, CO is hard to beat.

Mechanisms of Dread

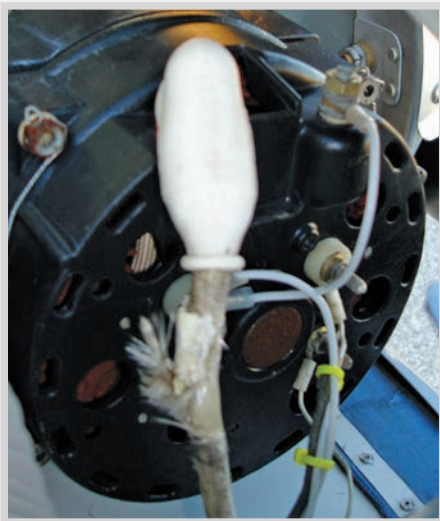
NTSB accident files indicate several common issues leading to smoke, fire, CO, or any combination thereof. The most prominent are exhaust system leaks or failures. Releasing a bunch of super-hot exhaust gases into the nacelle is exactly as bad as it sounds. In one example, a Bellanca pilot experienced an exhaust leak that caused an electrical system fire near the fuel pump and required a forced landing due to fuel starvation. Fortunately, the pilot was able to walk away with only minor injuries.

Another common ignition point is the electrical system. Short circuits in wiring can start fires on their own, but there are also situations where loose wires can chafe against other components and cause arcing. This problem is espe-

Exhaust Leak:
If you see damage like this, it is evidence of an exhaust leak that needs to be investigated by an AMT immediately.



Frayed Insulation:
Damaged insulation on wiring can lead to arcing which can cause both electrical and engine fires.



Wires and Hose:
Properly secured and separated wires and hoses are critical to preventing chaffing that can cause fires.



Welds:
Pay added attention to welds or joints in your exhaust system as they can be common failure points.

Photos courtesy of Adrian Eichhorn.

cially dangerous when wiring chafes against a fuel line, and even more if it occurs around the instrument panel. In one accident, wiring chafed against a fuel flow gauge pressure line, ignited the fuel line, and destroyed the aircraft. Luckily, the pilot was able to make an emergency landing at the

first signs of smoke, and to safely exit without injury.

Prevention is far better than dealing with an airborne fire.

to properly tighten bolts or clamps can lead to catastrophe. One sport pilot accident illustrates this unfortunate reality. The pilot was the owner and builder of his experimental light-sport airplane and had spent the previous four months tracking down a fuel leak. Two days before the accident, he reported resolving the issue. The pilot was performing touch and gos when witnesses observed the airplane on fire before it went down. The investigation determined that an oil and fuel line had not been properly

Maintenance errors lead to a significant number of smoke, fire, and CO-related accidents. Really simple issues like failing

torqued down and that one of them likely came loose due to normal engine vibrations and caused a fire in the compartment. Because of fire damage in the engine compartment, investigators could not determine which line actually initiated the blaze, but neither would have been affected by the pilot's recent repair to the fuel system.

Preventive Measures

As accident files suggest, the causes of these nightmares are often linked. An exhaust leak can grow. An electrical fire can burn a fuel line. But just as the causes are linked, so too are the solutions. Prevention is far better than dealing with an airborne fire, so here are a few strategies you may find helpful.

The first and easiest is a CO detector. They are relatively cheap and can provide a good early warning sign of potential problems. CO detectors can often alert you to the presence of CO even when you can't smell exhaust fumes. They range from the simple color-changing dot style detectors, to more sophisticated devices that are both portable and panel mounted. The more sophisticated devices have

the advantage of being active, meaning that they sound an alarm when potentially dangerous CO levels are reached.

Another good practice is to enhance your preflight when it comes to the engine compartment. Scan the exhaust system for any cracks or holes. Some common failure points you should pay attention to are the muffler and any exhaust system joints or welds. If access allows, scan the compartment for loose wires or hoses. Sometimes they can come loose from their attachment points and this can lead to chafing or fatigue damage. Check the battery for any signs of scorching or singeing that might indicate an unsafe condition around it. Finally, look for loose connections or hardware. Does that nut look like it has backed off? Is that hose clamp secure? These kinds of things can and do happen, whether it's a mistake during maintenance, or just the parts wearing out. Undetected and unresolved, these simple issues can have deadly consequences.

What if the Nightmare Arrives?

What should you do if you find yourself in a fire and/or smoke-related nightmare? The FAA's *Airplane Flying Handbook* has some good suggestions. The first step is to determine what kind of fire you are dealing with. The two major categories are engine and electrical fires.

Engine fires are generally indicated by smoke or flames coming from the cowl, although sometimes they are not visible from the cockpit. Another sign can be discoloration or bubbling of the cowl. By the time any of these signs are visible, the fire is usually well developed. You should always refer to the manufacturer's procedures first, but here are some general guidelines:

- Mixture — Idle Cutoff
- Fuel Selector — OFF
- Ignition — ON
- Ventilate Cabin (unless fire worsens or reignites)

Do not attempt to restart the engine. Also some manufacturers will advise that you turn off the master switch while others may not. This will disable radios, transponders, etc., that could be useful in getting emergency assistance. But it also could be helpful in extinguishing the blaze.

This potential conflict, however, does not apply to electrical fires. Electrical fires can usually be distinguished by the distinct odor of burning insulation. Your specific aircraft's procedures are the key, but in general, steps to follow if an electrical fire is detected include:

- Attempt to identify the faulty circuit via the circuit breaker panel and other electrical systems.
- If that fails, and flight conditions permit:
 - Turn battery master — OFF
 - Turn alternator/generator — OFF

If electrical power is necessary and you want to attempt to restore power, you should:

- Turn all electrical switches — OFF
- Turn the master back — ON
- Individually turn each switch back ON while waiting a short time in between to check for signs of a fire.

This procedure assumes that the electrical fire doesn't cause an engine fire, which can of course happen when it compromises a fuel or oil line.

