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FAA Safety BRIEFING

Winter FLYING SAFETY

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ABOUT THIS ISSUE…

The November/December 2023 issue of *FAA Safety Briefing* focuses on winter operations. Articles cover some of the exciting opportunities that the winter flying season offers as well as provide a review of several important cold weather safety strategies.

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FAA Safety BRIEFING

The FAA Safety Policy Voice of Non-commercial General Aviation

DEPARTMENTS

DON'T GIVE WINTER THE COLD SHOULDER

This time of year presents pilots with somewhat of a recurring conundrum: Do I fly, or do I fold? While some are content with tucking in their airplanes for a long winter's nap, others embrace the change of season, taking advantage of the uncrowded skies, boosted performance, and winter's unparalleled natural beauty. Regardless of which category you might fall into, you'll want to heed some important guidance on the many nuances and risks of cold-weather operations. This issue of *FAA Safety Briefing* is a great place to start.

As stated above, those willing to scoff at the falling mercury and take to the skies in winter are often rewarded with several nice perks. But at the same time, there are many risks inherent with winter flying that pilots need to be aware of, especially if you're new to this type of environment.

The subject of icing quickly comes to mind as a leading foe for winter flyers. In the feature, "FIKI Wiki," we cover the dangers of structural icing and take a look at some newer, as well as some tried-and-true methods of aircraft anti- and deicing that can help keep you safe. A more insidious form of ice that can collect in your carburetor is covered in detail in the article, "Breaking the Ice." Beware, this nemesis to carbureted piston engines can sneak up quickly and can affect aircraft in a much wider range of weather conditions than structural icing.

In the feature "Surviving the Season," we take a look at what it takes for both you and your aircraft to be fully prepared for winter climates. We cover some cold hard facts on cold stress prevention and appropriate attire, as well as offer advice on keeping your survival kit stocked with the right gear.

And for those who might decide to fold up shop for the winter instead of braving the elements, we've got you covered with some tips and techniques on how to safely store your aircraft in the feature, "Putting Your Aircraft to Bed." There's a lot to consider with this process, including potential hazards that might be present, and where and for how long the aircraft will be stored. Incidentally, this extended downtime offers an excellent opportunity to brush up on some aeronautical knowledge areas that might need polishing.

There's much more than just this magazine to help you get ready for the unique challenges of winter flying. The FAA has a host of other helpful resources available online. For example, check out FAA's winter flying resources page at bit.ly/FAAWinterResources. Here you'll find quick access to some great winter videos on how to predict icing conditions and the Winter Weather Challenges episode of our popular *From the Flight Deck* series.

There are also links to many winter safety articles, including this one at bit.ly/3sITJQi that offers 14 items you should add to your winter safety list and a series of articles on the FAA's weather camera program, which has locations in many snow-bound areas like Alaska, Colorado, Maine, Montana, and Utah.

The FAA Safety Team (FAASTeam) website at FAASafety.gov is another great resource for winter weather information. Try taking the Inflight Icing online course at bit.ly/ALC-33 to test your knowledge or peruse the Winter Flying Tips brochure at bit.ly/45P8Fuw.

While cold-weather operations do have their share of unique risks, don't let that dissuade you from enjoying the many benefits this type of flying can offer. With the right mix of knowledge, preparation, caution, and good judgment, winter flying can be wonderful. Safe flying!

AVIATION NEWS ROUNDUP

FAA Invests $121M to Reduce Chance of Close Calls at Airports

The FAA has awarded more than $121 million to airports across the country to reduce the risk of runway incursions. Projects will reconfigure taxiways that may cause confusion, install new lighting systems, and provide more flexibility on the airfield. The recent projects announced include:

- **Willow Run Airport, Mich.:** $12.8 million to construct a 6,720-foot parallel Taxiway A to eliminate the need for aircraft to back-taxi on the runway.
- **Eugene F. Kranz Toledo Express Airport, Ohio:** $4.6 million to shift Taxiway B11 from its current airfield location to 450 feet east to meet FAA design standards and improve 16,450 square feet of the airport's taxiway safety area erosion control system to eliminate ponding on airfield surfaces.
- **Richmond International Airport, Va.:** $5.6 million to shift Taxiway E from its current airfield location to the north to meet FAA design standards.
- **Jackson Hole Airport, Wyo.:** $2.6 million to construct a 1,500-foot taxiway to eliminate the need for aircraft to back-taxi on the runway and to rehabilitate 2,400 feet of the existing Taxiway A pavement to maintain the structural integrity of the pavement and to minimize foreign object debris.
- **Naples Municipal Airport, Fla.:** $3.5 million to reconfigure Taxiway A at the intersection with Taxiway B to improve non-standard pavement geometry; shift Taxiway A3 and reconstruct 3,000 feet of the existing service road to enable the safe movement of vehicles and ground service equipment.

To learn more about these runway construction projects, visit bit.ly/3LxzRag and also review the FAA runway safety technology fact sheet at faa.gov/newsroom/runway-safety-fact-sheet.

New Video Focuses on Aviation Phraseology

Aviation has a unique language designed to ensure effective communication between pilots and controllers. Understanding and using these words and phrases properly is vital for avoiding errors and maintaining safety. For example, "roger" is not a clearance or an appropriate response to a yes or no question; it only means that the transmission was received.

A new video in the FAA's popular *From the Flight Deck* series discusses phraseology and what you might encounter when operating on the surface of an airport or preparing to land. The video covers ground terminology, including standby, go ahead, hold short, monitor, taxi up to and hold short, continue, and line up and wait. It also reviews airborne phrases like cleared to land, cleared low approach, cleared for the option, go around, and continue.

Check out the video for yourself at faa.gov/flight_deck to learn more about what a pilot may hear from a controller and what it really means.

FAA Authorizes Additional Operators to Fly Drones Beyond Visual Line of Sight

The FAA authorized two more companies to operate drones beyond

#FLYSAFE GA SAFETY ENHANCEMENT TOPICS

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

NOVEMBER

CFIT and the Normalization of Deviation Bias – a look at the dangers posed by human biases in cases of controlled flight into terrain.

DECEMBER

Making the Numbers – a review of best practices for determining and predicting aircraft performance.

visual line of sight (BVLOS). UPS Flight Forward with its Matternet M2 can conduct small package delivery and uAvionix with its Rapace can use the Vantis Network to test its detect and avoid technology.

On Aug. 24, the agency authorized Phoenix Air Unmanned to operate SwissDrones SVO 50 V2 drones BVLOS for aerial work, aerial photography, survey, and powerline and pipeline patrol and inspection. The FAA issued the approvals after asking for public input on four BVLOS requests. The agency is reviewing one additional request. Data collected from these operations will inform the FAA's ongoing policy and rulemaking activities.

The FAA's long-term goal is to safely integrate drones into the National Airspace System rather than to set aside separate airspace exclusively for drones and, is currently focused on developing standard rules to make BVLOS operations routine, scalable, and economically viable. This approach is consistent with the FAA Modernization and Reform Act of 2012 and the FAA Extension, Safety, and Security Act of 2016. The 2016 Act directed the FAA, in conjunction with NASA, to continue developing a plan for Unmanned Aircraft System Traffic Management (UTM), which will assist in integration efforts.

Happy Aviation History Month!

Aviation History Month, observed in November, celebrates all the contributions and achievements made to the field of aviation and its development. And there's a lot to celebrate!

Many of us first think of the Wright brothers when it comes to aviators in history, but others were lifting off in devices long before Wilbur and Orville took to the air. For example, Otto Lilienthal built gliders and flew them near Berlin, Germany, in the 1890s. His very invention aided the Wright brothers in the design of a powered airplane.

So, this November, be sure to explore the people, places, and technology that make up aviation history. Read a book. Visit a museum (check your local area, some museums will have special events). Listen to a podcast or watch a documentary about aviation history. Find an air show or take a flight.

No matter how you choose to celebrate, reflect on the pioneers whose brilliance and creativity proved that the sky is not the limit.

FAA Hits 1,500 Controller Hiring Goal for 2023

The FAA has hired 1,500 air traffic controllers and met its 2023 goal needed to continue rebuilding its training pipeline. The agency also announced that by late August, it had approximately 2,600 controllers being trained at facilities across the country. Many of these controllers are already certificated to safely work some air traffic positions as they continue training on others.

New controllers start their career journey at the FAA's academy in Oklahoma City. After graduating, they relocate to one of the FAA's hundreds of air traffic facilities. There they begin training to become certified on specific airspace positions for that facility, Terminal Radar Approach Control (TRACON), or en route center. Certification varies from 18 to 24 months, depending on the airspace complexity.

Like the certification process for many highly skilled professions, air traffic control requires rigorous training. Not everyone who applies or enters the process will be ultimately successful.

The COVID-19 pandemic forced the FAA to close its academy for six months in 2020 and pause on-the-job training at facilities for almost two years.

FAA Extends Remote ID Enforcement Date Six Months

Drone pilots who are unable to comply with the broadcast requirement of the Remote ID Rule will now have until March 16, 2024, to equip their aircraft. After that date, operators could face fines and suspension or revocation of pilot certificates. This requirement can be met by purchasing a standard Remote ID-equipped drone from a manufacturer or purchasing a Remote ID broadcast module, which can be affixed to existing drones that do not have Remote ID equipment.

Remote ID acts like a digital license plate and will help the FAA, law enforcement, and other federal agencies find the control station when a drone appears to be flying in an unsafe manner or where it is not allowed to fly.

Learn more at bit.ly/FAARID.

DR. SUSAN NORTHRUP, FAA FEDERAL AIR SURGEON

THE WAIT IS PART OF THE JOURNEY

We are very aware of the frustration that many have with the airman medical certification process. Many conditions require an observation period before the risk to public safety drops back to that of the general population or specific testing to ensure a pilot can maintain adequate control in flight. Fortunately, as medicine advances, we are able to certificate pilots with more and more complex conditions that were previously disqualifying. Unfortunately, this comes at a cost to the individual in expense (sometimes) and inconvenience as well as to the FAA in terms of workload, which can lead to delays.

Let's consider insulin-treated diabetes mellitus as an example. Prior to 1996, this was disqualifying for all classes of medical certificates, but then protocols were developed to allow Class III special certification. A few years ago, technology advanced sufficiently that we were able to extend this to Class I and II medical certificates. This significantly increased our workload while our staffing remained the same. As my predecessor liked to say, it is easy to say no, but sometimes it's very difficult and time-consuming to safely get to yes. Please know that we are taking steps to reduce processing time.

Recall that we allow aviation medical examiners (AMEs) to issue a medical certificate in select cases via the Conditions an AME Can Issue (CACI) and AME Assisted Special Issuance (AASI) processes. Both allow the pilot to leave the AME office with their certificate in hand, and the former helps to reduce the number of cases requiring review by the FAA.

We have also expanded our staff in mental health and neurology. Not only is there an increase in the number of applicants for medical certification, but an increased percentage of these have a mental health diagnosis, including attention deficit hyperactivity disorder (ADHD). We are also actively recruiting additional staff to help in this area.

Another recent change expanded the ability of AMEs to upload medical documents pertinent to certification. Although the application for both pilot and medical certification has been online for some time, the security aspects of uploading documents have been a major challenge. To help speed the process along, follow the checklist in the disposition tables in the Guide for Aviation Medical Examiners for many conditions, provide all the documents required in any letters you receive from the FAA, and bring these documents to your AME. Please read any correspondence from the FAA carefully. If we ask for a study, we have specific reasons for this, and failure to provide the information will delay certification or even result in a denial.

We regularly expand the number of conditions that we can certify as safety permits. The authorization of Class I or II medical certificates to some pilots who use insulin to control their diabetes has been a success; to date, there have been no medical incidents related to insulin use in this group of pilots. With regard to cardiac conditions, we now certificate pilots with pacemaker dependence and have halved the observation period for pilots with a Class I or II medical for some coronary stents. The treatment of cancer has improved so dramatically that we have now certificated pilots for conditions that would have been uniformly fatal just a few years ago, including one pilot with a brain metastasis, which resolved in treatment.

Some of the biggest changes have been for mental health. We have just added a new medication for the treatment of depression (bupropion extended release) and are reviewing additional medications. We have also reduced the minimum evaluation period required for ADHD for many pilots, saving both time and expense. Finally, formal neuropsychological testing for selective serotonin reuptake inhibitor (SSRI) renewals is no longer automatically required for renewals unless it is clinically indicated.

