by DUANE E. BEST / AOPA 195750

There is no need to salt the plane away during cold weather months if a few basic precautionary practices are learned and followed, Author claims

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Are you prepared for another winter season? Aircraft operation in the winter months can be hazardous, but it need not be.

In this day, it is difficult to imagine that an otherwise competent pilot would deliberately make a winter morning takeoff without removing the frost from his wings. Yet, some still try.

Lloyd Otey (AOPA 20311), chief pilot for Holladay Aero in Richmond, Va., related a tale about a frosty Aero Commander: "So he pulled the wheel back and got off the ground a little ways, but it didn't last long. He clobbered her and just tore it all to . . . "

Costly? Very. Avoidable? Quite.

Frost is structural ice. It destroys the ability of an airfoil to produce lift just as surely as an encounter with freezing rain. Hazards like this continue to cause bent airplanes. It points up the necessity for continuing vigilance to avoid winter's hazards.

There can be no wiser guide to cold weather operation of your plane than the owner's manual. A review of your manual's instructions is excellent and very inexpensive advice.

"Whether" depends on weather. The first step in the go/no-go decision is a thorough weather check. Most ideal is a face-to-face chat with a forecaster where you can review with him the many charts and station reports that are available. Ask for clarification of any weather factors you don't fully understand.

Particular attention should be paid to ceilings and cloud conditions at points en route and at destination; winds on the surface and aloft; the extent of any fronts with an analysis of local conditions reported at stations ahead and behind the front, plus any restrictions to visibility.

Remember to relate the temperature-dew point spread. When the spread reaches 3° to 5° and a little industrial smoke or haze is present in the atmosphere, a slight breeze can stir up a dandy fog.

George M. Whyte (AOPA 38564), who operates Aero Enterprises, Inc., at Meacham Field in Fort Worth, Tex., says, "We recommend to our people that they don't fly with less than 2,500-foot ceilings until they get a lot of experience." Whyte, an ATR examiner with well over 20,000 hours in his logbooks, adds, "We teach our students to always do a 180 when the ceiling gets down to 1,500 feet. When they are 1,000 feet above the surface and still below the clouds it is time to turn back."

When the VFR pilot goes on top he must do so with caution. With today's high-performance aircraft and all the sophisticated radio equipment that is available, it is quite easy to hop over the top of clouds en route. Often this can provide a smooth ride in the sunshine.

In the winter, areas of cloud cover are of greater depth and cover far wider areas of the surface than in warmer months. The U.S. Air Force flatly prohibits its pilots, when on VFR flight plans, from operating on top of more than five-tenths cloud cover, which is the transition point between "scattered" and "broken" conditions. Are your equipment and skill better?

Restricted visibilities are a continuing hazard to winter operations. The worst of these are fog and snow. It is usually not possible to maintain VFR minimums in snow showers. Even a very light snow shower can chop forward visibility drastically. According to standards used by the Weather Bureau, light snow indicates a visibility of five-sixteenths to five-eighths of a mile. This is no spot for the VFR pilot, you'll agree.

When ceilings are low all VFR activity, including migratory birds, is compressed into a smaller vertical space. Reduced visibility at the same time sets the stage for a near miss, or worse. The winter-wise VFR pilot will never paint himself into a corner by flying into a situation of both low ceilings and restricted visibility. Certainly, "1,000 and 3" is legal. Seldom is it smart.

Try this test. Pick a known landmark that is five miles from the center of your local airport. At 2,000 feet over the airport in your own airplane, spot that landmark and use your hand to shield your view down to that distance. You may find it uncomfortably close. If you relate this specific distance to a known reference point on your airplane you will have a reasonably accurate method for judging visibility in other situations.

In many parts of the country, local weather conditions may vary greatly from the general weather pattern. It is important to have some knowledge of these conditions.

Director of Michigan's Department of Aeronautics, James D. Ramsey (AOPA 153742), cautions about a certain section of his domain. "Particularly troublesome throughout the winter is the lower southeast corner of Michigan," he said. "A strong northwest wind will sweep across open areas of water in Lake Michigan, creating blizzard conditions in that particular corner of the state when weather conditions elsewhere are VFR. This area bears watching. It is a heavily traveled route from Michigan to northern Illinois and southern Wisconsin."

Circumnavigation by going north over the water also has its hazards. Ramsey says, "It is quite common to have a temperature inversion over the lakes in winter which causes a heavy haze condition. When you get out over the lake you lose your horizon completely. While it's VFR according to weather reports, it's actually IFR."

When asked how he would advise someone planning a winter flight from the midwestern states into the Pacific Northwest, Harley E. Pry (AOPA 66566) of Western Aircraft Corporation, Spokane, Wash., replied, "From the Miles City, Mont., and Scottsbluff, Neb., country, I would make it one jump at a time and then stop to check the weather for the next leg. Weather

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problems out here are normally not permanent but they are of such magnitude that it's impossible to fly around them. Mountains get in the way. You'll find that this country just doesn't have very predictable weather patterns."