Engine fires are generally indicated by smoke or flames coming from the cowl, although sometimes they are not visible from the cockpit.

While dealing with any kind of fire you will need to find a landing site, since there's no way to tell how much damage the fire has caused or if it is fully extinguished.

CO is a less visible threat, but all the more dangerous due to its stealthy nature. Should you experience the symptoms of CO poisoning, or get an alert from a detector, you should take immediate action. Turn off the heater (if on), open fresh air vents and windows, and use supplemental oxygen if equipped. Once those actions are complete, land as soon as possible.

Waking Up

Smoke and fire issues are truly the nightmares that haunt many pilots. It's far better to prevent them than to try and deal with them in flight with fewer options. Remember that fires are an absolute emergency that demand quick, correct action. Memorizing your aircraft's specific procedures is highly encouraged as you will likely be required to divide attention between extinguishing the fire, contacting ATC, and selecting a landing site. In the case of an engine fire, you *will* be landing, and in the case of an electrical fire or CO exposure, you *should* be landing. There's no glory in battling these nightmares. Get on the ground and live to tell the tale. ➤

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

LEARN MORE

Airplane Flying Handbook: Chapter 17, Emergency Procedures
go.usa.gov/xyTtc



THE DANGEROUS POWER

Tips for Avoiding Collisions and Close Encounters

BY ADAM MAGEE

A popular saying is that “flying is the second greatest thrill known to man, landing is the first.” That certainly rings true for the lighter-than-air community, as nearly every balloon landing involves the need to navigate obstacles. Power lines are a big one — contact with power lines is the number one cause of fatal balloon accidents.

Pre-flight Prep

The first step in accident prevention is the critical “go/no go” decision, which includes use of preflight checklists and decision making tools as part of a proactive strategy. I am an avid believer in the PAVE and IM SAFE checklists. PAVE stands for **P**ilot, **A**ircraft, **e**n**V**ironment, and **E**xternal pressure. You can consider the IM SAFE checklist as a branch of the Pilot part of PAVE. It stands for **I**llness, **M**edication, **S**tress, **A**lcohol, **F**atigue, and **E**ating. These items combine to determine your personal level of risk for a flight, and they could prompt you to cancel or reschedule the flight.

Many factors can elevate the risk of a flight, so you need to carefully consider what it’s going to take for you to cancel your flight. One thing? Two things? Three? I often tell pilots in training that PAVE and IM SAFE are there for you to “be aware of your unawareness.” These elements repre-



OF POWER LINES

sent things that might cause you to second guess some of your decisions had an accident occurred. For example, you might say, “If I had known [fill-in-the-blank], I wouldn’t have flown” or, “If I had known there weren’t many landing options downwind, I would have rescheduled my flight.”

In essence, PAVE and IM SAFE offer an opportunity to review factors and risks that you might be unaware of. I also tell students to “Always set up your flight for success!” Use PAVE and IM SAFE, use checklists, plan your flight, and follow the balloon flying rule of thumb for 100 feet of downwind distance from obstacles for each knot of wind during takeoff. Give yourself the best opportunity to succeed. Don’t cut corners or allow hurrying, complacency, and laziness to ruin your day.

Distractions

A balloon flight can provide many distractions that break a normal flow and disrupt standard procedures. One such distraction is coordinating with a chase crew. I will always remember a time when I was a child watching several balloons take off in a field. There were power lines downwind but during takeoff one pilot was searching for his handheld radio. Thus distracted, the pilot flew right into the power lines. Thankfully, the pilot survived by turning off the fuel and pulling the top to allow the balloon to drape over the

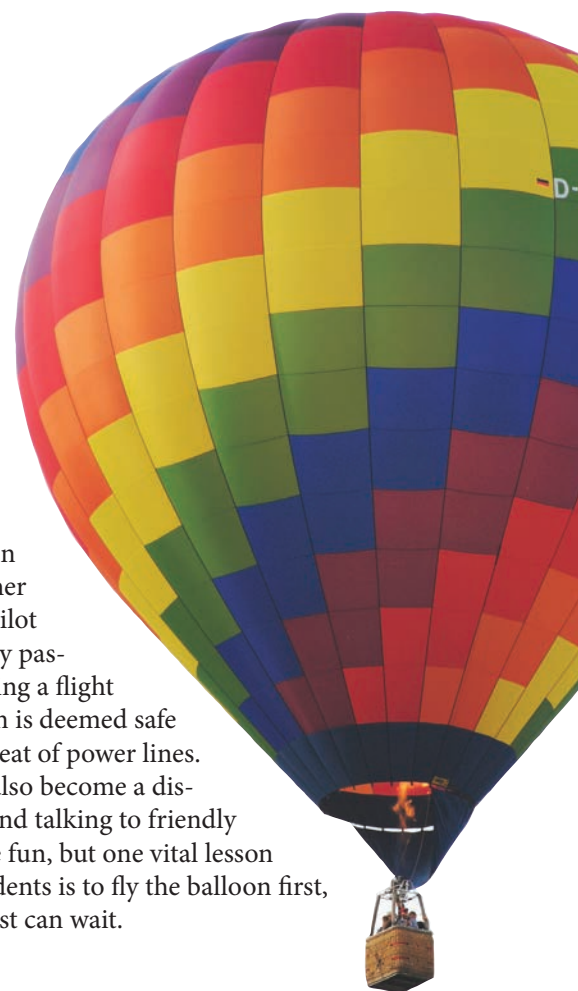
power lines.

Passengers can create distractions. It’s normal for passengers to use mobile phones and social media during a flight, but don’t let that be a distraction to you. Among other things, a balloon pilot should not take any passenger photos during a flight unless the situation is deemed safe and there is no threat of power lines.

Spectators can also become a distraction. Waving and talking to friendly landowners can be fun, but one vital lesson that I teach all students is to fly the balloon first, and always! The rest can wait.

