

AOPA

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Winter Flying

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Importance to Members

The challenges of winter flying can be summed up in four words: cold, ice, snow, and wind. Every day's a weather day after the first snowfalls of winter arrive in colder regions. Now a whole set of conditions, accompanied by a cryptic stream of abbreviations to describe them, shows up in notams, regular and special surface weather reports, automatic terminal information service broadcasts, and verbally from the tower. After the season's first light dustings of snow give way to accumulating storms and snow-removal operations, pilots need to inform themselves continually about runway, taxiway, and ramp conditions. The information in this subject report will provide tips for successfully meeting the challenges of winter weather.

As always, feel free to call AOPA's Pilot Information Center at 800/USA-AOPA with questions.

Overview

This subject report provides information on winterizing your aircraft and operational tips for flying in cold weather. In addition, a large section is devoted to aircraft icing – everything from de-icing systems to taxiing on an icy runway to avoiding ice enroute. Many articles on the various aspects of winter flying are included in the AOPA Archives section for your review.

Technical Information

Winterizing Your Aircraft

"It's getting really cold in my area now; is there a certain kind of oil that I should use in the wintertime?"

"What is the proper way to heat the engine on my airplane? The temperature outside is positively frigid here now."

"What should I use to get the ice off of my airplane's wings? We've had icing conditions for more than a month here."

These are typical questions heard by the aviation technical specialists in AOPA's Pilot Information Center during the winter months. When the weather turns cold across much of the United States, flying takes on a whole different set of concerns for pilots. Following is a list of important things to consider when entering the winter months. Keep in mind that many of the procedures listed are either



better done, or required to be done by a certified aircraft mechanic.

Cover or Clear: If your aircraft isn't hangared, make sure the wings and cowling are covered. Ice builds on the wings, resulting in inefficient airflow and longer takeoff runs. If you don't have covers for the wings, use a hand broom to brush off snow and ice. Cover the pitot tube and vents.



Control Cables: Because of contraction and expansion caused by temperature changes, control cables should be properly adjusted to compensate for those changes. Your airframe and powerplant mechanic should check the tension and make any adjustments needed.

Park toward the Sun: Park in the direction that the sun rises in the morning; it will help melt the snow and ice on the windshield.

Preheat: For those who normally base their airplanes indoors, here's an inexpensive way to preheat. Wrap the cowling in heavy blankets, and place two or more mechanic's drop lights in the forward openings or stuff them into the open cowl flaps. A pair of 75-watt bulbs will keep the engine compartment 20 to 40 degrees F above ambient temperature, for very little money. Just be sure that the light isn't touching anything that might catch fire, and keep the area near the lights free of fuel and oil. Prime at least three times before starting the engine (check your aircraft's manual). Have a carbon monoxide detector, especially if you have a tightly sealed airplane.

Wheelpants: Take off the airplane's wheelpants (if applicable). Ice and slush can collect under the pants and cause the wheels to lock up when you land.

Engine Breather Tube: One of the hazards of winter operation is that the engine breather tube may freeze shut. This tube provides a vent for normal crankcase pressures that occur during engine operation. Simply clear the breather tube before and after each flight.

Oil: Don't forget to change your oil! For oil weights, reference your POH or provided aircraft manual. Winter operations usually call for less viscous oil so that oil circulates more quickly after engine start.

Retime Magnetos: Ignition timing can fall out of specifications after a few months use. Improperly timed magnetos make starting harder and can lead to engine damage.

Inspect cabin heat system: In aircraft equipped with heat exchangers that surround mufflers or other parts of the exhaust system, there is a danger of carbon monoxide seeping into the cabin. Remove heater shrouds, check for cracks in exhaust system and patch or replace questionable parts. Defective combustion heaters in twin-engine aircraft also can leak carbon monoxide into the cabin.

Install heat retention devices: If recommended by the aircraft's manufacturer, install baffles and oil cooler covers when temperatures drop to specified levels. Once installed, remember to observe temperature limitations for the devices. Some manufacturers allow temporary operations with the devices installed in warm weather.

Check insulation: Inspect insulation of all oil lines and hoses. Also check insulation of tanks in a dry sump system (external reservoir).