Across the country, Ray Hylan who operates Hylan Flying Service in Rochester, N.Y., advised about some of their local problems. "A lot of private fields get snowed in up here," he said. "The only airports that are sure to be open are those where the airlines go. We check pretty thoroughly before we let an airplane go to be sure that the destination airfield has been plowed and will be open."

Ramsey pointed out other problems involving snow in Michigan. "Late in the season it still may be the dead of winter up here," he advised. "At some of the smaller airports, they've moved the snow to the point where the banks get so high they start narrowing down the runways and taxiways. Pilots should check the field carefully from the air before they land. It gets down to the point where sometimes the taxiways are just sufficiently wide to clear the wingtips and the snow may be piled five or six feet above the airplane." He further cautioned about lack of depth perception and loss of landmarks in snow areas.

Other considerations for planning the winter flight were suggested by George Nelson at Skyharbor Air Service in Cheyenne, Wyo. He says, "We advocate staying along well-traveled airways or along the highways in bad weather. Pilots should have an emergency kit with them and they should at least have some way to start a fire." Nelson also cautioned about watching for decreased aircraft performance, even during the winter, at high-altitude airfields.

In 1963, Alan I. Brunstein of the Civil Aeronautics Board's Bureau of Safety, completed a detailed study of fatal general aviation accidents involving weather. Said Brunstein, "the inexperienced pilots tend to be relatively cautious, but by the time the 100- to 299-hour category is reached there is a tendency toward overconfidence and a mistaken idea of ability to cope with certain weather situations. Based on experience gained through accident investigation . . . in too many cases it appears that there is a lack of awareness and appreciation for the dangers inherent in adverse weather conditions."

For getting maximum utility out of an airplane during the winter months, each pilot must establish certain rules of his own. Considerations will vary with the circumstances. Sensible flight planning should always include a flexible schedule, a healthy respect for weather and knowledge of local conditions that might be encountered. Set limits and refuse to allow yourself to exceed them, regardless of the pressures. *Always* have an "out."

Any discussion of winter hazards must include icing. Structural icing can be encountered any time an airplane flies into visible moisture at freezing temperatures. The minute that ice formation is spotted the winter-wise pilot will take action to get out of it, unless he is equipped to cope with it.

Structural icing causes decreased lift, increased drag and decreased power effectiveness. Ice can mean big trouble within minutes. Wind tunnel experiments have proven that ice deposits of a half-inch at the leading edge of an airfoil can reduce its lifting power up to 50%. Drag increases an equal amount. The stalling speed increases greatly and to an unknown quantity.

Additional icing complications which can never be divorced from winter weather are the hazards of ice on the windshield, pitot ice, static vent ice,

carburetor ice, oil breather ice and fuel vent ice. A pilot who suddenly finds his hands full trying to maintain his orientation may be overwhelmed by such added complications.

Carburetor ice is a concern of all pilots. Condensation of water due to venturi cooling can form ice accumulations within the carburetor. If it is undetected, engine failure may result.

To detect carburetor ice, watch for a slight drop in r.p.m. with a fixed-pitch prop or a slight drop in manifold pressure when flying a constant-speed prop. Full carburetor heat is the immediate cure. When power has been restored heat should be reduced to a preventive amount which, without a carburetor air temperature gauge, can only be determined by trial and error.

It is imperative to keep the engine running in order that enough heat can be produced to eliminate the ice in severe cases. With the application of carb heat, set the mixture control to full rich and be ready to use primer fuel if necessary.

Carbon monoxide poisoning is still another of the hazards with which the winterwise pilot must cope. Odorless, colorless and tasteless, carbon monoxide (CO) is the product of unburned fuel and is present in the exhaust of any internal combustion engine. It is deadly.

The first symptom of poisoning is a feeling of tightness across the forehead accompanied by a slight headache. As the headache increases to a throb, one may experience weakness, dizziness and dimming of vision. This may be followed by vomiting and convulsions. Obviously, at this point one can no longer control an airplane.

Once CO is suspected one must immediately shut off the cabin heater and open a window if possible. Avoid smoking and breathe 100% oxygen if it is available. Land at the first practical opportunity.

Carbon monoxide is most prevalent during rich mixture operations. During cruise flight, accurate leaning is recommended as a good method to reduce the possibility of CO by minimizing it in the exhaust gas. Should you ever smell exhaust fumes in the cabin, suspect the presence of CO.

According to FAA's Aviation News magazine, a nine-month test involving about 200 aircraft showed 19% of them had a marginal level of CO contamination.