During Flight

Even while in compliance with minimum safe altitudes, balloons fly in close proximity to power lines





during contour flying or on approach to landings. I tell students to fly the power poles. Here's what I mean. It is difficult and sometimes impossible to see the power line itself. It is much easier to look for power poles, but that too comes with a caveat: "flying the poles" can be difficult in places where aesthetically pleasing power poles blend in with the environment. The smartest strategy is to expect a power line to every building — even barns or outhouses, as well as just about every road or driveway. Count on their existence until you are absolutely sure the area is clear.

If you are contour flying, be careful when operating below tree height as power lines may be hiding. Similarly,

"When in doubt rip it out!" If a power line strike is imminent, the safest decision is to turn off all fuel, bleed all remaining fuel from the lines, and "rip out" the deflation port.

if there is a gap in the trees on approach to landing, be aware that power poles could be in those trees with a line going right between the trees you are planning to "split." I once decided to have a student practice an approach to landing over

power lines. I told the student to assume the trees were power lines and to make the approach over them. As it turned out, there *were* power lines hidden in those trees.

The key takeaway is to maintain a healthy respect for power lines. A balloon should always be at an appropriate height above power lines. It should be level or ascending when approaching and crossing power lines. The pilot must be aware of wind shear that could put the aircraft into a "false heavy" situation that pushes it down into a power line. To avoid the dangers created by wind shear, keep an appropriate height above power lines and maintain control while in the descent. Precision is especially important in order to maintain control while transitioning the wind layer upon approach to landing.

Upon Landing

Again, expect power lines everywhere. Scan the area multiple times and ask the ground crew to do the same. The crew use radio or hand signals to identify power lines on approach.

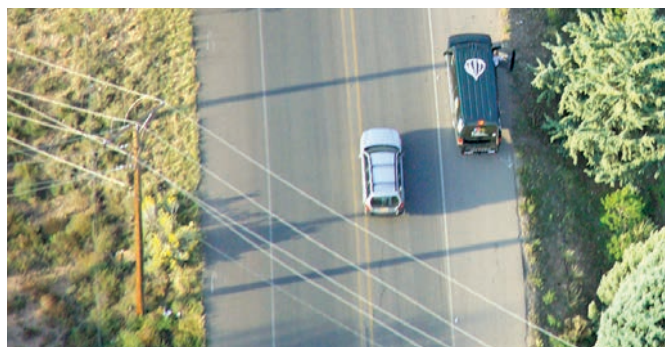
Avoiding power lines and other obstacles requires the pilot to plan the approach based on winds. One helpful technique is to have the ground crew release a pibal (helium balloon) to identify wind directions above the ground. I carry shaving cream onboard to help me see the winds below.

Be mindful of obstacles 360 degrees around the balloon, and maintain awareness of the balloon's movement on approach. A pilot should pick a point of no return that leaves plenty of space before obstacles. When looking for an appropriate landing spot and while on approach, use the GPS to keep track of speed.

What if a Power Line Strike is Imminent?

"When in doubt rip it out!" If a power line strike is imminent, the safest decision is to turn off all fuel, bleed all remaining fuel from the lines, and "rip out" (e.g., open wide) the deflation port. Cooling and descending is a much quicker action, which allows for greater chance of survival in this situation.

Making contact with a power line at the basket or flying wires level is extremely dangerous. It is considered less dangerous to hit at the envelope level and drape the balloon over the power lines. If a pilot "rips out," there is a better chance of contacting the lines with the envelope. Attempting to operate the burners to overfly power lines too often results in contacting the lines at the flying wires or basket,



which increases the risk of fatalities. As all balloonists should know, initiating an ascent in a balloon can be slow due to the time it takes the burners to raise the balloon's internal temperature.

Summing it Up

Nearly every balloon landing involves the need to navigate obstacles, including power lines. Keep these tips in mind to avoid the dangerous power of power lines. ➤

Adam Magee is a commercial hot air balloon pilot/flight instructor, an FAA Safety Team (FAASafetyTeam) Representative, and was named the 2019 District and Regional FAA CFI of the Year. He is co-founder/president of The Balloon Training Academy, a 501(c)(3) non-profit organization and an appointed training provider of the FAASafetyTeam.

CHECKING THE LISTS

ABC Checklist, Personal Minimums, Passenger Briefing

Emergency Approach/Landing: Alphabet Checklist

- **Airspeed.** Memorize best glide speed and try not to lose any altitude until reaching that speed. Once there, trim for hands-off glide.
- **Best field.** Note wind direction and strength, then current position. Where are you relative to a suitable field (e.g., high, low, downwind, base, final)?
- **Checklist.** Start with a flow pattern across the panel. If altitude and circumstances permit, review the written restart checklist. Under all circumstances, fly the airplane first.
- **Declare an emergency.** Note current position and then tune the radio to 121.5 MHz, which should already be in the standby position. When making the mayday call, state who (tail number), what, where, and how many aboard. Set the transponder to 7700.
- **Exit preparation.** Prepare passengers: secure seatbelts, brief passengers on exit procedures, move first aid/survival equipment to a convenient place, and prepare the aircraft, e.g., cracking doors if the Pilot's Operating Handbook/Aircraft Flight Manual so directs.
- **Fire prevention.** Shut the fuel off, along with the three Ms: mixture, mags, and master. Ensure the fire extinguisher is close at hand.
- **Ground plan.** Touch down at the slowest possible airspeed and then evacuate the aircraft. Account for everyone and use the first aid/survival equipment as needed.