Inspect hoses, hoseclamps, hydraulic fittings and seals: Check all hose lines, flexible tubing and seals for deterioration. Non-airframe and powerplant mechanics can replace prefabricated fuel lines and any hose connection except for hydraulic connections. Retorque all dampers and fittings to cold weather specifications.

Add air to tires and struts: Cold temperatures cause pressure in tires and struts to decrease. If the seal in the oleo strut is deteriorated, the strut will not hold air pressure. The seal must be replaced by a mechanic.

Test, clean and charge battery: Use a hydrometer to determine the battery's specific gravity, which is a measure of its state of charge. A fully charged battery should have a specific gravity of about 1.265 and can stand temperatures as low as -60 degrees F without danger of freezing. A healthy battery should need charging only after several weeks of disuse. Most automotive battery chargers can be used to charge an aircraft battery. Use low amperage over a long period of time. During the winter, perform the hydrometer test once a month and keep an eye on fluid levels. If the battery is two or more years old, it will probably need to be replaced.

Inspect deicing equipment: Cycle the boot system once a week to prevent stiffening of the rubber, which can shorten boot life. Check deicing boots for cracks and cuts. BFGoodrich, which makes rubber boot deicing systems, recommends semiannual applications of a compound called Agemaster Number 1 to boots to slow the aging process of the rubber. Regular applications of a Goodrich product called Iceex will enhance ice shedding by reducing the ability of ice to adhere to the boots.

Clothe Carefully: Dress warmly; pack a snack bar for fuel; keep a well-stocked survival equipment kit.

Cold Weather Operations

Many special aircraft operating procedures should be observed when flying in cold conditions. These procedures will help to increase safety, reliability, performance, and best of all, help decrease engine wear.

Block the Skis: If you're flying on skis, put something such as a plastic garbage bag or blocks between the skis and the snow when the airplane is parked.

Warming Up: Warm up the engine at 1,000 to 1,200 rpm unless it's necessary to reduce rpm to keep from exceeding the oil pressure redline. As the oil warms up, the rpm can be increased. Allow plenty of time for the engine to warm up. Don't consider taking off until the oil temperature has stabilized at least at the bottom of the green. Don't try to expedite the warming of the engine by closing the cowl flaps, either; airflow over the cylinders during ground operation is not sufficient that way, and you'll only end up with lukewarm oil and hot heads.

Icing: Icing is a large topic, and will be discussed later in this subject report, but major operational considerations will be listed here. When taxiing be aware of patches of ice. When flying enroute avoid icing conditions by all means, and, if you pick up ice unexpectedly, exit icing conditions as soon as possible.

Carb Heat: Some carbureted engines, like the O-470 in the Cessna 180 and 182, run markedly better if partial carburetor heat is applied during cruise flight in cold weather. A carburetor temperature gauge is necessary to practice this art, which consists of adding carb heat to maintain a 10 degree C. /50 degree F. carb throat temperature.

Brake Easy: Planning should include minimum brake usage when landing and when taxiing through snow since warm brakes melt any snow upon stopping. Then the snow refreezes, locking the plane in position.

Weather: Always get a complete weather briefing and perhaps an update before your proposed flight. Sounds like a no-brainer, but many pilots find themselves surprised by weather conditions they were not expecting. If you have trouble interpreting a text based report, don't hesitate to call a flight briefer at 800/WX- BRIEF (800/992-7433).

File a Flight Plan: This is one of the most reliable, easiest, and cheapest means of insurance any time of year. Just file a flight plan when you check the weather.

Fuel: Bring lots of it – more fuel equals more options. Be it climbing above clouds, or steering around a storm, you'll be glad to have it.

Cell: Bring a cell phone.

Cross Wind: A competent pilot will know and adjust his or her cross wind approach to final to the current conditions. A commonly used rule of thumb is cut your max crosswind component in half for a snowy runway, and cut it by 75% for ice landings. This will help prevent the aircraft from weathervaning into the wind.