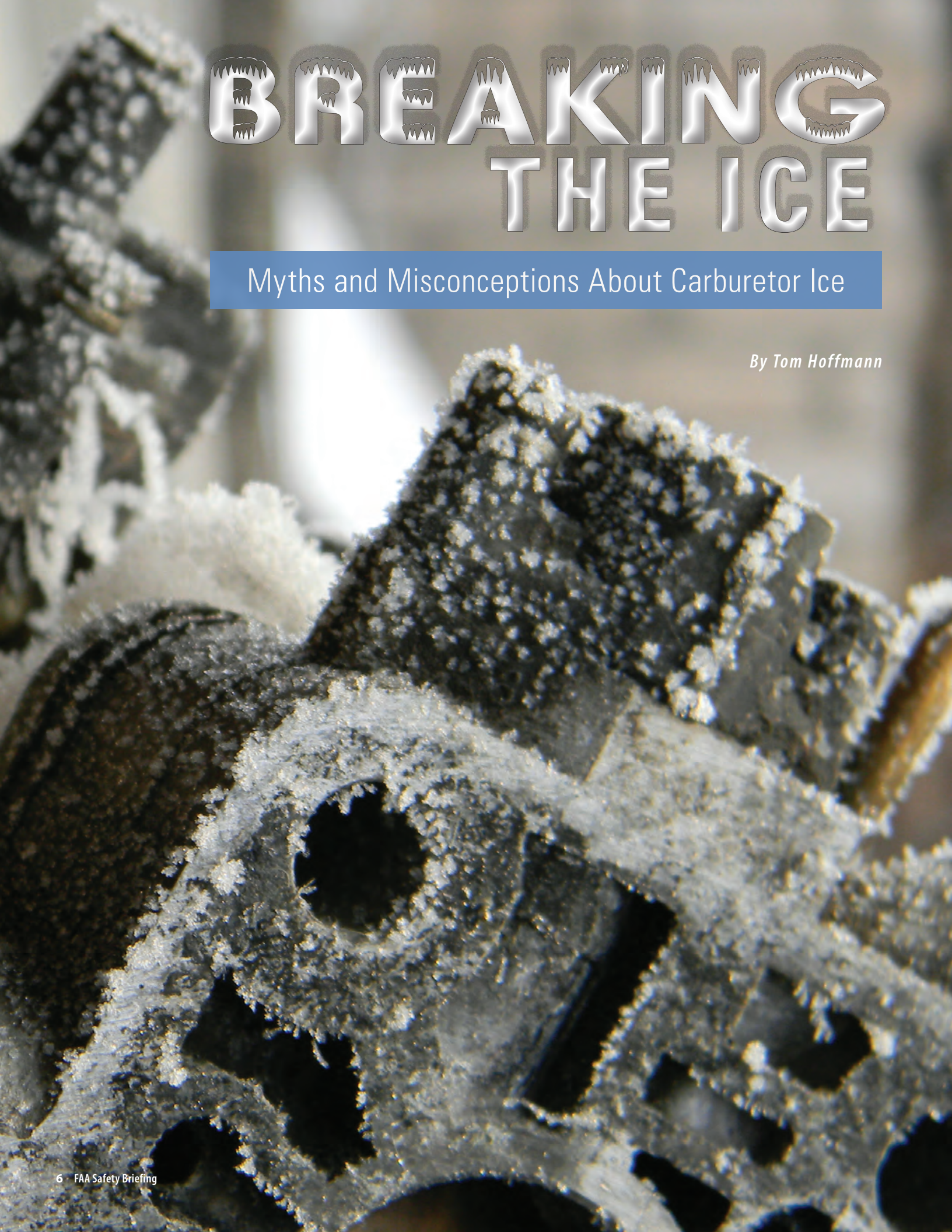
Improving efficiency with this process is and remains a work in progress. We look forward to working with you to get you your medical certificate as quickly as possible.

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

BREAKING THE ICE

Myths and Misconceptions About Carburetor Ice

By Tom Hoffmann



When it comes to aircraft icing, it's usually the clear or rime variant accumulating on airframe structures that gets the spotlight. And for good reason. Structural icing has hugely debilitating effects on all four major forces in flight and can be deadly if not avoided or handled properly. However, there's a more insidious type of icing lurking under the cowling that can prove just as deadly and is prevalent in a more varied range of weather conditions than its chilly cousin.

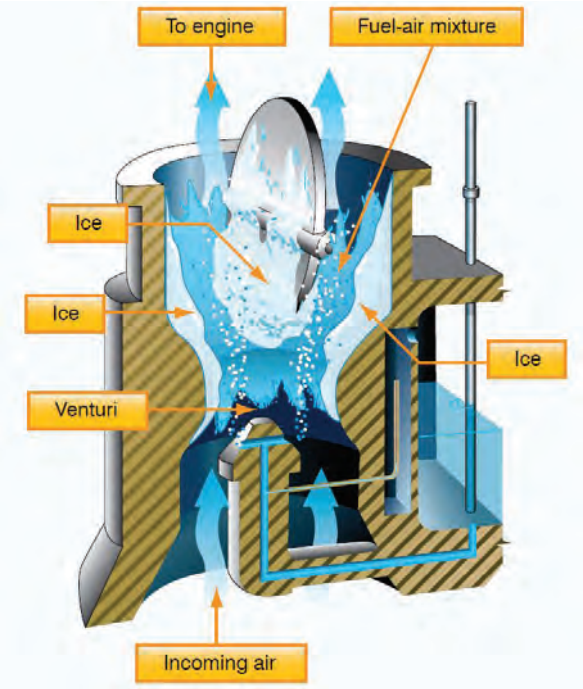
Carburetor icing, or carb icing, can starve an engine of its power-producing properties, often without warning. Thankfully, carb ice can be fairly easy to avoid and/or mitigate — provided you're familiar with the correct information and procedures. Yet, every year many pilots find themselves victims of carb ice and unaware of its propensity in some warmer environments.

A recent search for carburetor icing-related accidents since 2018 in the NTSB's aviation accident database rendered 192 accidents, 19 of which were fatal. A common theme among the accidents was the inability to recognize carb icing symptoms and the improper use of carburetor heat.

So, what can pilots do to combat this icy villain? Let's take a closer look at what carb icing is, how it can affect your flight, and how to deal with it.

What is Carb Ice?

Carb icing occurs when moisture in the air freezes and collects on parts inside of the carburetor and/or the air intake, blocking airflow to the engine. It can happen to any carburetor under the right atmospheric conditions and even a small amount can cause a power loss.



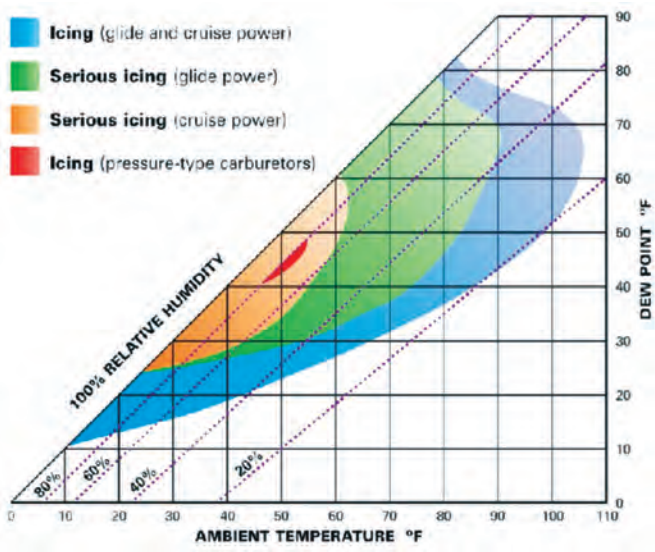
The formation of carburetor ice may reduce or block fuel/air flow to the engine.

As noted in FAA Advisory Circular (AC) 20-113, *Pilot Precautions and Procedures To Be Taken in Preventing Aircraft Reciprocating Engine Induction System and Fuel System Icing Problems*, and the FAA Safety Team's *Winter Flying Tips* pamphlet, there are actually three types of carburetor icing to be aware of:

- ***Impact ice*** forms by the impact of moist air at temperatures between 15 and 32 degrees Fahrenheit (F) on air scoops, throttle plates, heat valves, etc. It usually forms when visible moisture like rain, snow, sleet, or clouds are present. Most rapid accumulation can be anticipated at 25 degrees F, when the supercooled moisture in the air is still in a semi-liquid state. (Note: Impact ice can also block the air filter and rob the engine of air needed for combustion, even on a fuel-injected engine.)
- ***Throttle ice*** forms at or near a partly closed throttle valve. The water vapor in the induction air condenses and freezes due to the venturi-effect cooling as the air passes the throttle valve. Since the temperature drop is usually around 5 degrees F, the ideal temperatures for forming throttle ice would be 32 to 37 degrees F (although a combination of fuel vaporization and throttle ice could occur at higher ambient temperatures).
- ***Fuel vaporization ice*** forms at and downstream of the point where fuel is introduced and occurs when the moisture content of the air freezes as a result of the cooling caused by vaporization. It generally occurs between 40 and 80 degrees F but may occur at even higher temperatures whenever the relative humidity is more than 50%. Fuel icing usually occurs in conjunction with throttle icing and is most prevalent in engines with conventional float-type carburetors.

A key takeaway here is that carburetor icing doesn't just occur in freezing conditions; it can occur at temperatures well above freezing when there is visible moisture or high humidity. You'll notice in Figure 1 on the following page that the temperature and humidity range most prone to carb ice covers many conditions we fly in throughout a good part of the year. While this chart can help determine prime conditions for carb icing, remember it can still occur in conditions outside of that range.

Figure 1 — Carburetor icing probability chart.



It's also worth noting that differences in engine airflow and cowling design make some aircraft types more prone to carb ice than others. For example, due to engine design and carburetor placement, a high-wing Cessna 182 with a big-bore Continental engine is more likely to build carb ice than a Lycoming-powered Piper *Cherokee*. Just remember that no carbureted engine is immune from carb icing, nor is a fuel-injected engine immune from impact icing.

How Do I Know I Have Carb Ice?

Carburetor ice can be detected by a drop in rpm in fixed-pitch propeller airplanes and a drop in manifold pressure in constant-speed propeller airplanes. You may also experience engine roughness and vibration when carb ice is encountered.

Pilots should also be cognizant of the increased likelihood of carb ice during certain low-power configurations like descents and idling on the ground. If the pilot doesn't take immediate action to clear the ice, it will continue to restrict the fuel/air flow and the engine may lose power completely.

"In my experience, throttle ice, which seems to manifest itself on cold days during extended periods of ground operations, is the type of carb icing that seems to be unfamiliar to many pilots," says Andrew Walton, director of safety at Liberty University's School of Aeronautics.

Walton shared an enlightening scenario of such an encounter with throttle ice during an instructional flight at Liberty in 2009. As reported by the instructor onboard, a Cessna 172 had an extended wait before takeoff due to inbound traffic. The outside air temperature was just above freezing and the humidity was low. Once airborne, the instructor stated that the engine started cutting in and out. They applied carb heat in case of icing and immediately returned to the field. It appears throttle ice had developed at low power after the run-up and while waiting for takeoff.

"This incident demonstrates that while pilots are generally aware of the possibility of fuel ice at higher temperatures and humidities, they don't realize that throttle ice can happen on the ground during taxi," Walton added.

Another good way to help pinpoint the likelihood of carb ice is by using a carburetor temperature gauge. They are usually color-coded with yellow indicating the temperatures where icing may occur. If you have one, be sure to include it in your instrument scan.

Bring the Heat!

So, what's the best course of action for combatting carb ice? Carb heat of course. In most airplanes, when you pull the carb heat knob, a flapper door opens and the engine pulls warm air through a heat exchanger that surrounds your exhaust system. Carb heat use will cause the engine to have a slight loss in power due to the warmer and less dense intake air. If there is carb ice present, you may also notice the engine running rough before eventually smoothing out. This may last from 30 seconds to several minutes depending on the severity of the icing.

The key to carb heat effectiveness is knowing when and for how long you use it. Use it too late (i.e., after a significant amount of ice has accumulated) or too briefly, and you may not have enough heat available to melt the ice. Sometimes descending to a lower altitude where the air is warmer works, but the terrain has to allow for that.

Pilots should consult the airplane flight manual or pilot's operating handbook (POH) for specific instructions on carb heat use, but a best practice is to use carb heat during low-power operations like descents and during landing, as well as when carb icing symptoms exist.

Master instructor and designated pilot examiner Doug Stewart is a proponent of this advice but makes it a point to stress the need for carb heat *before* reducing power. "During checkrides, I might only see one out of ten pilots pull the carb heat before beginning a descent to land," notes Stewart.