Seepage of CO into the cabin can be caused by exhaust system cracks or holes, openings in the engine firewall, defective gaskets and mufflers and worn exhaust stack slip joints. Some manufacturers recommend inspections of these areas every 25 flight hours. On the market are inexpensive CO detection devices which are recommended as an in-flight supplement to regular inspections.

Winter engine starting problems occur because engine oil congeals, batteries deteriorate and fuel will not vaporize so readily. W. D. Thompson, chief of flight test and aerodynamics for Cessna's Commercial Aircraft Division, recommends engine preheat anytime the temperature is below 20° F.

In a detailed study, "Cold Weather Operation Of Lycoming Engines," Lycoming's Joe Diblin (AOPA 309015) says most engines begin to exhibit hard starting characteristics when temperatures reach freezing and oil, regardless of SAE range, reaches a near-solid state from 5° F on down. Diblin tells of an experiment at 25° F which showed that the average aircraft battery lasted for about two minutes of attempted starting.

Asked about care of batteries, Warren Jennings (AOPA 216592) of Mooney Aircraft, Inc., suggests that since battery efficiency deterioriates rapidly once the freezing mark is reached, the use of an auxiliary power plug installed near the battery can be beneficial to pilots who consistently fly in cold weather. The battery should be removed and taken indoors to preserve its life and strength when temperatures drop toward zero.

What kind of preheat is recommended? A high capacity, forced-air heater (100,000 BTU) will do the job most quickly. Since these are not always available one may have to settle for a couple of 200-watt light bulbs secured under a tightly cowled engine or an oil immersion probe used overnight. Even an insulated blanket will keep engine oil temperatures warm for several hours in below-zero weather.

One heater recommended by Diblin for use as an overnight heat source is a small, 2,400 BTU portable safety heater. It burns about a quart of high grade kerosene in 18 hours through catalytic action which eliminates carbon monoxide. After keeping the engine warm it can be safely placed in the cabin for additional heat during flight.

Not recommended is any type of heater that has an open flame. The dangers of burning the ignition harness or of setting the airplane on fire are too great.

Diblin writes, "Even with oil dilution we still recommend preheating. Normally an attempt to start an engine that is too cold generally results in getting the spark plugs wet, necessitating removal of plugs before another attempt to start," he says.

"One phase that sometimes startles people when they encounter their first cold weather operation is that upon starting they have no oil pressure. This is especially true in twin-engine aircraft where the oil pressure line is generally frozen solid. However, in our supercharged engines particularly, we cannot risk running these engines without oil pressure. Therefore, the oil pressure line, oil tank, radiator, prop hub and engine must all be preheated, and the engine not operated without minimum oil pressure in very cold weather."

Diblin further says that cylinders may be preheated to normal operating temperatures long before the oil is warm enough to flow and lubricate. "Directing the hot air blast onto the oil reservoir will greatly speed up the preheating period," he advises. "We also recommend running an air duct into the cabin to preheat the engine instruments and gyros so that they will operate normally."

An old North Country trick of draining the warm oil and taking it indoors overnight is still effective according to Diblin. However, it is no longer recommended except as an occasional procedure in extreme temperatures. When used repeatedly, it may contribute to shortened engine life due to water condensation problems within the engine when the oil is removed. Preheat is still recommended before putting warm oil back into the engine.

Once the engine has been started, owner's manual procedures should be used for warmup. What is correct for one engine may prove harmful for another.

As a general rule, the engine should be warmed until the oil pressure stays at least below the upper red line while accelerating and decelerating the engine. If controllable, the prop should be exercised two or three times to insure warm oil in the hub. Whether a winter kit installation to restrict airflow around the engine is advisable will depend upon manufacturer recommendations.

Caution should be exercised against skids if it is necessary to run up and taxi on icy ramps and taxiways. Scrubbing of nose tires in sharp turns may cause partial deflation of tubeless tires in cold weather says Cessna's Thompson.

Operations from jet airports have a few special hazards. The heat from jet engines may melt just the surface of snow-packed ramps, taxiways and runways. These spots are extremely slick and stopping may be difficult. Always be ready to supplement nose wheel steering with power for directional control on the ground.

Ground operation in the wake of any large aircraft should be avoided if there is hardpacked snow and ice on the surface. Chunks dislodged and blown rearward by either jet or prop blast can cause considerable damage to smaller airplanes.

Taxiing through puddles of water or slush should be avoided when possible. If unavoidable, retractable gear should be cycled once or twice after takeoff to allow the slipstream to remove as much moisture as possible from landing gear components before it can freeze. In aircraft with fixed gear, it may be advisable to remove wheel pants during the winter to preclude ice accumulations around the tires.

With the weather studied, the aircraft preheated, all frozen moisture removed, and a current inspection against carbon monoxide contamination, you are ready for safe, winterwise air travel. Provided that you use power to keep the engine warm during cold weather descents, you and your passengers will undoubtedly enjoy winter flying that is totally lacking in unwanted surprises. □