Icing

We will start this section by discussing the different types of de-ice systems available. TKS (aka the weeping wing) works by secreting a controlled amount of de-ice fluid on different parts of the aircraft. Heated boots are typically used by larger aircraft, and use engine bleed air or electricity to heat parts of the airframe to melt ice. Finally, the pneumatic boots use engine bleed air to inflate bladders on various aircraft surfaces, thereby breaking off the ice. All of these systems serve a similar purpose – to keep the airframe ice-free – but each one does it differently. Some icing systems are certified for Flight into Known Icing (FIKI) while others are not.

A pilot should also be aware that there are two different types of icing – rime and clear. Rime icing is characterized by small super cooled water droplets and develops as a thin white cover on leading edges. Clear is, as the name implies, is clear. The super cooled droplets of clear icing are larger and typically found in cumulus clouds. Keep in mind that these two icing types can mix to form what we call “mixed icing.”

The bottom line on icing is don't fly into know icing conditions, even if your aircraft is certified for it. There have been cases of aircraft that are certified for FIKI that crashed when icing exceeded the capability of their system. In-flight icing is an extreme circumstance that must be dealt with quickly in any aircraft, small or large. At the FIRST sign of icing descend to an altitude with an above freezing air temperature, or expedite a 180 degree turn. If icing is serious, or if you are unsure of your ability to properly handle the situation, contact ATC immediately. They can provide you with vectors and altitude changes.

When taxiing, look out for ice. Check the brakes before you do your run-up to be sure you can keep the aircraft from moving. Attempting to perform a run-up on ice can result in sliding out of control. Additionally be sure to hold proper aileron deflection throughout your taxi. This will help prevent the tendency for your aircraft to weathervane into the wind.

The following is a list of precautions to help make your icy landing a safe one.

If you encounter icing on approach to landing start by turning off the autopilot. Autopilots can mask abnormal control feel and prevent you from detecting the onset of a stall or handling problem.

Make sure all your ice-protection equipment is on. If you have deice boots, inflate them at the final approach fix (instrument approach) or key position (VFR approach), and then again on final – if ice is still building.

Avoid abrupt control movements. Make small pitch corrections and keep your bank angles very shallow. This gives you a greater margin against the stall. Remember, iced-up airplanes stall at higher-than-published stall speeds.

Fly the approach at a higher-than-normal airspeed.

Don't extend flaps. Extending flaps can allow ice to form aft of the leading edges, and blanket the airflow over the horizontal stabilizer or stabilator.

Be prepared for a stall or abrupt loss of lift. A conventional wing stall calls for adding power and lowering the nose.

A tailplane stall however, or stall of the elevator or stabilator, calls for a completely different recovery procedure. Most often preceded by a lightening of pitch feel, pitch oscillations, or an uncommanded lowering of the nose, tailplane stalls require that you pull aft on the control yoke and reduce power. That's because horizontal stabilizers and stabilators generate negative lift, which acts in a direction opposite to the wings' lift. High power settings, high airspeeds, and extended flaps all increase a tailplane's angle of attack. Raising the nose lowers the

tailplane angle of attack, and breaks the stall.

Additional Resources

Start your search for winter weather information and safety tips here, with a collection of safety publications, online courses, videos, stories, and quizzes from the aviation safety experts in the [AOPA Air Safety Foundation](#).

[Cold Comfort: Tips for Winter Flying](#)

[Cold Weather Whys and Hows](#)

[Airframe and Powerplant: Winter Prep](#)

[Survival Strategies: Winterskills](#)

[Wx Watch: Winter Warm Fronts](#)

How 'warm' air can turn ugly

[Wx Watch: Ice Advice](#)

Escape and Evasion Tactics

[Winterwise: Icing tips and traps](#)

[Tips on Winter Flying](#)

FAA Accident Prevention Program; FAA-P-8740-24, AFS-800 0879

From the AOPA Archives

[The Weather Never Sleeps: Baby, it's cold outside -](#)

AOPA Flight Training, December 2008

[Training at 30 Below -](#)

How a flight school in Fairbanks, Alaska, handles winter weather

AOPA Flight Training, December 2008

[America's Airports: An Air-Mailed Village](#)

Without airplanes, this Alaskan settlement might disappear

AOPA Pilot, June 2008

[Never Again: Whiteout](#)