> **There's an increased likelihood of carb ice during certain low-power configurations like descents and idling on the ground.**

For Stewart, timing is everything too. "When a carbureted engine quits due to carb ice, the longer you wait to apply heat, the less chance there is of getting that engine running again." He adds that waiting to run through your checklist might be too late as the residual heat from the exhaust system may already be gone. Bottom line: if you suspect carb icing, particularly if you're within the sweet spot for temperature and humidity, use carb heat.

Is There a Downside to Using Carb Heat?

Since carb heat usually brings unfiltered air into the engine, there is concern among pilots that its use may cause damage to the engine. Pilots should exercise caution and limit the use of carb heat in extremely dusty areas, or where there may be volcanic ash present.

Another concern is the degraded climb performance when performing a go-around with the carb heat left on. Pilots should be aware of this, particularly when certain atmospheric conditions may require all available power to arrest a descent. It's best to follow the procedures stated for carb heat use in the aircraft's POH. Just remember that not using carb heat when required for a power-off or low-power descent for landing could result in carb ice and restrict your engine's ability to develop full power on a go-around.

Troubleshooting Tips

Ensuring you're prepared for any icing of the induction kind means checking the carb heat system before you fly.

When pressed for time, resist the urge to speed through your instrument checks on run-up. Instead, take the time to carefully record the appropriate rpm drops when carb heat is applied.

If you're not seeing a significant rpm drop, the system could be leaking, or your cable could be broken. Leaky air boxes are common. When it comes to how much of a drop you should expect to see, the manual is the best place to look. It's common to expect a drop between 75 and 150 rpm. Any less might be worth a discussion with your mechanic.

There are plenty more resources on this subject, so be sure to check out some of the links in the Learn More section below. *Being prepared is the key to keeping your carburetor ice-free!*

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

LEARN MORE

FAA AC 20-113, *Preventing Engine Induction System Problems*
bit.ly/AC20-113

FAA SAIB CE-09-35, *Carburetor Icing Prevention*
bit.ly/SAIB0935

FAA *Pilot's Handbook of Aeronautical Knowledge*, Chapter 7, Aircraft Systems
bit.ly/AeronauticalKnowledge

FAA Safety Team's *Winter Flying Tips*
bit.ly/45P8Fuw

FAA Safety Team Online Inflight Icing Course (ALC-33)
https://bit.ly/ALC-33

NTSB Safety Alert 029, *Engine Power Loss Due to Carburetor Icing*
bit.ly/NTSB-SA29

"Bring the Heat," *FAA Safety Briefing*, Jan/Feb 2017
bit.ly/FAASB-BringtheHeat

AOPA Safety Brief, *Combatting Carb Ice*
bit.ly/AOPA-SafetyBriefs

AOPA *Carburetor Icing* article
aopa.org/training-and-safety/students/presolo/skills/carburetor-icing

SURVIVING THE SEASON

Best Practices for Winter Weather Readiness

By Nicole Hartman

Like many, my family and I enjoy watching wilderness survival shows, like the History Channel's *Alone*. We find it entertaining and comforting, in a strange way, to witness thrilling survival experiences in brutal environments from the luxury of our cozy couch. We can't help but envision how we would act if put in that same situation. Would we be prepared? Could we survive? Our guilty pleasure has us considering these hypothetical questions, but any pilot who flies in extreme winter weather should consider them seriously.

With fewer planes in the sky and the potential for better visibility and boosted aircraft performance, the winter season presents supreme conditions for flying — if you're properly prepared. Here are some vital areas to plan for if you're thinking of flying this winter.

Frigid Fitness

Any survival expert will agree that physical and mental well-being are imperative for a successful expedition. As a pilot flying in the winter, it's important to understand the effects that colder weather can have on your body and mind. Cold stress, caused by exposure to extreme cold and windchill, can impair basic motor functions and have serious consequences.

Pilots are susceptible to cold stress before, during, and after flight. This occurs whenever skin temperature starts to drop, followed by internal body temperature. When your temperature drops below 98.6 degrees F, blood flow to your extremities is restricted to preserve heat in your core. We're all accustomed to chattering teeth and shivering, but as your body is unable to warm itself, fatigue and confusion or disorientation can also set in. Prolonged exposure can lead to serious cold-related conditions including hypothermia, which affects the ability to think clearly and move easily, and frostbite, which damages deeper tissue and can lead to tissue death.

Cold stress, caused by exposure to extreme cold and windchill, can impair basic motor functions and have serious consequences.

None of these symptoms are conducive for a safe and pleasant flying experience, so what can you do to keep Jack Frost from nipping at your nose?

- **Layer:** There is no single magic garment able to adapt to the environmental variables of winter. Wear a breathable, wind/water-resistant outer layer, an insulating middle layer, and a breathable, moisture-wicking base layer to provide the protective barriers needed to combat cold. Protect extremities with thermal headwear and gloves. Supplement with warming packs for feet, hands, and liners.
- **Footwear:** Tennis shoes are fine for pre-flight in a warm hangar, but make sure your footwear is appropriate for the weather before pulling the aircraft outside and taking off. Consider wearing boots with a moisture-wicking lining to help stay dry and a slip-resistant sole for added safety.
- **Hydrate:** Dehydration in cold environments is a major risk especially since lower temperatures suppress thirst (the body is focused on regulating core temperature more than fluid balance).
- **Eat:** Eating a healthy meal before flight is important for your physical and mental wellbeing. Eating also keeps your metabolism up which helps you retain heat.
- **Rest:** Make sure you're well-rested before flying. Your body needs energy to maintain its core temperature. Additionally, exhaustion and fatigue can exacerbate an already stressful situation.
- **Limit Direct Exposure:** The less time you're exposed to the elements, the less likely you are to be severely impacted by them.

Make a List. Check it Twice.

Now that you're properly bundled, you need to make sure your aircraft is ready to face the elements. In the winter, your preflight checklist is especially crucial and should be scrutinized with even more care than Santa double-checking his naughty list. Inspect your aircraft as though an examiner is observing you: check tire pressure (which tends to drop in cold weather), perform any needed snow/ice removal, and inspect the engine cowling for any debris or small animals looking for a place to stay warm.

Pay special attention to the aircraft openings where snow can enter, freeze solid, and obstruct operation, especially if an aircraft is parked in an area of blowing snow. These openings should be free of snow and ice before flight. Inspect pitot tubes, heater intakes, carburetor intakes, anti-torque and elevator controls, and main wheel and tail wheel wells where snow can freeze around elevator and rudder controls.

Be sure to inspect your fuel vent before takeoff. A vent plugged by ice or snow can cause the engine to stop, the tank to collapse, and potentially other serious damages. Additionally, always double-check your anti- and de-icing equipment.

It's crucial to warm up your aircraft cabin and engine in cold weather, especially if it's not being stored in a hangar. Watch for potential fire hazards due to faulty heaters and/or cords and do not leave your airplane unattended during the preheating process. Be careful that the heat ducting is not blowing on flammable parts of the airplane such as upholstery, canvas engine covers, and flexible fuel, oil, and hydraulic lines. Ensure you always have a fire extinguisher at the ready during the preheating process. Be aware that if your aircraft is stored in a hangar, frost may develop on it once it is brought out into the cold. Keep an eye out for this and be prepared to remove as necessary.

Precipitation Preparation

Proper flight planning is always important; however, it is particularly crucial when flying in winter weather. With the possibility of sudden weather changes, pilots must have a detailed understanding of weather conditions and forecasts along their flight route. Simply put — winter preflight planning should take longer than prepping to fly in warmer weather. Keep this in mind as the tendency to rush to avoid becoming cold could result in missing a critical item.

> **Pay special attention to the aircraft openings where snow can enter, freeze solid, and obstruct operation, especially if an aircraft is parked in an area of blowing snow.**

The cold air of winter often provides increased visibility, letting you see everything more clearly from further away. However, snow and ice can create hazardous conditions, so knowing the fastest or safest escape route is a critical part of the flight planning process. Be sure to utilize the numerous weather tools available to inform go/no-go decisions. Pay attention to the weather patterns most common in your local area and assess the trends for your destination several days ahead of time if you're flying cross-country.

Flight planning should include your destination as well as some contingency routes in case you encounter unexpected weather and need to change course. Mid-air, mid-ice storm is not the time to come up with a "plan B." The more you understand how the weather acts within your common flying zones, the better prepared you'll be for any issues that arise during flight.

Equip for Elements

Winter flying is not like competing on a reality survival show, with an entire production team waiting in the wings in case something goes wrong. When you're waiting for aid in an unheated airplane on a cold, snowy night, you'll be wishing you had the option to "tap out" and be rushed off to safety and warmth.

Even the most cautious pilots experience emergencies, so always pack necessary survival equipment, including extra winter clothing, a fully charged phone, a flashlight with new batteries, high-energy food (like protein bars and

nuts), and water. Additionally, consider equipping your plane with some survival gear for the worst-case scenario. Some states (like Alaska) require specific equipment to be carried on board, by law, applicable to the time of year. Be sure to check your local area before flying.

> **Simply put — winter preflight planning should take longer than prepping to fly in warmer weather.**

Your basic survival kit should consist of the 6 C's of survival.

- **Cutting Tool:** A knife is a versatile, indispensable addition to any survival kit. A small and useful tool, a knife can be used for processing wood and as a flint and steel striker for fire.
- **Fire Starting (Combustion) Device:** This can include stormproof matches, a simple lighter, or a ferro rod.
- **Cover:** A lightweight, compact, and multi-purpose tarp, drop cloth, emergency blanket, or even a heavy-duty plastic trash bag. This cover can be used as a wind-breaker, sleeping bag, or ground covering. It can also be used to catch rain/snow for drinking water or to signal for rescue if it's reflective or brightly colored.
- **Container:** An uncoated metal container can be used directly over a flame to purify water or to create a hot water bottle to aid in keeping you warm.
- **Cordage:** A 7-strand paracord is very helpful for many things and very difficult to replicate in the wilderness.
- **Communication:** A satellite phone, InReach, or Spot device. Having the ability to communicate your exact location via satellite when not in cell coverage significantly reduces the time necessary to facilitate a rescue.

Cold, Hard Facts

With so many variables to consider, from abrupt changes in weather to equipment maintenance, many general aviation pilots may decide to skip the wintertime adventure for something more mild (and warm), like binge-watching the latest season of *Survivor*. However, with the right preparation and precautions, wintertime can truly be a wonderland, offering some of the best air for flying.

Nicole Hartman is an *FAA Safety Briefing* associate editor. She is a technical writer-editor in the FAA's Flight Standards Service.