Preventing Emergencies: Use Personal Minimums

Use personal minimums to prevent emergencies resulting from conditions beyond the capability of the pilot and/or aircraft. Think of personal minimums as the human factors equivalent of reserve fuel. Personal minimums should provide a safety buffer between pilot skills and aircraft capability required for a specific flight, and pilot skills and aircraft capability available through training, experience, currency, proficiency, and airplane performance characteristics. To create personal minimums:

- **Step 1 — Review Weather Minimums** (VFR, MVFR, IFR, LIFR).
- **Step 2 — Assess Your Experience and Comfort Level.** What are the lowest weather conditions that you have comfortably experienced in the last six to twelve months?
- **Step 3 — Consider Other Conditions.** Similarly, what are the most challenging environments or conditions you have comfortably (and recently) experienced in terms of wind, turbulence, high density altitude, challenging terrain, busy airports, or short runways?
- **Step 4 — Assemble and Evaluate.** Use these numbers to develop your baseline personal minimums.
- **Step 5 — Adjust for Specific Conditions.** Any flight involves almost infinite combinations of pilot skill, experience, condition, and proficiency; aircraft equipment and performance; environmental conditions; and external influences. Make adjustments based on changes in the PAVE checklist factors

— Pilot, Aircraft, Environment, and External Pressures.

- **Step 6 — Stick to the Plan!** Just as with fuel, you shouldn't attempt a flight that requires the "reserve" or worse, "unusable fuel" level of your piloting skill and aircraft capability.

Preparing the Passengers: S-A-F-E-T-Y Briefing

Always review critical items with passengers in an emergency. Here's a slightly adjusted version of the Passenger S-A-F-E-T-Y Briefing checklist we have previously presented:

- **Seatbelts.** Secure seatbelts and safety harnesses.
- **Air.** As appropriate, ask passengers to help with opening or closing air vents. This item is also helpful if the situation involves airsickness.
- **Fire Extinguisher.** Brief passengers on location and use.
- **Exit, Emergencies, and Equipment.** Make sure passengers know how to open the door(s). (Note: You can also prevent an emergency by ensuring that doors are properly closed!) Brief emergency equipment and evacuation plans.
- **Traffic and Talking.** Let passengers know when you need them to minimize conversation.
- **Your Questions?** Especially in an emergency situation, be sure to resolve any questions.

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

WHEN MINUTES COUNT



The crew loads a “patient” into the EC135 for transport to a hospital.

Modern Helicopters Speed Up the “Golden Hour” | BY JOHN CROFT

Minutes count — especially when it involves getting a critically ill patient to the proper hospital, particularly in dense urban areas.

“Time is of the essence,” says Dr. Christopher Wuerker, executive director for Medical Shock-Trauma Acute Resuscitation (MedSTAR) Transport at MedStar Washington Hospital Center. “Minutes count and that’s where helicopters come into play.”

Wuerker oversees a helicopter transport program that hospital operator, MedStar Health, primarily uses to transfer patients between Maryland, Virginia, and Washington D.C. hospitals. As in other major metropolitan areas, gridlock is a common feature of surface transport in D.C. The advanced navigation and surveillance capabilities deployed by the FAA are a key part of the helicopter success equation.



MedStar 1 flight crew with Schubert, Cleckley, and flight nurse Joan Kubelius-Hogan, pose with a simulated patient on the MedStar Washington Hospital Center helipad.

I recently flew on two different MedSTAR flights to see how the program benefits from industry-leading risk management processes and advanced technologies like Automatic Dependent Surveillance-Broadcast (ADS-B) and Performance Based Navigation in its operations.

MedSTAR supplies flight paramedics and flight nurses but contracts the flight operations to Shreveport, Louisiana-based Metro Aviation. MedSTAR has four Eurocopter EC135s based in three locations for the 24/7/365 operations. Three helicopters, each with a crew of three — pilot, medic, and nurse — are on call every day; one helicopter is a hot backup. The crews and the helicopters are equipped for instrument flight rules flights as well as night vision goggle operations.

On March 18, 2019, I accompanied a crew out of Tipton Airport in Fort Meade, Maryland for a demonstration flight in VFR conditions to MedStar Washington Hospital Center to simulate helipad operations and patient loading and unloading into the hospital's Level I trauma center.

A MedSTAR flight typically begins with a hospital physician's "flight request" call to MedStar's communications center in Lanham, Maryland. The call center links the requesting doctor with an "accepting physician" at one of MedStar Health's nine acute care hospitals. If the doctors agree that the patient should be flown, a request is sent to the iPad of a Metro Aviation pilot. The pilot completes a risk assessment using the iPad, which also serves as the electronic flight bag. The risk assessment includes questions on weather, route, pilot's readiness, and the crew's fitness for the flight. The completed assessment goes to Metro's operational control center in Shreveport, Louisiana where communications specialists review and evaluate the score. Once they approve the flight, Shreveport sends a dispatch number to the pilot, and the flight launches. It's typically less than ten minutes from first notification to skids-up.

During the demo flight, pilot Steve Schubert demonstrated how he uses ADS-B Out and In to boost situational awareness in the cockpit, but also to give air traffic control and Homeland Security agencies more precise surveillance data inside the highly secure airspace near the White House and the Capitol. MedSTAR has been

operating with ADS-B for more than a decade, starting with the FAA's Safeflight 21 program in 2006. "We get an audio callout when [the traffic] is close," says Schubert. "Air traffic controllers do a tremendous job pointing out traffic, but sometimes there are too many aircraft and having the information on a display is extremely helpful."

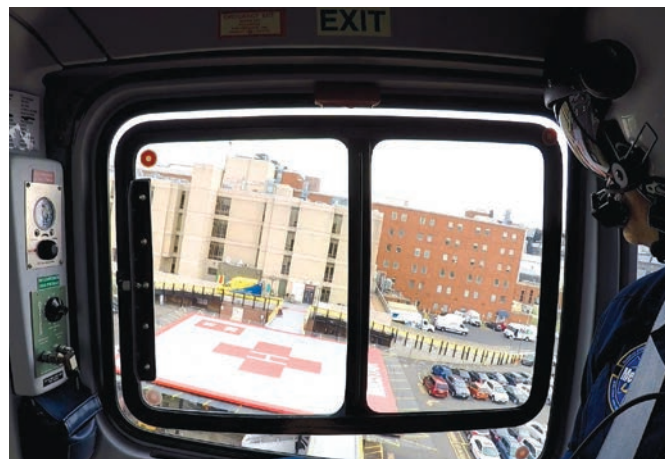
At the hospital center, the crew demonstrated the transportation of a patient to the Level I trauma center. A

To have ILS-like capability is really a game changer.

typical round trip for the Tipton Airport team is 0.2 flight hours to the outlying hospital; 0.2 hours to MedStar Washington or MedStar Georgetown, and 0.2 hours back to Tipton.