AOPA Pilot, January 2007

[Flying Season: Winter Wonderland?](#)

What looks pretty from the air can be a problem when you land

AOPA Pilot, December 2006

[Postcards: The Gods of the Hills](#)

Winter flying in Vermont

AOPA Pilot, February 2005

[Answers for Pilots: Winter wise](#)

Knowledge is key to staying safe when the temperature drops

AOPA Pilot, January 2005

[Wx Watch: Ice Flight](#)

NASA's Glenn Research Center pushes the (icing) envelope

AOPA Pilot, October 2003

[Frigid-Flight Fundamentals: How to Get Winter Flying Down Cold](#)

AOPA Flight Training, November 2002

[The Hows and Whys of Aircraft Preheat](#)

Flight Training, December 1995

[The Hot and Cold of It](#)

AOPA Pilot, December 1995

[Recurrent Training: Ice, Snow and Frost](#)

Flight Training, November 1994

[How to Fly in the Cold](#)

Flight Training, December 1993

[Avoiding Frigid Flight Fright](#)

Flight Training, March 1992

[Safety Pilot Landmark Accidents: Ice Crisis](#)

Never let your guard down

AOPA Pilot, November 2007

[Airframe & Powerplant: Deicing tools](#)

Exploring propeller deicing options

AOPA Pilot, October 2007

[Flying Seasons: Icing Accidents](#)

Learning from the stats

AOPA Pilot, January 2007

[Wx Watch: Icing, the Win a Six, and Expo](#)

A go/no-go decision prompts reflection

AOPA Pilot, January 2007

[Wx Watch: Ice Surprises](#)

Icing's sucker punches

AOPA Pilot, October 2006

[Never Again: A trace is ice](#)

AOPA Pilot, April 2006

[Wx Watch: A Perfect Ice Flight](#)

Why on-top rules

AOPA Pilot, February 2006

[Instructor Report: ASF Safety Spotlight](#)

A cold lesson about icing

AOPA Flight Training, January 2006

[Accident Analysis: Ice isn't nice](#)

Lift can't touch this stuff

AOPA Flight Training, December 2005

[Wx Watch: The Trouble With Zero](#)

Is your OAT showing you SAT?

AOPA Pilot, December 2005

[Wx Watch: Ice Fighters](#)

Weaponry for the ice wars

AOPA Pilot, November 2005

[Surviving an inadvertent icing encounter](#)

AOPA Flight Training, February 2005

[Wx Watch: Escaping the Frozen Zone](#)

AOPA Pilot, January 2005

[Never Again: Unavoidable ice](#)

AOPA Pilot, December 2004

[Wx Watch: Icing on the Web](#)

Two must-see icing Web sites

AOPA Pilot, November 2004

[The Weather Never Sleeps](#)

The ice man cometh

AOPA Flight Training, November 2004

[Wx Watch: Iced-Up Tails](#)

Avoiding ice-induced pitchovers

AOPA Pilot, November 2003

[Icing Rules of Thumb](#)

AOPA Pilot, January 1999

[Winter Chills](#)

AOPA Pilot, February 1993

[Carb Ice Versus Carburetor Heat](#)

FAA Aviation News

[AOPA Air Safety Foundation's Safety Hot Spot: Winter Weather](#)

Here's a collection of safety publications, online courses, videos, stories, and quizzes from the aviation safety experts in the AOPA Air Safety Foundation.

[AOPA Air Safety Foundation's Safety Quiz: Aircraft Icing](#)

Sponsored by Sporty's Pilot Shop

[Cold Facts: Wing Contamination](#)

AOPA Air Safety Foundation Safety Brief

[Aircraft Icing](#)

An AOPA Air Safety Foundation Safety Advisor

[FAA rescinds known icing interpretation at AOPA's request](#)

September 25, 2008

[Pilot Counsel: The law on 'known icing'](#)

AOPA Pilot, August 2005

[Cold Weather Operation of Aircraft](#)

Advisory Circular 91-13C

[Pilot precautions and procedures to be taken in preventing aircraft reciprocating engine induction system and fuel system icing problems](#)

Advisory Circular 20-113