LEARN MORE

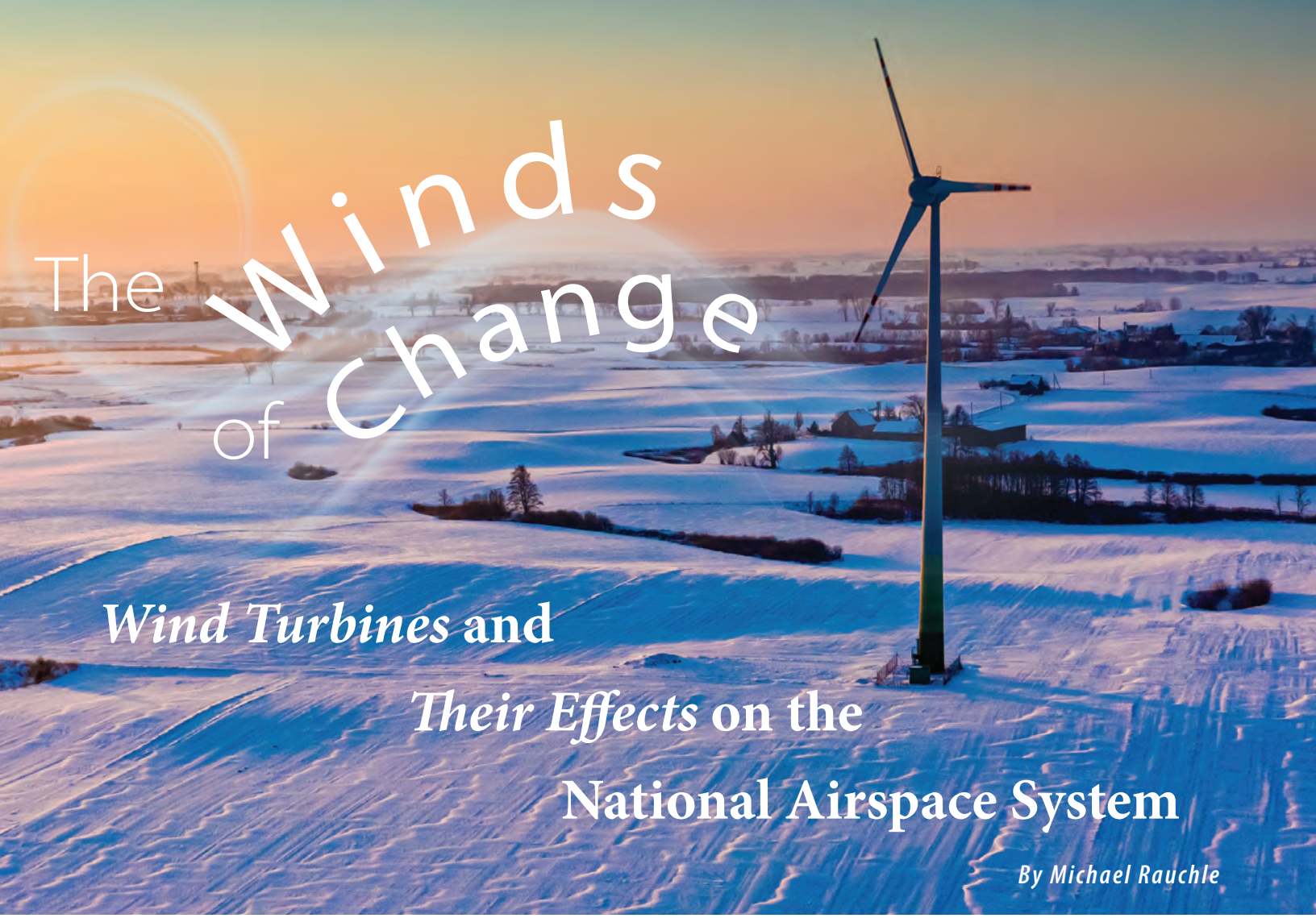
Winter Flying Tips
bit.ly/3L75RkB

From The Flight Deck – Winter Weather Challenges
bit.ly/3FdXq3G

Chilled to the Bone, *FAA Safety Briefing*, Nov/Dec 2014, Page 14
bit.ly/3PIngmg

Keeping Your Cool in the Cold, *FAA Safety Briefing*, Nov/Dec 2014, Page 18
bit.ly/3PIngmg

Alaska Statute for Survival Gear
bit.ly/48pPtFB



The Winds of Change

Wind Turbines and *Their Effects* on the National Airspace System

By Michael Rauchle

You do not have to look very far to realize that there is a global "push" for greener energy. The concept of using wind power to bring well water to the surface, operate sawmills, and generate electrical power has been utilized since at least the mid-1800s. Currently, there are more than 72,000 wind turbines throughout the U.S., with the majority concentrated in the nation's midsection.

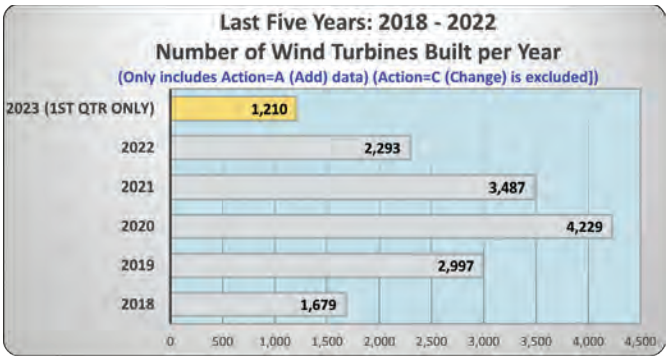
Wind turbine technology has experienced significant advances including composite base fixture construction and increased efficiency of the rotating airfoils to generate more power. While wind energy innovation improves our ability to harness renewable energy, it also introduces additional challenges for the aviation industry. This article educates pilots about wind turbines and wind turbine farms and how the FAA is ensuring the safety of the National Airspace System (NAS). We'll discuss how wind turbines and wind turbine farms are marked, lighted, and charted, including how NAS users can play an active role in the evaluation process, as well as provide some recommendations to help pilots safely avoid encounters with wind turbines.

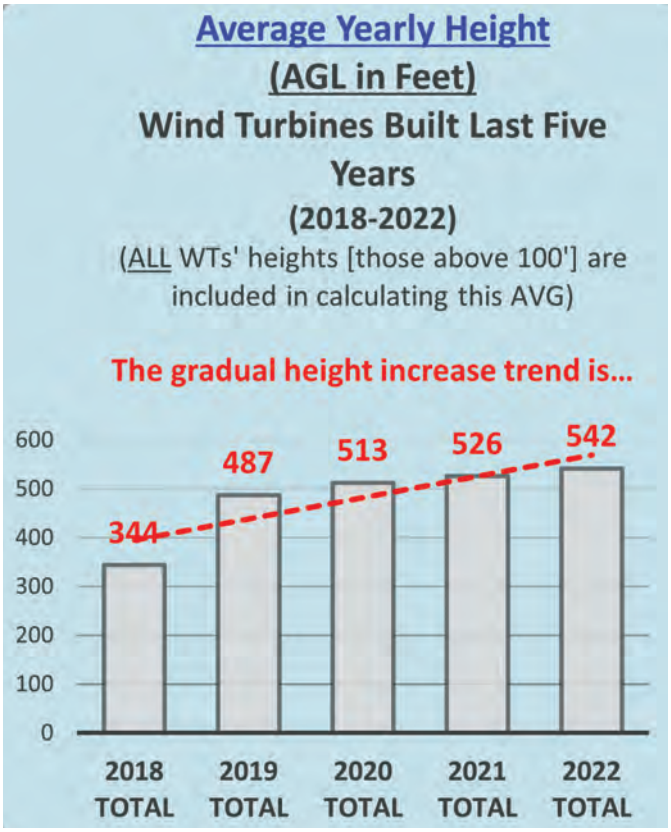
A heat map showing the locations of wind turbines in the U.S. (Screenshot from USGS.gov)

A Closer Look at Wind Turbine Data

The FAA maintains a Daily Digital Obstacle File (DDOF) of all known obstructions in the NAS. The FAA's Flight Technologies and Procedures Division, with assistance from the Safety Analysis and Promotion Division, recently completed a data review and analysis of the DDOF regarding wind turbines.

The data review and analysis revealed some interesting trends. Over the past twenty years, both the population and height of wind turbines have grown significantly. Older wind turbines have an average height of 344 feet above





ground level (AGL) or less. More recently, wind turbines are being built around the country with heights exceeding 499 feet AGL, with the tallest turbines exceeding 800 feet AGL. When first introduced, wind turbines affected only uncontrolled (Class G) airspace. However, recent trends indicate that new and re-powered wind turbines are encroaching on controlled (Class E) airspace. Increasing heights of the wind turbines directly correlate to the potential for impacting more aircraft flying in the NAS. You might now be wondering how the FAA evaluates existing and proposed wind turbines for their potential NAS impact. Let's take a look.

How Wind Turbines are Reviewed and Evaluated

In accordance with Title 49 of the United States Code, section 44718, and 14 CFR part 77, *Safe, Efficient Use and Preservation of the Navigable Airspace*, the FAA is responsible for conducting aeronautical studies to ensure the safety of air navigation. To fulfill this obligation, the FAA's Flight Standards Service, along with many other offices within the FAA, review and comment on aeronautical studies such as wind turbine farms and other types of potential obstructions that may affect navigable airspace. FAA Joint Order (JO) 7400.2P, *Procedures for Handling Airspace Matters*, prescribes the policy and general process for FAA evaluations of proposed wind turbine farms.

Wind turbines are typically lit with medium intensity, flashing red lights, placed as high as possible on the turbine nacelle.

Flight Standards is responsible for evaluating proposed wind turbines and wind turbine farms for potential "VFR Effect." As part of that process, Flight Standards identifies potential VFR routes, flyways, and other concentrations of VFR traffic within two statute miles of the proposed location(s). The Obstruction Evaluation Group within the FAA's Air Traffic Organization determines the actual traffic volume using traffic data sources. When the aeronautical study is completed, the FAA issues a determination letter to the person or entity submitting the construction proposal. The letter states whether the proposed structure constitutes a hazard to air navigation (or not) and includes a list of provisions such as how the structure(s) should be marked and lighted. Submitters file requests for aeronautical studies through the Obstruction Evaluation/Airports Airspace Analysis (OE/AAA) public portal at bit.ly/OEAAA.

The FAA circulates some aeronautical studies to give the public an opportunity to review and comment on such proposals. The OE/AAA public portal allows a user to register, subscribe to notifications, view, search, and comment on aeronautical studies that are available. The FAA encourages anyone with an interest in participating in this process to register for an account with the OE/AAA public portal and configure your email preferences to be notified of circularized cases (account required). Here's a link to view circularized cases bit.ly/OEAAAcases.

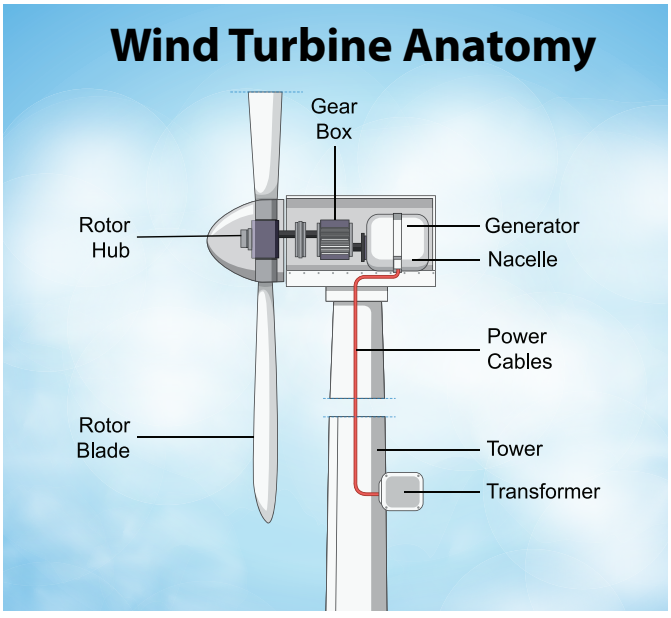
Wind Turbine Marking and Lighting

The FAA publishes recommendations for marking and lighting of obstructions to improve daytime and nighttime visual conspicuity. Wind turbines are normally painted white or light gray to improve daytime visibility. The color palette was determined by an internal FAA

study that strikes a balance between aviation safety and being "community friendly." In addition, snow-prone areas are evaluated for additional markings to improve the visual conspicuity of the wind turbines against a snow-covered landscape.

Wind turbines are typically lit with medium intensity, flashing red lights, placed as high as possible on the turbine nacelle. The lights should be synchronized to flash together; however, not all wind turbine units within a wind turbine farm (a group of three or more wind turbines in the same location) need to be lighted, depending on their location and height. Sometimes, only the perimeter of the wind turbine farm and/or an arrangement of interior wind turbines are lit.

Some wind turbine farms utilize Aircraft Detection Lighting Systems (ADLS), which are proximity sensor-based systems designed to detect aircraft as they approach the obstruction. This system automatically activates the appropriate obstruction lights until they are no longer needed based on the position of the transiting aircraft. For more information on how obstructions like wind turbines are marked and lighted, refer to Advisory Circular 70-7460-1, *Obstruction Marking and Lighting*. Lastly, it is worth mentioning that anyone can report potential observed outages of obstruction lighting of wind turbines or other lighted obstructions via the public Obstruction Light Outage Reporting tool at bit.ly/3Z80kQv (account required), or by calling (877) 487-6867 or (800) 478-3576 if in Alaska.



Pilots should also be aware that wind turbines in motion could result in limitations of air traffic services in the vicinity of the wind turbine farms. Pilots utilizing VFR flight following should be aware that ATC may have difficulty observing non-transponder and/or non-ADS-B Out equipped VFR aircraft when flying in the vicinity of wind turbine farms (see *Aeronautical Information Manual* 4-5-1 paragraph B(1)(g)). In extreme circumstances, this can extend for more than one nautical mile horizontally around the nearest turbine, and at all altitudes above the wind turbine farm.

Many pilots are unaware of the several unique hazards that wind turbines and wind turbine farms pose.

Wind turbines may also adversely affect doppler weather radar returns due to the reflectivity and motion of the rotating blades. Pilots should be aware of this when evaluating weather radar data near wind farms to avoid mistaking the motion of the wind turbine blades for actual weather. For more details on this, go to weather.gov/mkx/windfarm.

Wind Turbine Safety Data and Potential VFR Safety Concerns

According to NTSB accident data, there have been at least six wind turbine related accidents from 2003 to 2023 with eight fatalities. A cursory review and analysis of these accidents indicate that insufficient preflight planning and/or aeronautical decision-making may be contributing factors. This would indicate that many pilots are unaware of the several unique hazards that wind turbines and wind turbine farms pose.