On a later second flight, we flew with a Metro pilot from a MedSTAR base at the St. Mary's County Regional Airport in southern Maryland to learn how Metro benefits from the Wide Area Augmentation System (WAAS) approach capability in two of its four helicopters.

Jeremy Fryer, an ex-Army AH-64 Apache pilot, explained that by having WAAS and helicopter approaches with localizer performance with vertical guidance (LPV) minimums, crews have more assurance that they can safely reach the hospital in lower visibility conditions. "With WAAS giving us an extra 200 feet compared to a GPS



Flight paramedic Ryan Cleckley scours the landing area at MedStar Washington Hospital Center on arrival.

LURKING BENEATH THE SURFACE

A Guide to Hidden Damage Inspections

“Just because you can’t see something doesn’t mean it isn’t there. It’s just waiting for the right time to show itself.”

— Emma Hart

Incidents such as a hard landing, prop strike, an overspeed, lightning strike, or excessive turbulence can hide damage that is not immediately evident upon visual inspection. After any such event, it is important to verify that no internal damage is lurking beneath the surface.

It’s Not “Just a Scratch”

Even if you cannot see evidence of aircraft damage or deem visible damage to be cosmetic, the fact is that excessive loads can result in failure or deformation of the structure. This deformation may be “just a scratch,” but deformed parts can overload structures or parts adjacent to the damage.

To detect and classify damage, note that certain appearances are specific to one of the five types of structural stress: tension, compression, torsion, shear, or bending.

Tension

Tension overloads can occur when an aircraft has a hard landing, taxis on a rough field, or operates in very turbulent air. Examine all attachment fittings for tension failures or deformation. Closely inspect welds. In metal aircraft, check for wrinkling of the skin around wing, stabilizer, and landing gear attachment points, plus deformed or cracked fittings. Carefully examine wing strut attachment points.

Compression

Compression is a force that tries to

NO PART OR AREA OF THE AIRCRAFT SHOULD GO UNCHECKED AFTER AN ACCIDENT OR INCIDENT.



While on the ground, the force of gravity places an aircraft’s wing under compression and tension.

crush an object. Check for compression failures appearing as bulges, bows, bends, ridges, or breaks in the paint.

Torsion

Certain landing gear types employ a torsional member referred to as a “scissor,” “nut cracker,” or “torque link.” Carefully inspect this assembly for loose bolts and cracks, especially if the aircraft has landed in a rough or rutted field.

Shear

When an overload occurs, the part with the least resistance will be the first to fail. Examine bolts, rivets, and clevis pins for signs of failure. These parts can shear or partially shear and yet appear perfectly normal to the casual observer.

Bending

Overloads that cause bending usually result from abnormal landing and flight loads, or improper ground handling of the aircraft. Bent components result from: stepping or pushing on lift or other struts; lifting the aircraft by the stabilizer; jacking or placing supports under longerons; or exceeding turn limitations of the

nose steering mechanism. On fabric-covered airplanes, a bent member can often be detected by fabric looseness or wrinkling. Wood or metal skin may become wrinkled, cracked, or distorted.

Hidden Damage — The Regs

If an owner/operator tells a part 145 repair station that the aircraft was in an accident, the repair station has a legal obligation to follow the hidden damage inspection procedures in their repair station or quality control manuals. Part 145 requires that certified repair stations have procedures to inspect for hidden damage to articles involved in accidents, and you must comply with service bulletins and FAA Airworthiness Directives. Certain post-accident/incident inspections are mandatory based on manufacturer requirements, but no part or area should go unchecked after an accident or incident.

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

LEARN MORE

Advisory Circular 20-106, *Aircraft Inspection for the General Aviation Aircraft Owner*
go.usa.gov/xyYd4



IN AN EMERGENCY, FIND YOUR SEA OF TRANQUILITY

It's hard to believe it's been 50 years since the United States' historic landing on the lunar surface. The accomplishment of the crew and supporting cast of the Apollo 11 mission was indeed a testament to human ingenuity, know-how, and perseverance. But save for the quick thinking of "a few good men," it could have gone down quite differently.

If you (like me) weren't able to watch this dramatic event unfold live, multiple specials that relive every nail-biting moment have aired in recent months. The Eagle lunar module was in its critical final landing phase before the now infamous "1202 Alarm" began flashing for all the world to see. The seemingly incessant warnings caught the astronauts off guard. They remained calm but were understandably anxious — Neil Armstrong's heart rate reportedly peaked at 156 bpm during the descent. The alarm turned out to be an indication of computer overload and was not deemed as abort-worthy. Moments later, Neil was moon-walking.

Despite months of intensive training in simulators and going over every possible contingency plan, the Apollo 11 crew never once encountered a 1202 alarm. Although initially bewildered by the mysterious warning, the crew worked calmly and rationally with Mission Control to determine the best course of action.

This plan of action coincides neatly with one of the recurring aviation safety messages in this emergency-focused issue. As Susan Parson writes in her "Keep Calm and Carry On" article, "For any incipient or full-blown emergency, [...] step one always has to be keeping your wits about you."