For starters, the rotating blades are unlighted obstructions that can extend several hundred feet above the lighted nacelle/blade hub. Note that the boxed elevation figure on VFR aeronautical charts associated with wind turbine farms accounts for the mean sea level height of the wind turbine blades when passing the 12 o'clock position.

In addition, a 2014 University of Kansas and Kansas Department of Transportation joint study, *Wind Farm Turbulence Impacts on General Aviation Airports in Kansas*, has identified that wind turbines can generate low altitude turbulence up to several miles downwind of the turbine(s). The amount of turbulence depends on the prevailing wind speed. Therefore, pilots should exercise caution and avoid low-altitude flight downwind of wind turbine farms. Pilots

should also be vigilant when flying in the VFR traffic pattern near wind turbine farms that are located within a few miles of an airport. Pilots should report (via a PIREP) turbulence encounters and the suspected source to ATC or the nearest Flight Service Station.

In accordance with 14 CFR section 91.119, pilots must maintain appropriate separation (laterally and vertically) from wind turbines. Attempting low-altitude flight between wind turbines could be hazardous because meteorological towers (METs), some less than 199 feet AGL, may be embedded within the wind turbine farm. METs are very difficult to acquire visually and are not always marked, lighted, or charted. Finally, pilots are reminded of the basic VFR weather minimums contained in 14 CFR section 91.155 (bit.ly/14CFR91_155) and that some wind turbines may significantly exceed 499 feet AGL and extend into Class E airspace (700 feet AGL floor and greater).

VFR Charting and Flight Planning Tips

As a result of industry feedback as well as internal review, the FAA recognized the need to enhance how the agency depicts wind turbines and wind turbine farms on visual charts. In early August 2023, the FAA's Aeronautical Information Services Visual Charting Team began implementing charting enhancements to sectional aeronautical, VFR terminal area, and helicopter route charts to depict the location of wind turbine farms more clearly. This change will also be published in the F*AA's Aeronautical Chart User's Guide.*

VFR pilots, as part of their comprehensive preflight planning, should carefully evaluate their intended route of flight, ensuring that minimum visibility and cloud clearances can be maintained as well as maintaining safe distances from obstructions. Pilots should carefully study their charts, noting all obstructions along the proposed route of flight and elevation figures to select their VFR cruising altitudes. The boxed elevation figures, as well as other charted elevations and the charted (quadrangle) maximum elevation figure (MEF) should be compared and taken into consideration.

Also, VFR pilots should carefully review NOTAMs (notice to air missions) for temporary or permanent obstructions along the planned route of flight during their preflight preparations. Emphasis should be given to obstructions in the vicinity of the approach and departure ends of the runway complex, or any other areas where flight below 500 feet AGL is planned or likely to occur.

This aeronautical chart shows a depiction of multiple wind turbine farms with the enhanced charting specifications near Amarillo, Texas (AMA).

Lastly, always leave yourself an "out" and consider multiple contingency plans (including returning or diverting), which may be a safer course of action. VFR night flying along a route that includes wind turbines and wind turbine farms introduces additional challenges. As we mentioned earlier, not all the wind turbines within a farm may be lighted — it might just be those on the outer perimeter. Pilots should also be aware that wind turbine farms utilizing ADLS may cause a temporary "startle effect" due to unexpected activation of the lights as their aircraft approaches.

> **The FAA and industry-stakeholder partnerships will continue to look for solutions to ensure that both wind energy and aviation can safely co-exist.**

Watching Which Way the Wind Blows

Wind-powered energy will continue to proliferate for the foreseeable future and now you should be familiar with many aspects regarding wind turbine impacts to the NAS. As the wind energy industry continues to evolve, new challenges may emerge for the aviation industry. The FAA and industry-stakeholder partnerships will continue to look for solutions to ensure that both wind energy and aviation can safely co-exist.

If you have questions or comments regarding this article, please direct them to the FAA's Flight Technologies and Procedures Division at 9-AWA-AVS-AFS420@faa.gov with the subject line: Wind Turbines.

Michael Rauchle is an aviation safety inspector with the FAA's Flight Procedures and Airspace Group.

LEARN MORE

FAA AC 70-7460-1, *Obstruction Marking and Lighting*
bit.ly/AC70-7460-1

FAA's Obstruction Light Outage Reporting Tool
bit.ly/3Z80kQv

Obstruction Evaluation /Airports Airspace Analysis Portal
bit.ly/OEAAA

FAA Aeronautical Chart User's Guide
bit.ly/FAAChartGuide

FAA Daily Digital Obstacle File
bit.ly/3RyoIJc

14 CFR part 77, *Safe, Efficient Use and Preservation of the Navigable Airspace*
ecfr.gov/current/title-14/part-77

FAA JO 7400.2P, *Procedures for Handling Airspace Matters*
bit.ly/JO7400_2

Photos courtesy of NASA

FIKI Wiki

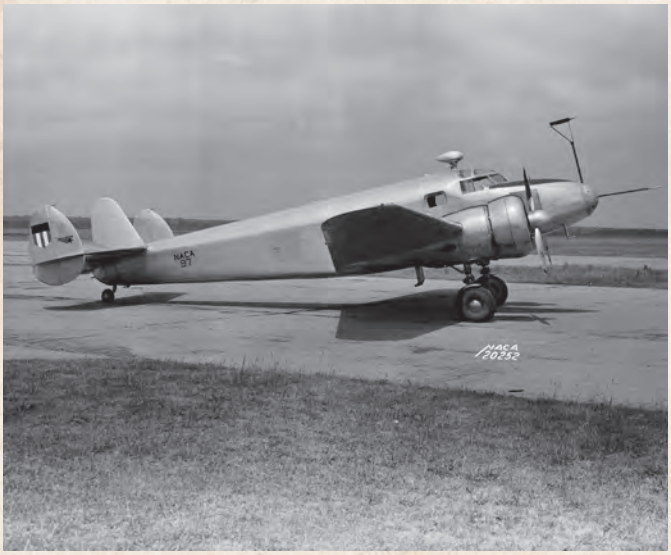
A Quick Guide to Inflight Ice Protection

By James Williams

Airplanes and ice were not a good match from the start. But limiting our annual aviating by somewhere between three and six months — and more in some parts of the country — was never a good solution either. So, ice protection, as it became known, was a requirement for many year-round operations. Pneumatic boots were introduced in the early 30s, and weeping wings in the early 40s. The advent of jet engines in the late 30s eventually led to the introduction of bleed air systems. And now, more robust electrical systems allow for new solutions.

As far as how the FAA arrived at introducing regulations on icing protection systems, there is some interesting history rooted in WWII strategies. According to a NASA special publication, *Engines and Innovation*, military planners initially suggested an offensive through Alaska and the Aleutian Islands as the most direct approach to Japan after the attack on Pearl Harbor. This led the Army to request research from General Electric, Massachusetts Institute of Technology (MIT), and all three laboratories at the National Advisory Committee on Aeronautics (NACA, NASA's predecessor agency) to improve protection against aircraft icing. Ironically, a more southern approach was chosen, and the Pacific theater became known for the exact opposite conditions. Although the Japanese would go on to occupy Attu and Kiska for more than a year before they were dislodged, the Aleutians would not be the main thrust for the Allies. This research had limited value during the war, but it would provide data to the Civil Aeronautics Administration for regulation.

Let's take a look at the history of some ice protection systems, where we are now with this technology, and what options might be right for you.



A Photo of NACA's Lockheed 12 test plane.

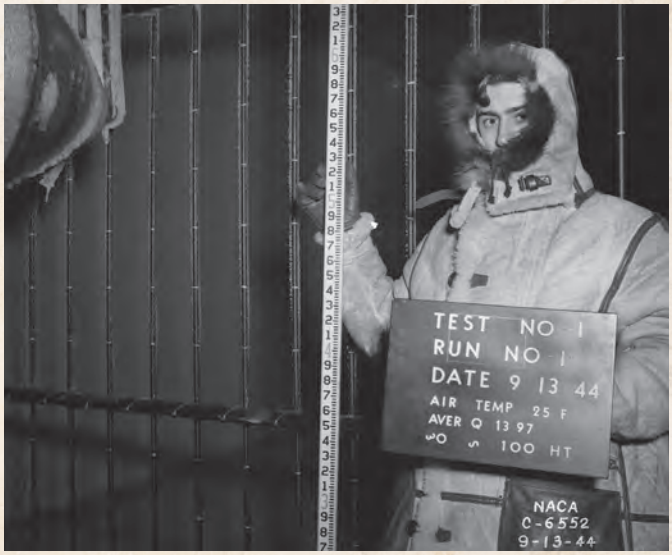


Photo of a test in NACA's icing wind tunnel in 1944.

Photos courtesy of NASA

Dictionary of Terms

Before we dive into the details of icing protection systems, let's first define some terms. There are anti-icing and deicing systems. Anti-icing systems are designed to prevent ice from accumulating on protected surfaces while deicing systems are designed to periodically remove accumulated ice from protected surfaces. Some systems can have aspects of both, but some only have one, so it's essential to understand what exactly yours is designed to do and what limits it can handle.

Another definition to understand is FIKI, an acronym for flight into known icing conditions. This is an approval to operate in icing conditions with certain systems that are certified. It's critical to know whether your system has this approval or not because many unapproved systems appear similar to approved systems and are often made by the same manufacturers. The difference often lies in some combination of endurance, redundancy, and completeness.

Inadvertent systems, sometimes called escape systems or non-hazard systems, are intended to allow pilots who encounter unforecast icing to escape with some additional safety margin. They do not allow for flight into forecast or existing icing conditions, or for continued flight in those conditions. The best way to think of them is like the instrument-based training requirement from the private pilot certificate. Those tasks are there to give you a basic ability to recover from an inadvertent instrument weather encounter, not to allow you to file and fly under instrument flight rules (IFR). It is critical to know the capabilities of your system before you need to use it.

Burn, Bust, Weep, and Zap

There are several ways to approach ice protection. Still, they all perform a similar function: prevent or eliminate (or both) ice accumulation on protected surfaces of an aircraft with a minimal performance impact. NACA developed a test airplane during the war, a Lockheed 12, that used engine exhaust gases to heat the leading edge. The solution worked, but the increased mechanical complexity meant that it was not feasible to implement in production at a time when industrial capacity around the world was at an extreme premium. The concept would become more viable with the arrival of jet engines. The jets provided an abundant source of hot air courtesy of bleeding it from the compressor stage of the engine. By preventing any ice from adhering to the heated surface, this anti-icing solution is very effective and allows the wing to maintain optimal shaping, but it is costly in terms of performance. Bleeding that air off the compressor reduces thrust, meaning that either higher thrust settings are required, or performance is reduced when the system is in use.

Small general aviation (GA) aircraft must pursue other options since bleed air systems are generally incompatible. The first option was pneumatic boots, which were invented in the late 1920s by researchers at BF Goodrich and originally called rubber "overshoes." Pneumatic boots work by using a series of rubber bladders that lie flat when not in use but can be periodically pumped full of air to change the shape of the leading edge of the wing to break

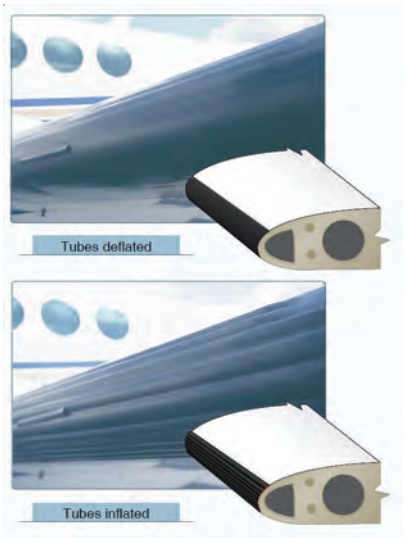


Photo of a pneumatic boot system.

up any ice accumulation. Boots are very effective and allow for practically unlimited usage in an icing encounter. The downsides include additional weight from all the boots, pumps, and electrical capacity needed to run the system. Also, pneumatic boots are strictly a deicing system, and the rubber material's condition will need to be monitored as it will degrade over time, especially when stretched routinely.

One of the most popular GA icing protection systems is what is referred to as a weeping wing. These systems use a leading edge with micro-perforations that "weep" a fluid to lower the melting point of water/ice. The British invented them during WWII. It works similarly to how salt is used on the road or antifreeze is used in automotive cooling systems. This gives the system a few key advantages. First, it functions in both an anti-icing and deicing capacity. It also provides coverage beyond the leading edge as the fluid will be carried by the slipstream across the surface. This addresses one of the weaknesses of boots in that it prevents/eliminates ice accumulation behind the leading edge. Weeping wings also require less electrical energy to run their pumps than boots. But every system has its limitations. Weeping wings are time-limited by the amount of fluid on board. And that fluid is a variable weight penalty and a possible supply issue at some airports if you need to refill while flying cross country.

A newer solution is a rework of the electro-thermal heated wing concept, in which an electrical current provides the heat. This eliminates the need to sap bleed air and, thus, performance from the engines of a jet. It also means that it can be installed on non-turbine aircraft. The downside is that it requires quite a bit of electricity. One system for GA that was spun off from NASA technology required the installation of a very beefy alternator to provide the power needed. There is no broad-based adoption of this approach at the moment, as the company that marketed it for GA no longer lists it on its website.

Deicing systems for other surfaces, like this weeping prop, may or may not be included in non-FIKI systems.

Photos of a weeping wing FIKI system.

Another electric-based solution is electromechanical or electromechanical expulsion. These systems use a series of actuators to induce a shockwave in the aircraft's skin and literally blast the ice off the protected surface. These systems have been proven effective and have much lower electrical operating requirements than heating systems. While this may sound like a perfect solution, there are always some disadvantages. First and foremost, they need to be built into the aircraft, though some systems may be retrofitted. While they are in use in some aircraft, they have

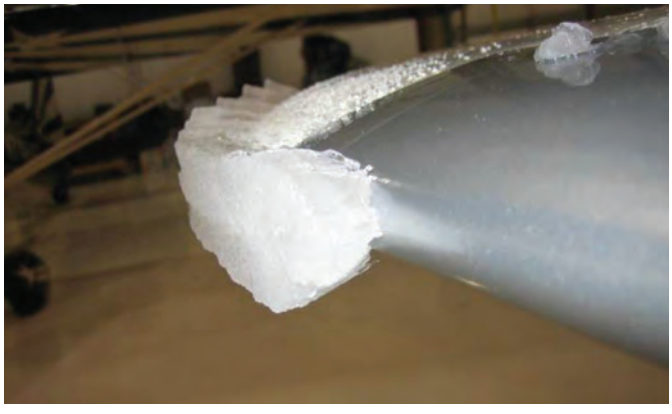


Photo of an electric anti-icing system developed by NASA for general aviation.

Photos courtesy of NASA

generally been limited to business jets or larger. They may prove a viable, well-tested solution for modern electric designs that will be sensitive to the electrical draw of many other technologies. Affordably integrating this solution into GA could be a challenge but would open up ice protection to many more pilots.

The Devil in the Details

When considering ice protection, the first step is deciding whether you want to pursue a system as part of an aircraft purchase or retrofit. Any of the systems described here will come with a cost in terms of weight, maintenance, training time, and money. In some cases, it may be best not to opt for one at all. But if you have a need that justifies ice protection, is an escape/inadvertent system sufficient? As noted earlier, many of these systems function similarly to the FIKI-approved versions, but lack redundancy or additional protections (i.e., backup pumps/electrical equipment or protection on windshields or propellers). These omissions align with the mission of providing an escape capacity while reducing cost, complexity, and weight. This is a good compromise point for many GA pilots. It's essential, though, to mind the limitations built into the system and use it as intended.

Suppose you have the need and resources to jump into a complete FIKI system that will give you the best capabilities. Just remember that the additional maintenance, weight, and cost of these systems should not be taken lightly. These robust systems also have limits, so, be sure to consider all of the pros and cons when selecting a system. A FIKI approval doesn't make your plane impervious to icing. Even large aircraft with FIKI systems have been lost to icing accidents. A complete understanding of your icing equipment, in coordination with sound risk management, can help you maximize your winter flying safely.

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

LEARN MORE

"FIKI Wiki – What You Need to Know About Icing Conditions and Systems," Nov/Dec 2014 *FAA Safety Briefing*, page 21
bit.ly/FAASB_NovDec14

FAASTeam Inflight Icing Course (ALC-33)
bit.ly/ALC-33

FAA *Aviation Weather Handbook*, Chapter 20, Icing
bit.ly/AviationWx

Don't Forget to Breathe and Check Your Speed

Induction system icing occurs when ice forms around the air intake of an engine robbing the engine of air to support combustion. Carburetor ice is discussed in our "Breaking the Ice" article, but let's not forget our fuel-injected friends. Induction icing that occurs around the air inlets and filters of these aircraft can significantly reduce engine power or even cause them to fail if blocked by ice. Knowing your aircraft and using an alternate air source can prevent both conditions. When power loss is noticed, activate the alternate air source immediately if the aircraft is not equipped with automatically activating spring doors. Keep in mind that as with carburetor heat, alternate air sources also use unfiltered air. Use of an alternate air source on the ground should be avoided unless icing conditions are present during taxi operations.

To avoid airspeed errors or a complete loss of airspeed indications, remember that pitot tube and/or static pressure port icing must be considered. During preflight, checking the operation of the pitot heat is always recommended, especially during the winter months or when flying in visible moisture. Several situations can lead to misinterpretations of airspeed that must be understood and avoided.

1. *Static port is blocked by ice creating a smaller difference between ram and static pressure*. As a result, airspeed will falsely decrease during a climb and increase during descent. The opposite is true during a descent. These false indications have led to confusion, incorrect application of power and pitch, and sadly, accidents.
2. *Pitot tube ram air hole is blocked, but the aft drain hole and static port are open*. In this situation, the airspeed would read nearly zero as inaccurate static pressure is introduced and ram air pressure is lost.
3. *A completely blocked pitot tube (ram and drain holes)*. In this case, the ram pressure is trapped and as a result, the airspeed remains unchanged so long as the altitude does not change. A climb will indicate an increase in airspeed while a descent will show a decrease in speed. You can think of your airspeed indicator as now acting in the same manner as the altimeter. This is another recipe for problems if not recognized and dealt with by immediately turning on the pitot heat and recognizing the false indications.

Putting Your Aircraft to Bed

The Before and After of Aircraft Winter Storage

By Rebekah Waters

Winter weather can take its toll on many things: roads, trees, cars, and of course aircraft. Some aircraft continue flying year-round, but some settle down for a long winter's nap. Any aircraft that spends the winter months in hibernation should be properly prepped and protected.

Proper winter storage has two main parts. There are things you can do now to limit the corrosion or damage Old Man Winter might throw your way. There are also things you will need to do later — when your aircraft comes out of storage — to make sure it is safe and ready for its first spring flight. Let's take a look at the "before" and "after" of aircraft winter storage.

Preparing for Winter Storage

Knowing that aircraft can deteriorate quickly when they sit around not being used, you'll want to have a plan in place if you decide to store it through the winter months. Giving your aircraft a washdown and clean out is a good start, but if you plan on storing your aircraft for a significant amount of time this winter, you may need to do more. Most manufacturers recommend taking some special steps if an aircraft will be inoperative for more than 30 days.

A good first step is to familiarize yourself with the pilot's operating handbook (POH) or aircraft flight manual (AFM). Reread the sections on winterizations — even if you read them last year. This will tell you if you need to take action to protect internal parts like using fogging oil to prevent corrosion or a fuel additive to protect the fuel. Remember moisture is your enemy. Most of the manufacturer's recommendations will be aimed at keeping your engine dry and free of corrosion. Your mechanic can also be a good resource to make sure you haven't forgotten any of the recommended crucial steps.

To find out what else goes into successful aircraft winter storage, I talked to Gary Suozzi, aviation safety inspector with the FAA's Aircraft Maintenance Division. Suozzi outlined some basic steps to remember like chocking the wheels (front and back) and making sure to release the parking brake.

"If the parking brakes are applied over a period of time, it could cause a flat spot on the rotor disk or brake pads," Suozzi says.

He also recommends making sure that the fuel cocks are closed and the master switches are off. This will prevent any condensation or moisture from collecting during storage. Some other items to consider before storing your aircraft include changing the oil and filling the fuel tanks. New oil provides greater protection to the engine's internal components and filling the fuel tanks will help prevent condensation from forming and/or freezing, which can cause damage to the fuel cell or airframe.

Extreme or extended cold can create fuel leaks as metal connections contract allowing rubber fittings to become loose. When stored outside, check your aircraft during periods of extreme or extended cold. Checking for leaks can save money and the amount of cleanup time needed for the lost fuel. In most cases, simply tightening the fuel line clamps will stop the leaking.

Where you store your plane will have a big impact on how your plane weathers the winter months.

"It is best to keep the aircraft in an enclosed environment whenever possible – especially in areas with salty air," says Suozzi. This could be a tent or a hangar. "What is important," he continues, "is to keep it away from any wind-driven events, if possible, especially the night before flight." If this isn't possible, Suozzi recommends applying a canopy cover or tying a dust sheet over the cockpit area to protect the aircraft from above. "But do not place a cover directly on the windshield," he warns. "Water that leaks through the cover could lead to crazing. Also cracks could occur if large amounts of water collect under the cover, and temperatures fall below freezing," adds Suozzi. Another thing to remember when outside storage is unavoidable is to store the propeller in the vertical position. "This will avoid an accumulation of water on the spinner which would cause an imbalance," says Suozzi.

Storing your aircraft inside a warm cozy hangar may sound ideal. In fact, it's so ideal that animals might seek accommodation in your sheltered aircraft. To keep critters at bay, make sure you plug and cover any spots where they might gain entry including the pitot tube, access ports, and engine cowlings. When blocking the inlets, exhaust, and vents, use paper tape or another type of barrier. This should help prevent animals from making your aircraft their own winter storage spot.

While not everyone can keep their aircraft in a heated hangar over the long winter months, there are other ways to keep your aircraft protected. If you are using tie-downs, think about what surface your plane will be parked on. Is it paved or unpaved? When considering what type of anchor you will need, factor in the weight of the aircraft. Make sure to select an anchor with appropriate holding power.

Use the manufacturer's recommended baffling and covers. It is also important to adjust control cables to compensate for cold contraction. Removing wheel covers can reduce the chance of frozen slush locking the wheels and brakes. If you can't cover your entire aircraft, it is recommended to at least cover the cockpit, engine, and wings. Covering is the ultimate protection. When this isn't an option, inside covers are the next best option.

Finally, don't forget about the battery. Keep it charged or remove it if your aircraft is parked outside. Suozzi recommends purchasing a "battery tender" (a device that charges and maintains a battery) if electrical or solar power is available. "It will save you the cost of a new battery plus the labor," says Suozzi. You'll want to take the same care of the battery in your emergency locator transmitter (ELT). It is important that this battery is charged and ready to perform properly if you need it to.

> **Be sure to take care of your emergency locator transmitter (ELT) battery. It is important that this battery is charged and ready to perform properly if you need it to!**

De-winterizing Your Aircraft

It may seem a long way off, but before you know it, Punxsutawney Phil and his elusive shadow will be hogging the spotlight. Shortly after that, when the weather starts to warm, it will be time to bring your aircraft out of storage. Let's look at the steps you can take to bring your aircraft safely out of hibernation.

Start with a thorough inspection. Check all hoses, flexible tubing, and seals for signs of deterioration like cracks, hardening, and lumps. Tighten loose clamps and fittings. Make sure to inspect the heater system for

To avoid damage like this Cessna 172 prop, always check carefully for cracks

leaks that could lead to carbon monoxide problems. Look for guide wires that are unraveled or corroded. You should carefully double-check any areas where damage could result in a catastrophic condition.

"Mother Nature is not your friend," says Suozzi. "That is why I recommend using a hangar whenever possible." But even if your aircraft was stored in a hangar over the winter, a good preflight is essential to a safe operation. Look at the aircraft from the standpoint of a mechanic. "Metal contracts and expands with changing temperatures so make sure to look for distortions," adds Suozzi. If you note any distortions, get a mechanic to inspect them. Finally, Suozzi reminds us that even though you did your best to keep them out, don't forget to check for small animals and nests in the fuselage. Besides the surprise factor of finding one, these critters could create a fire hazard.

Keeping tie-downs secure and removing snow and ice loads from the aircraft both go a long way to protecting your investment.

Suozzi also points out that winter storage can impact your annual inspection. Annual inspections, as the name suggest, are good for twelve months. The months your plane is in storage count towards those 12 months, so keep an eye on when the next inspection is due.

Storing your aircraft for the winter is no small feat. It is far from just parking your plane for a few months until you are ready to fly again. But, if you are thoughtful and careful about the "before" and "after" of winter storage, you'll be ready for another year of flying safely.