A common piece of advice dispensed in aviation training is to wind your watch when facing an emergency. While that might confuse those who have never had to actually wind an analog watch, the point is simple: stop and take a moment to process what's happening before you make decisions or take action. In some cases, you may simply be a flick of a switch or a turn of some knob from returning to ordinary flight. So when faced with aeronautical adversity, strive to be calm and methodical in your immediate actions, and don't let any labored limb-flailing cause additional problems.

Another Apollo 11 precept is learning to address the unknown. The astronauts trained tirelessly for every conceivable type of emergency before their mission. But things happen, and they happen when you least expect them. As pilots, we can't possibly train and prepare for every single

anomaly or problem that might arise. While we should continue to train for common emergency scenarios, we should also endeavor to keep learning about the aircraft and the potential pitfalls of technology (glass cockpits, angle of attack indicators, engine monitoring systems, etc.) Know your equipment — including the gadgets you bring on board and your Automatic Dependent Surveillance – Broadcast (ADS-B) equipment.

Thankfully, the Apollo 11 crew had Mission Control to help troubleshoot the 1202 alarm code. While pilots don't have the luxury of engineers and scientists being at the ready when something goes wrong, we do have access to a vast network of aeronautical expertise in the air traffic control system. ATC can help with anything from directions to the nearest airport or suitable landing area, to obstacle awareness, to coordinating a first responder rendezvous. Just browse the numerous "saves" that controllers have made over the years for all types of inflight emergencies (bitly.com/ArchieL). Last year's top save award included controllers from Fort Worth Center who successfully aided a Cessna Cardinal pilot during a complete electrical failure.

While your next flight might not carry challenges on an interplanetary scale, with the right training, tools, and mindset, you'll be prepared to handle any earthly airborne errors that come your way.

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



HELICOPTER N123, STATE YOUR EMERGENCY

There's some simple, time-tested advice about what a pilot's priorities should be when flying: aviate, navigate, communicate. The advice doesn't change in an emergency situation. The first priority is to fly the aircraft. Sometimes that means knowing when enough is enough and it's time to land.

For the first six months of 2019, the safety record of the U.S. helicopter industry was sobering with 15 fatal helicopter accidents including 27 fatalities, a frightening pace that could rank among the community's worst years in decades. NTSB investigations typically take 12 to 18 months, so only preliminary reports are available on these events. However, these reports offer information suggesting that continued flight in marginal VFR conditions can quickly lead to inadvertent flight into IMC (IIMC), which contributed to about half of the fatal accidents.

The United States Helicopter Safety Team (USHST) classifies these events as Unintended Flight in Instrument Meteorological Conditions (UIMC), which is a relatively new term for the industry. This classification was developed by the Commercial Aviation Safety Team (CAST)/International Civil Aviation Organization (ICAO) Common Taxonomy Team (CICTT) for standardization worldwide. UIMC is applicable when a pilot is flying VFR, and for any reason, ends up inadvertently in IMC. However, there should be no misunderstanding,

UIMC and IIMC are the same thing.

When a UIMC/IIMC event occurs, it usually follows a common pattern. A pilot who is neither instrument rated nor instrument proficient takes off in a helicopter not certified for IFR flight. The weather is marginal, but the pilot decides to "give it a try." Once in flight, weather is as bad as forecasted or even worse, but the pilot feels committed to pressing forward, even when it means flying lower and slower. Eventually, the helicopter ends up at a low altitude, low airspeed, and in the clouds. Panic, spatial disorientation, loss of aircraft control, and a crash typically follow.

The USHST analyzed 104 fatal accidents from 2009 to 2013 and identified a need for increased emphasis in handling various "emergency" scenarios. They developed Helicopter – Safety Enhancements (H-SEs) to address high threat situations like UIMC. For example, H-SE 127A is focused on training for recognition of spatial disorientation and recovery to controlled flight. The H-SE includes emphasizing use of all available resources (to include automation). H-SE 123 is focused on increased use of simulation to rehearse "at risk" scenarios and develop safe decision making.

A quick look at NTSB fatal accident reports indicates that the life span of an unprepared VFR pilot entering IMC in a helicopter is less than 60 seconds. The sad irony is that a life-

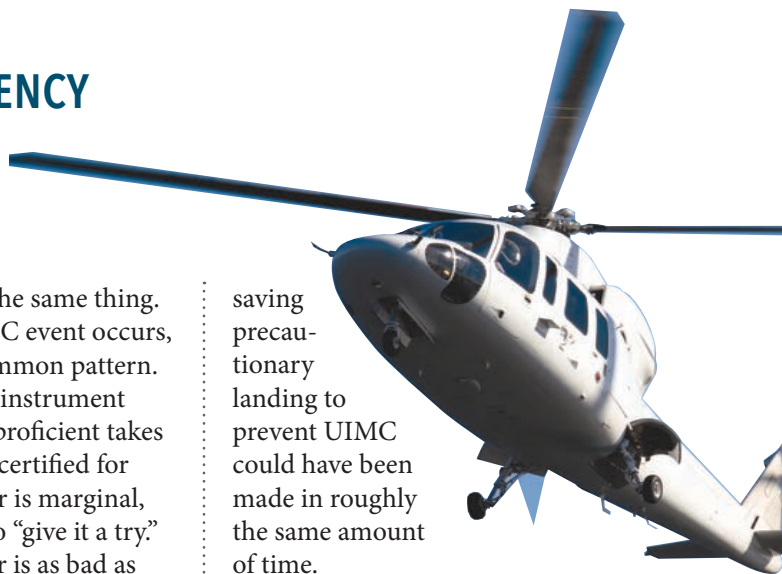
saving precautionary landing to prevent UIMC could have been made in roughly the same amount of time.

Helicopters have the unique ability to land almost anywhere in the event of a hazardous situation. Always be prepared to execute a precautionary landing before conditions create a UIMC event. The Helicopter Association International (HAI) promotes a "Land & Live" program encouraging pilots to execute a precautionary landing when a potentially unsafe situation is developing. Taking this program a step further, some situations require us to "Not Take Off and Live." Don't take off until the weather is not only above the regulatory minimums, but also above your own personal minimums.