Do you have any helpful winter storage tips you'd like to share with our readers? Send them to SafetyBriefing@faa.gov.

Rebekah Waters is an *FAA Safety Briefing* associate editor. She is a technical writer-editor in the FAA's Flight Standards Service.

LEARN MORE

Winter Weather Options, *FAA Safety Briefing*, Nov/Dec 2014, Page 5
bit.ly/3PIngmg

FAA Safety Team's Winter Flying Tips
bit.ly/45P8Fuw

AOPA's 5 Tips For Winter Airplane Storage
bit.ly/3ZsPpkq

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JAMES WILLIAMS

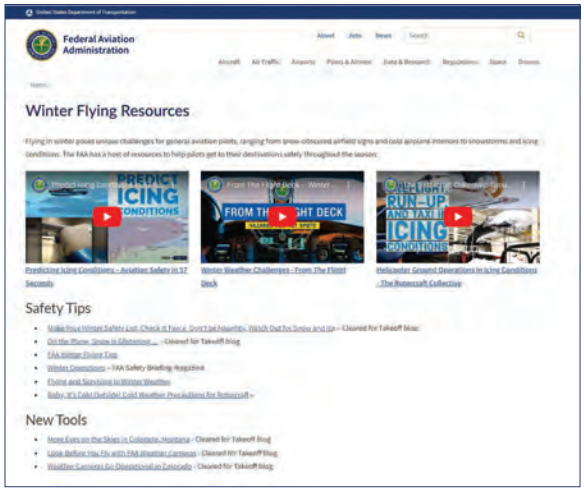
TIS THE SEASON . . . TO GET READY FOR WINTER

As I write these words, summer's protracted assault on our comfort has finally appeared to ebb for the year. But that means a new season is lurking just around the corner: winter. By the time you can read this, you may already be within its grasp. The good news is that winter has some key benefits for aviators. Cooler temperatures mean denser air and better performance both aerodynamically and mechanically. However, as discussed elsewhere in these virtual and physical pages, there are challenges that disrupt our winter wonderland. So how do we prepare?

In this circumstance, we have a solution. The FAA has compiled a Winter Flying Resources page specifically intended for general aviation (faa.gov/holiday-travel/weather/winter-weather-resources). This page contains resources from across the FAA and in multiple formats. Let's take a closer look.

Dive In

Leading off is a series of YouTube videos from our *57 Seconds to Safer Flying, From the Flight Deck*, and Rotorcraft Collective series focusing on winter flying safety. These brief and bite-size samples from our established series offer helpful winter-centric info and can be an excellent way to get started with your preparations.



> THERE ARE CHALLENGES THAT DISRUPT OUR WINTER WONDERLAND. SO HOW DO WE PREPARE?

From there, you can jump into more long-form written content. This includes several blog posts, articles, and presentations on winter flying by the FAA and even an entire issue of *FAA Safety Briefing* from 2014. The topics cover tips on everything from clearing all aircraft surfaces before a flight to more advanced subjects like winter survival should the worst happen.

The New Tools section provides resources for pilots preparing to operate aircraft in winter conditions. Currently, the articles focus on the FAA Weather Camera program (weathercams.faa.gov). The Weather Camera program originated in Alaska as a safety mitigation to prevent weather-related accidents by placing internet-connected cameras in mountain passes to allow pilots to visually check conditions at any time without incurring any risk. The program was very successful and was rolled out across the state. After that success, the FAA looked to implement it elsewhere, including Hawaii and other sites in the lower 48. The cameras display not only a current image for each heading, but also a clear day reference image so pilots can better determine conditions.

Another good resource to check out is the FAA's *Aviation Weather Handbook*. Updated in 2022, the *Aviation Weather Handbook* combines the information from what used to be six separate Advisory Circulars into one handy publication. It covers not just weather theory and how to get weather information, but also features an entire chapter on icing. The handbook is a great way to get a deeper understanding of any weather topic that attracts your attention.

While these are not an exhaustive list of all FAA's winter flying resources, they do provide a great baseline for you to start with. Even if you're an experienced winter weather flyer, it's always good to brush up every year. You can think of it as a prelude to a safe and successful winter flying season.

Is there a topic you don't see that you think should be included? Let us know. We're always looking for good ideas that will help everyone be a better four-season flyer.

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

LEARN MORE

FAA Winter Flying Resources
bit.ly/FAAWinterResources

FAA Weather Cameras
weathercams.faa.gov

Aviation Weather Handbook
bit.ly/AviationWx

REBEKAH WATERS

HOW COLD IS TOO COLD TO DRONE ON?

My New England-born parents taught me how to handle winter weather by prepping my vehicle (good tires, plenty of wiper fluid, full tank of gas, and clean all the snow off) and shoveling like a New Englander (early and often!). Thanks to them, you won't find me rushing out for bread and toilet paper when the forecast predicts snow. There's a similar amount of proactive preparation required for cold-weather drone operations. Weather is always a factor for aircraft, including drones — clouds, fog, or strong winds could leave you grounded. As the temperatures drop, there are even more factors to consider before takeoff.

Cold air can affect your drone's battery. Starting a car with a cold-soaked battery can be hard. Drones are no different, as their lithium polymer batteries are greatly affected by cold weather. The colder the ambient air is, the slower the electrochemical reaction will be for any system. Slower movement equals more effort to create the same level of power required by the draw of the electronic speed controllers connected to the power distribution board. Think about cranking the engine of a cold car, especially with an older battery. It's the same with drones and their batteries. Cold temperatures also increase the internal resistance of the battery, which can lower the battery's capacity. The exact temperature ranges depend on the chemistry of the batteries, but basically, colder weather equals less power.

Cold weather can also impact the electric components in DC systems. The colder it is, the slower these systems will function. The effect may be minimal, but as the energy transfer from component to component slows, it degrades the overall flight duration.

Aircraft icing, another winter hazard, can affect multiple aspects of your operation. Icing can occur when the outside air temperature is near or below freezing and the dew point is less than 5 degrees from that point. Winter air can contain droplets of supercooled water. When conditions are right, they can form a layer of ice on any surface. This is most likely when the temperatures are at or slightly above freezing. The more ice that sticks to the wing or rotor blades, the less effective they will be at generating lift.

One upside to winter flying is the likelihood of colder, drier air. Cold air is more dense than warm air. This can improve takeoff and flight performance. Another benefit of winter flying is there is generally less turbulence which helps improve drone stability and makes for some beautiful smooth video shots!

Don't want to wait for spring to fly? The risks posed by winter weather can be reduced by proper planning or using weather-resistant hardware. Be aware of weather conditions and changes during your flight. If you must fly in frigid conditions, consider using a hybrid-electric drone. In some models, the gas engine can warm and recharge the batteries. Some fixed-wing systems have pinholes in the wing surface that release a glycol solution during flight to prevent ice formation.

The Alaska UAS Test Site Team prepares for a winter flight. (both photos)

Sometimes low-tech solutions work just as well. The Alaska UAS Test Site Program is no stranger to extreme winter weather challenges. At the 2019 UAS Integration Pilot Program meeting, Cathy Cahill, Director for the Alaska Center for UAS Integration (ACUASI) and professor of chemistry at the University of Alaska Fairbanks, shared an anecdote about how her team uses HotHands (small pouches that provide air-activated warmth when slipped inside gloves and socks) to keep their batteries warm until the time they need to use them.

While most drone operators won't need to go to these lengths, it's important to remember how weather might impact your operations. Expect reduced battery life, reduced flight time, and have a way to remove frost from rotor blades and keep a spare set handy! Always check the forecast, and make sure you are prepared both for your comfort and the performance of your drone.

Rebekah Waters is an *FAA Safety Briefing* associate editor. She is a technical writer-editor in the FAA's Flight Standards Service.

REBEKAH WATERS

KEEPING THE CABIN WARM AND SAFE

In the early days of flying, pilots only had a few options for staying warm while flying in winter weather. Initially, flight suits were the only option. By WWII, the Air Force equipped its planes with a Type F-1A utility heater: a portable gasoline-powered unit used to heat many things including tents, hangars, and the cockpit. Today's pilots stay warm and cozy in heated cabins, but this modern convenience also introduces a potential hazard: carbon monoxide (CO) poisoning.

Any time fossil fuel is burned, carbon monoxide poisoning can occur. Breathing this odorless, colorless gas leads to headaches, dizziness, weakness, upset stomach, vomiting, chest pain, and confusion. Breathing a lot of CO could cause fainting or death. Even the least of these symptoms are extremely dangerous during flight. Each year, accident investigations reveal that CO is a probable cause in accidents that occur in cold weather. What can you do to lower this risk?

Many aircraft are heated by an exhaust shroud heating system. This system warms ambient air that is directed through and warmed by the shroud and then pushed back through a firewall and heater valve into the cabin. Inspecting this system is the most important thing you can do to prevent CO poisoning. Any crack, no matter how small, has the potential to create a hazardous, even fatal, situation. Since there are limitations to what pilots can check during a preflight, it is imperative that mechanics break out a flashlight and make a thorough inspection. Check for things like corrosion and exhaust flange integrity. Inspect the entire heater system, including hardware attachments.

Even if a mechanic completes a thorough inspection of the heater system, pilots should still be vigilant for any signs or symptoms of CO poisoning. Sometimes called "the silent killer," CO symptoms are often described as flu-like (minus the fever). In the article, "Clear the Air: The Deadly Effects of Carbon Monoxide," AOPA warns that if pilots experience any symptoms of CO poisoning while using the cabin heater, they should immediately turn it off (bit.ly/3ES9R4U). Get fresh air into the cabin by opening the air vents and land as soon as possible. If systems persist after a suspected CO exposure, it's important to get treatment from a medical professional.

In addition to regular inspections and constant vigilance for symptoms, a CO detector is another line of defense against the hazards posed by CO. There are many different types of CO detectors for aircraft. They range in price from a few thousand dollars for a sophisticated sensor with a screen that displays CO levels, to just a few dollars for a simple card with a dot that changes color when CO levels are too high. The FAA recommends that GA airplane owners and operators research the different options and install a CO detector that is right for them.

As you help pilots prepare to enjoy those heated cabins this winter, don't forget that you are the first line of defense against the dangers of CO poisoning. During inspections, make sure you remove the cowling and thoroughly check the heating system. Remind pilots to pay attention to how they feel while flying with the heater on. Finally, suggest they install a CO detector if they don't already have one, or consider upgrading to one that provides an aural warning. Winter flying means colder cabin temperatures, but before they crank up the heater, you can make sure it's safe!

Photo by Adrian Eichhorn

Evidence of an exhaust leak can be seen on nearby components.

Rebekah Waters is an *FAA Safety Briefing* associate editor. She is a technical writer-editor in the FAA's Flight Standards Service.

LEARN MORE

NTSB Safety Alert, *Mechanics: Prevent Carbon Monoxide Poisoning*
bit.ly/3ERS51B

NTSB Safety Alert, *Pilots: Prevent Carbon Monoxide Poisoning*
bit.ly/3PQNxyH

GENE TRAINOR

DON'T ROLL THE DICE WITH ICE

As we enter the cold weather months, the FAA urges helicopter pilots and mechanics to prepare for icing conditions and other winter flying risks. Thankfully, equipment and operating procedures have evolved over the years to greatly reduce these risks. A key factor, as in any season, is pilot and mechanic vigilance.

One important document to familiarize yourself with is a Special Airworthiness Information Bulletin (SAIB) titled *Recommendations for Rotorcraft During Icing/Snowy Conditions*, which was published back on Nov. 26, 2013. The SAIB's warning that most helicopters are not FAA-approved for flight into known icing (FIKI) conditions remains relevant today. Instead, most of these helicopters are FAA-approved for flight into inadvertent icing conditions. The SAIB mentions two accidents in 2013, one of them fatal, where ice or snow ingestion led to the loss of in-flight engine power.

The SAIB warns that ice and/or snow can accumulate in the airframe engine inlet area while the rotorcraft is on the ground or in the air, and that turboshaft-powered rotorcraft are particularly vulnerable. Snow and ice can build up in the engine intakes and plenums when the rotorcraft is on the ground and the engine or engines are not operating or are operating at low power for extended periods. When a pilot increases engine power during takeoff, the accumulated snow and/

or ice can separate from the airframe inlet surface and get ingested into the engine, resulting in decreased power or engine failure.

The Rotorcraft Collective, an FAA-industry safety group, also produced a video online at youtu.be/ClAgalrHyig that outlines how pilots can prevent icing accidents.