An applicable quote from Stephen Coonts, naval aviator and author is: "Mistakes are inevitable in aviation, especially when one is still learning new things. The trick is to not make the mistake that will kill you." Continued VFR flight into IMC is a mistake that will kill you. The data proves it. If the weather is outside the capabilities of your helicopter, your rating, or your proficiency, don't take off. If you find yourself in weather worse than you expected, remember that your highest priority is to aviate: fly to your first opportunity to land safely, and wait for the weather to improve.

Scott Tyrrell is a continued operational safety specialist/accident investigator with the FAA's Aircraft Certification Service.

NTSB FATAL ACCIDENT REPORTS INDICATE THAT THE LIFE SPAN OF AN UNPREPARED VFR PILOT ENTERING IMC IN A HELICOPTER IS LESS THAN 60 SECONDS.





DRONE'T YOU FORGET ABOUT ME

Drones are everywhere these days. We often think of them as fun toys, fancy cameras, or (more ominously) big brother's eyes. There's no doubt that drones are changing the culture and the skies. It can be unsettling to see one flying by your kitchen window or near your child at the park, but it's important to remember that most drone technologies being developed today are meant to improve or even save our lives in some way. Drones are used every day to prevent or respond to emergencies.

DRONES ARE POWERFUL TOOLS THAT OFTEN COME WITH AUTOMATION FEATURES THAT ALLOW THEM TO PERFORM COMPLEX TASKS, BUT THEY STILL NEED TO HAVE A PERSON IN COMMAND OF WHAT THEY'RE DOING.

Emergencies are often unexpected, but they can be prevented or managed. Drones are helping us do this important work. Public safety personnel can quickly launch drones to conduct search and rescue operations that cover more ground more efficiently and safely than teams of people ever could. Victims get help more quickly and public safety personnel and volunteers are freed up to perform other important tasks that do require a human touch.

In Virginia, for example, a 92-year



old man went missing in a densely wooded area. Using a drone with high resolution cameras and infrared sensors, the police were able to locate him in just 20 minutes. In Texas, the public safety agency was able to drop a life vest to a mother and her 15-year-old daughter who were stranded in a rising river because they didn't know how to swim. These are just two examples of disaster scenarios that could have ended very badly but for the use of drones.

It's clear that drones are good tools for preventing and responding to emergencies, but do drones also *cause* emergencies? It can't be overstated that even a simple mishap can quickly turn into a dangerous situation through poor piloting. This fact is true for manned aircraft and it's also

true for drones. Drones are powerful tools that often come with automation features that allow them to perform complex tasks, but they still need to have a person in command of what they're doing. If you're flying a drone and asking yourself, "What's it doing now?" you are not in control and you are not flying safely. If an emergency situation arises, you have already surrendered your ability to manage it.

This all assumes that the person flying the drone understands how it works. If you're flying a drone, be sure you *do* know how it operates, so you can be sure you and your drone are never part of the problem.

Danielle Corbett is an aviation safety inspector with the FAA's Office of Unmanned Aircraft Systems.



Here's some feedback from members of our new GA Safety Facebook Group!

[Facebook.com/groups/GASafety](https://www.facebook.com/groups/GASafety)

As a student pilot in my 40s, I appreciate all the information and real-world scenarios discussed here. Lots of things to learn simply by being a member of this social media sub-page. Especially since the FAA gets involved often.

— James

I just joined this group not long ago. In two weeks, I will start my training to get my private pilot certificate and other ratings. I love this group for all the support and passion everyone has and has shown me thus far. Thank you, guys!

— Nick

Check Your ADS-B For Free

How do I make sure [my ADS-B] is working properly?

— David

Hi David,
The easiest way to check your ADS-B system is to run a PAPR report after any flight. PAPR, or Public ADS-B Performance Report, is a quick and easy way to check your system as many

times as you'd like — and it's free! Fifteen to 30 minutes after a flight, go to adsbperformance.faa.gov/PAPRRequest.aspx to request a PAPR report. It only takes a few minutes to get the report by email. If the report identifies any issues, you can take it straight to your avionics installer to help rectify any problems. Keep in mind that flying near the surface or at the fringe of ADS-B coverage areas may negatively impact the metrics provided in your PAPR Report.

Free FRAT App No More?

The Flight Risk Assessment Tool (FRAT) in the Apple App store is not free as stated in the video presentation "Introduction to Safety Risk Management." Where can one go to find the "free" app?

— S.

Thanks for your email. Unfortunately, the FAA does not own the FRAT App. The developer made it available free of charge for an initial period of time that has now expired. You can find free automated FRAT Spreadsheets for Windows Excel and Apple Numbers in the FAASafety.gov library at bit.ly/2ZVv9Iu.

Let us hear from you! Send your comments, suggestions, and questions to

SafetyBriefing@faa.gov or use a smart-phone QR reader to go "VFR-direct" to our mailbox. You can also reach us on Twitter @FAASafetyBrief or on Facebook facebook.com/FAA.

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

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Starting January 1, 2020, you must be equipped with **ADS-B Out** to fly in most controlled airspace.

Q: Should I purchase an ADS-B transmitter that allows me to enter a call sign?

A: If you always use your plane's registration number for air traffic control communication, you can use an ADS-B transmitter with a non-changeable call sign. However, pilots involved in specialty flying should consider an ADS-B unit that has a pilot-programmable call sign feature. If you take this route, you'll also want to integrate the call sign update task into your normal preflight checklist so you don't forget it. Also, consider that if/when you want to sell your aircraft, the buyer might want to use a call sign.



UNCOMMON SENSING

In this increasingly fast-paced world, there is an increasingly intense competition for a particularly limited item: your attention. Casual online window-shopping leads to ads that stalk you all over the Internet. External activities are even more disruptive, as daily life brings constant, multi-sensory efforts to divert your attention from your intended activity.

We survive by filtering. In sheer self-defense, we have all learned to look without really seeing; to hear without really hearing. While that can be a useful, even essential, habit in some aspects of modern life, it's positively dangerous in aviation. As noted throughout these pages, most aviation emergencies are long in the making. Noticing and promptly attending to small problems keeps them from becoming large and very loud problems that can put you and your passengers at risk.

If you are looking for ways to strengthen your mental “pay attention” muscles, if only for aviation purposes, here are a few tips from a trio of books I've enjoyed.

Learn to Look

The key point in a 2016 book called *Visual Intelligence: Sharpen Your Perception, Change Your Life* by author-artist and teacher Amy Herman is that “we can train our brains to see more, and to observe more accurately.” In her *The Art of Perception**



numerous exercises to help you with a skill that every pilot needs: “Reconciling larger concepts with more specific details, articulating visual and sensory information, and conveying it in an objective and precise manner.” It doesn't take much imagination to see (so to speak) how a high level of perceptual intelligence can help avert airborne emergencies, as well as handle incidents that truly occur without warning.

Ask the Right Questions

There is no shortage of ways to explain what “critical thinking” requires, but my favorite is the simplest: ask the right questions. In this connection, I especially enjoyed James E. Ryan's *Wait, What? And Life's Other Essential Questions*. As Professor Ryan observes, “many of us spend too much time worrying about having the right answers. [...] The simple truth is that an answer can only be as good as the

course, Herman uses museum art to help sharpen visual analysis, critical thinking, and communication skills. The book provides

question asked. If you ask the wrong question, you are going to get the wrong answer.”

I won't spoil the book for you by repeating Professor Ryan's list of essential questions. But I will say that while they all appear to be quite general, reading the chapter devoted to each one offers plenty of observations applicable to strengthening mental “pay attention” muscles.

Listen to Your Instincts

I have long been a fan of author Malcolm Gladwell, because I have learned so much from the piercing perceptions and keen insights in his body of work. One of my favorite Gladwell books is *Blink*, which explores the reasoned underpinnings of so-called snap judgments and gut feelings that a narrow definition of reason would compel us to dismiss.

In essence, Gladwell contends that human beings take in a great deal more information than we can consciously, or “rationally,” process. Nevertheless, other parts of the brain do note, process, and catalog information that might eventually be served up in the form of eye-blink conclusions, or in the kind of diffuse but gnawing sense of unease. I encourage my fellow aviators to always remember “all available information” might well include those instant “doesn't look right” observations, and that listening to the “doesn't feel right” instinct might be key to safe flights and happy landings.

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

WE HAVE ALL LEARNED TO LOOK WITHOUT REALLY SEEING; TO HEAR WITHOUT REALLY HEARING. WHILE USEFUL IN SOME ASPECTS OF MODERN LIFE, IT'S A DANGEROUS HABIT IN AVIATION.

BRUCE WRIGHT, PH.D.

Airman Education Team Lead, Aerospace Medical Education Division

No, Bruce Wright is not related to the Wright Brothers. But he shares both their passion for aviation and their Midwestern roots.

As a child, Bruce enjoyed building model airplanes and helping his neighbor restore a 1947 Bellanca *Cruisair*, a project that inspired him to earn his private pilot wings. In his spare time, Bruce now works on a full-size, experimental light-sport Rans S-7S *Courier* kit plane.

"I'm not currently flying because I am building another experimental aircraft," he notes. "As I get closer to finishing, I will get a flight review and a few hours of dual instruction to refresh my tailwheel skills."

Though not a career pilot, Bruce has been employed in the aviation industry from the start. He was commissioned in the Air Force after college and spent 22 years in the military. As an aerospace physiologist, he taught aviation physiology to aircrew members, performed physiology research at the Air Force Research Laboratory, and became an assistant professor at the U.S. Air Force Academy. While on active duty, Bruce also earned his master's and doctorate from Texas A&M University.

After retiring from the Air Force, he transitioned to civilian employment with the Department of Defense. Another 11 years of research work led to a position with the FAA's Civil Aerospace Medical Institute (CAMI) in Oklahoma City, where Bruce is today.

"I got an offer I couldn't refuse from CAMI! They wanted me to do the same thing I had done for military aircrew, but for the civilian aviation community."

As the airman education team lead for the FAA's Aerospace Medical Edu-

cation Division at CAMI, Bruce is responsible for training airmen and aircrew in global survival and how to manage physical and psychological challenges of the flight environment such as hypoxia, spatial disorientation, fatigue, and dehydration. He also supports aviation medical examiner (AME) training for physicians and personnel from the military and other federal agencies.

Bruce's team also contributes to FAA Safety Team safety seminars and conducts hypoxia demonstrations at major airshows using a Portable Reduced Oxygen Training Enclosure (PROTE).

"My biggest source of accomplishment comes from aviators who step out of our hypoxia demonstration," Bruce said. "They tell me that they have felt those symptoms in the aircraft before but didn't realize that they were experiencing hypoxia. It's a great feeling to know those we trained are safer pilots because they are much less likely to succumb to hypoxia."

If the budget allows, the team is hoping to upgrade to a larger and faster PROTE that can accommodate more airmen. The permanent chamber at CAMI and portable system allows for training approximately 5,000 pilots a year, a small portion of the pilot population. The only way to discover your personal hypoxia symptoms is to experience them in a safe training environment, which teaches pilots to recognize their symptoms and perform corrective actions that prevent the situation from developing into an accident.



In the future, Bruce sees an opportunity to measure cognitive performance in the cockpit, which could lead to some form of pilot performance indicator.

If you are at one of the major fly-ins, then stop by to chat with Bruce and take a turn in the altitude chamber. Another free opportunity his team provides to pilots are one-day aviation physiology and post-crash survival courses at CAMI. Airmen can call (405) 954-4837 to check available dates and enroll. This kind of training could very well save your life!

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



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