Both the SAIB and the video recommend the following:

- Review the rotorcraft flight manual's limitations and operations sections for flight guidance for icing or falling/blowing snow. Helicopters are often prohibited from operating in known icing conditions, or when snow is falling or blowing.
- Look out for icing at weep holes, especially blade tip caps; engine oil coolers; fuel vents; static ports; drive pulleys; pitot tubes; intake screens; and tundra boards or bear paws. Most icing occurs between 0 and -20 degrees Celsius (32 degrees to -4 degrees Fahrenheit). During freezing temperatures, pay particular attention for any sheet ice on the bottom and forward of the inlet. Ice can also form behind particle separators. Engine preheating may be required.
- Remove all accumulated snow or ice without chipping or scraping. Instead, use heated air or deicing fluid in accordance with the manufacturer's procedures.
- Evaluate current and predicted weather briefings from Flight Service. Other resources for weather conditions include aviationweather.gov/hemst and aviationweather.gov/icing.
- Park helicopters indoors or cover them. If the aircraft is parked outside, install inlet covers and exhaust inserts or covers. Make sure the REMOVE BEFORE FLIGHT streamers are visible.
- Prior to engine start, remove the inlet/exhaust inserts or covers and perform a complete inlet/exhaust inspection (using a flashlight). The inspection should include surfaces inside the inlet, the cowl area forward and around the inlet, and the area behind the particle separator or screen (if installed). Some aircraft may require fully opening the cowlings to gain access to inspect the inlet, assuring that a properly certificated person performs this task.
- If you keep the rotorcraft on the ground for an extended period (i.e., waiting for clear weather), shut down the engine or engines. Before takeoff, conduct a detailed preflight inspection and remove any snow/ice build-up. Perform the inspection even if the rotorcraft is fitted with some form of inlet protection, such as screens or baffles.
- Be aware that rotating icy rotor blades can sling ice at other aircraft and bystanders.

Winter weather is inevitable. Let's help make sure winter weather accidents aren't.

LEARN MORE

SAIB SW-08-03R4, *Recommendations for Rotorcraft During Icing/Snowy Conditions*
bit.ly/SAIB_0803R4

Check out our GA Safety Facebook page at **Facebook.com/groups/GASafety.**

If you're not a member, we encourage you to join the group of nearly 16,000 participants in the GA community who share safety principles and best practices, participate in positive and safe engagement with the FAA Safety Team (FAASTeam), and post relevant GA content that makes the National Airspace System safer.

Forgotten Flicker?

Thanks for the interesting article on LED lighting in the Mar/Apr 2023 issue [Changing the Light Bulbs at bit.ly/LEDtechnology]. As an imaging scientist, I am knowledgeable on lumens, watts, and spectral output, but learned a lot regarding specific airport applications. The one thing that surprised me in the article was there was no mention of flicker. All LED lights that do not incorporate phosphors to modify their color temperature have a distinct full-on to full-off high-frequency pattern. It is possible that I am hyper-sensitive to this, but as I sweep my eyes across a field of blue taxiway lights, I easily perceive the flicker. It was bothersome at first, but I have gotten used to it.

I fly out of KROC and immediately noticed the switch to LED PAPI lights, not because of the flicker, but because of the color. As you mentioned the red was more vivid, but the white was also more blue, making both easier to perceive. Any non-phosphor white LED light will tend to be bluer, more daylight in color (~6000 degrees K). Warmer, tungsten-like white LEDs (warm white/2700 K for example) use UV energy from the LED and phosphors to add red and yellow to the color output. The glowing phosphors cannot turn on and off as fast as the LEDs themselves and so the flicker effect is much less noticeable.

— Joe

Hi Joe. Thanks so much for your feedback on the article and for sharing your story!

Thank you as well for mentioning the flicker effect. To your point, we ran this past our visual guidance folks, and here's their reply:

When LEDs were first installed, there were several pilot reports of flicker or oscillation at KROC, which was more noticeable when the propeller achieved certain speeds. The flickering issue was investigated by the FAA, lighting manufacturers, and human factors personnel. This phenomenon only appears when the right aircraft at the right propeller speed interacts with an LED lighting fixture operating at medium or low step utilizing a Pulse Width Modulation (PWM) frequency of less than 200Hz. This led us to the conclusion that this is not a common situation. The FAA has incorporated a note in specifications and standards stating that oscillation or flicker may be visible to pilots using single-propeller aircraft if the PWM of the lighting fixture is 200 Hz or less. This could be useful to the airport operators and the lighting manufacturers.

When the LED PAPI was installed at KROC on Runway 22, the feedback from pilots was positive. Some of the comments were "perfect to touchdown" and "was easily identified."

Thanks for writing and for being an advocate for runway safety!

Getting into The Know

Thank you for all you do, I'm a new pilot and really enjoy the WINGS program. I have a request though, since as a new pilot, I "don't know what I don't know." Have you thought about doing a specific track for new pilots that covers the critical things that we maybe didn't get enough of or need a refresher on? The topics I'm thinking of are:

- **Airspace transitions when needing to pass through a Class B/C airspace**
- **What to say/listen for on the radio when landing at non-towered, towered, and class C airspace**
- **Fundamentals of constant speed props … proper vacuum/RPM/fuel burn and their interactions with elevation**
- **Proper climb and descent for best efficiency and safety**
- **Top five mistakes new pilots make (maybe from FAA or instructor feedback)**

For example, I just did a flight to Pearson Field in southern Washington State, which falls within PDX airspace and has unique radio requirements. I would have loved to have a class on these types of airspaces and proper etiquette.

— Eric

Hi Eric. Thank you for reaching out and congratulations on your newly minted pilot certificate. We also appreciate your feedback on the WINGS program. Our FAA Safety Team works hard to create informative and relevant safety information for our fellow aviators, and it's always nice to know when we've hit the mark!

Thank you as well for your great suggestions on topics for WINGS courses for new pilots. We have passed them along to our course developers for ideas on future content. Be sure to check out the WINGS Quarterly Checklist at bit.ly/WINGSchecklist to guide you on your path to proficiency.

The FAA Safety Briefing magazine periodically publishes issues focused on the safety topics you suggested, and these are great ideas for the future.

Thank you for being an advocate for safety. It's pilots like you with a passion for continued learning that help keep all fellow aviators safe on the ground and in the skies above.

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

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

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

DRIVING THE POINT HOME

The holiday season is a time for joy, sharing, and family get-togethers. Unfortunately, it's also a time for sneezing, coughing, and runny noses. With cold and flu season in full swing, we all need to practice those personal hygiene tips that COVID-19 has engrained in us so well. But for pilots, another unpleasant affliction tends to creep up on us in greater frequency during this "most wonderful time of the year" — one that aspirin or tissues can't help with: get-home-itis, aka plan continuation bias. It's basically when you press on with a plan, even when information suggests you shouldn't.

> KNOWING YOU HAVE A BACKUP PLAN CAN HELP TAKE THE PRESSURE OFF COMPLETING THAT FLIGHT WHEN CONDITIONS ARE NOT IDEAL OR BEYOND WHAT YOU WOULD USUALLY RISK.

With so much conspiring for our time and attention during the holidays, it's easy to succumb to the pressure of an invite or special event we planned on attending. Maybe you scored tickets to watch your favorite college football rivalry, or perhaps you can't wait to see your new grandbaby open gifts at Christmas. It could also be your Aunt Carol's cranberries and carrot cake at Thanksgiving that gets you pumped for a long trip. The good thing is that general aviation is often the key to help make these transcendent moments a reality. On the flip side, the specific timing of these events tends to stretch our personal minimums beyond a safe comfort level so that we don't disappoint those who are expecting us or those traveling with us.

Take the football game for example. You likely dropped some cash on getting good seats, not to mention a rental car and hotel for you and a couple of friends. Many college games start earlier in the day on Saturday, considerably narrowing the window of good weather opportunities for your flight. Let's also add that you had to work late the Friday before, leaving you minimal time for preflight planning and a good weather briefing. Throw another potential variable into the mix, like an argument with your spouse (possibly on how much you spent for those tickets!) or even getting a stiff neck from having to sleep on the couch unexpectedly. You can just see the Swiss cheese holes of accident causation lining up for a potentially bad flight.

With all that you have invested in the event, you become heavily biased toward continuing despite any red flags that pop up. These warning signs to cancel or discontinue the flight tend to be weaker than the motivation to complete the flight. For example, being too focused on your destination might have you overlook that bit of engine oil dripping from the bottom of the cowling, or a not-so-normal rpm drop after a magneto check on your run-up. Would you have stopped to investigate those items on a regular flight?

It's an unfortunate reality for many pilots who overlook key items that could lead to a much more dire situation later on. What can you do? For starters, have a backup plan. We say that a lot in this magazine, but it bears repeating. Is your destination close enough to drive? Or could you get a last-minute commercial ticket? If you have tickets to a performance or sporting event and things don't pan out, you might look for a way to sell those seats last minute via a third-party vendor.

Once you have your plan B (and possibly plan C and D) in place, be sure to get buy-in from your passengers and those expecting to see you. That will help manage expectations for everyone, yourself included. Knowing you have a backup plan can help take the pressure off completing that flight when conditions are not ideal or beyond what you would usually risk.

Need more help with your go/no-go decision? Try phoning a pilot friend to explain your scenario and get their opinion. They won't have the same mental bias as you to complete that flight and can offer honest input towards your decision.

The bottom line: know and respect your limitations for a safe flight. Be realistic and objective with your assessments before and during your flight. And deal with small problems before they become big ones. As the saying goes, sometimes the longest way around is the shortest way home. Fly safe and happy holidays!

PAUL CIANCIOLO

CHAD GILBERT

Safety Liaison Team Lead, FAA Safety Team

Born in the snowy hills of Vermont and growing up in New York and Massachusetts, Chad Gilbert spent his youth watching shows like "Whirlybirds" and "Sky King." He loved anything with an aircraft, which led him to a meaningful career decision after high school. Chad decided to head down to the Army recruiting office and investigate the possibilities when he discovered he might be next up in the draft.

"They asked, do you want to be a helicopter pilot?" explains Chad. "Of course! And the rest is history."

Chad spent nearly seven years as a rotary wing aviator serving in the Army as a helicopter pilot, flight instructor, and safety officer. While in the Army, he also studied at the University of Southern California's Institute of Aerospace Safety and Management. However, after leaving the military, non-flying jobs weren't satisfying enough. After some research, he landed a career flying as a line pilot, chief pilot, and training director that he would stick with for a decade. Chad later moved on to flying corporate for a pharmaceutical company and then an air ambulance.

Chad Gilbert

"The FAA piqued my interest, so I obtained the required airplane ratings and was hired as an aviation safety inspector out of Albany in 1996," he notes. "In March, I will have 34 years of government service under my belt."

Now, Chad is one of three safety liaison team leads working with the FAA Safety Team program managers (FPMs) serving at one of the FAA's 75 Flight Standards District Offices. The FPMs are responsible for conducting outreach to the general aviation community with in-person seminars, webinars, and meetings with flight and mechanic schools. They also moderate flight instructor forums and assist air traffic managers in conducting pilot/controller forums.

The three team leads are there to ensure a consistent safety message nationwide. With more than 13,500 rotary and fixed-wing flight hours to pull from, Chad is instrumental in providing a relevant and reliable safety program. He has also earned the Wright Brothers Master Pilot Award for 50 years of exemplary aviation flight experience, distinguished professionalism, and steadfast commitment to aviation safety.

With all that experience comes great responsibility and much knowledge to share. Since the theme of this *FAA Safety Briefing* issue is winter flying, here's some advice from Chad if you plan to fly on a cold, wet winter day.

"First, practice whenever you can, especially with a flight instructor experienced in winter weather operations," he explains. "Make sure to discuss different scenarios and pick the instructor's brain for the best solution to a given situation. Take a few lessons in real-time weather that you may encounter."

Chad landing a Sikorsky S58 at the 34th Street Heliport in New York City.

Another tip he offers is to always file a flight plan even if you intend to remain flying under visual flight rules (VFR) and stay local. Chad stresses that it's vital to communicate with controllers and keep them advised of any abnormal situations you encounter.

"If you need ATC assistance, ask for it immediately. It's better to be safe than sorry."

A complete weather briefing and contingency plans if the weather changes are critical in winter weather. You also need to be willing to execute that plan B if needed.

Chad recommends asking yourself: How well do you know your equipment? Is your aircraft certificated to fly into known ice? Could you encounter ice? Do you know how much a half-inch of ice weighs and how much it degrades the aircraft's performance? When was the last time you used your navigational equipment to its utmost capabilities?

Lastly, Chad suggests being honest with yourself. "If you are concerned that you may not be up to the weather challenges that you may encounter, don't fly that day."

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