



# **FLYING LESSONS for January 10, 2019**

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*FLYING LESSONS* uses recent mishap reports to consider what *might* have contributed to accidents, so you can make better decisions if you face similar circumstances. In almost all cases design characteristics of a specific airplane have little direct bearing on the possible causes of aircraft accidents—but knowing how your airplane's systems respond can make the difference as a scenario unfolds. So apply these *FLYING LESSONS* to the specific airplane you fly. Verify all technical information before applying it to your aircraft or operation, with manufacturers' data and recommendations taking precedence. **You are pilot in command and are ultimately responsible for the decisions you make.**

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## ***This week's LESSONS:***

### **Winter *FLYING LESSONS***

(with apologies to my tropical and Southern Hemisphere readers)

**There's a lot to learn** about flying in wintertime. I found that much of it isn't written in the aviation weather texts, or included in the computer-based training discussions of cold-weather operations. Here are some of the things I learned about winter flying the hard way, from my own experience, and from "hangar flying" with others. Perhaps they'll help you if you've not experienced them yet yourself.

#### ***"Fill in the holes"***

**My wife**, our then-infant son and I took a Christmastime trip in a Cessna 172, from Wichita to West Virginia, to Florida and then back to West Virginia before heading home. The weather was great most of the way, but it was just beginning to snow when we arrived in Charleston, West Virginia after the Florida leg of our journey. I arranged for the Skyhawk to be hangared during our family visit in "Charley West."

**As forecast**, three days later the skies were perfectly clear, the temperature very cold, as we drove out to the airport for the flight home. My first clue that our trip would not go as planned was when I saw our Cessna on the flightline as we drove up to the FBO. I'd not given instructions for the airplane to be pulled out, wanting to keep it inside in case of frost.

**As it turns out**, there had been a mix-up and our plane had never been stored inside (although the invoice at the FBO showed a hangar charge). A heavy snow that had fallen the day before had melted in the morning's sun to coat the airplane with irregular layers of clear ice.

**The rest of my morning** is a long story of bad customer service (this was over two decades ago, so it has no bearing on current service at Charleston), and a now-humorous but absolutely serious offer from the line boy to "throw a bucket of water on the wings to fill in the holes in the ice and make the wing smooth."

**It took several** hours in a barely heated hangar to get all the ice off so we could depart. But the winter *FLYING LESSON* I learned that isn't anywhere in the textbooks is to stay at the FBO to ensure your airplane is actually pulled inside, and come to the airport with plenty of time for

deicing in case it got pulled out and left there, if you're depending on having a clean airframe at your departure time.

### ***Ice in the fuel***

**An extremely cold,** Arctic air mass had descended on central Missouri. The actual air temperature was twenty below zero Fahrenheit (almost 30 below Celsius).

**I was** running a small flight school that winter, and despite the cobalt blue sky I was flying an instrument session with a student under the hood. Even though the training Skyhawk had been stored inside overnight, we had preheated its engine and cabin so it started up without too much protest. We were on vectors for an ILS (Instrument Landing System) approach to Kansas City International Airport.

**Inside the marker** and about two miles from the runway, the engine suddenly quit. I slapped the Cessna's flap switch to the UP position as I took control from my student and pulled the yoke back to hold altitude while he removed his view-limiting Foggles and reoriented himself visually. As the airplane hit Best Glide speed I nosed back down to maintain it, and we glided toward the runway, starting from slightly high on glideslope.

**I radioed the tower** that our engine had failed. The tower controller asked if I was going to make it to the runway and I replied "yes," confident we'd make it to the long stretch of pavement. About that time the engine re-lit. Somewhere in there I had pushed the throttle fully forward, because we suddenly had full power. But I didn't pull the throttle back until we had runway under the wheels. Our landing and taxi-in were uneventful.

**It took some doing** at the international jetport, but we finally got a piston-engine mechanic to check things over. The only evidence was small flakes of ice floating in the Lycoming engine's gascolator. Fuel drained from the sumps was normal and nothing unusual was visible through the filler caps. The engine started right up and passed several run-ups and magneto checks with soon-to-be flying colors.

**The culprit** seemed to be ice in the fuel. I later heard that water in aviation gasoline will freeze in extreme temperatures and, because very small ice crystals may float in avgas, there may be no evidence of icy fuel when you sample from the sump drains on the bottom of the tanks. Water is likely to freeze into crystals if an airplane is stored in a heated hangar, where the air is warm enough for liquid water, and then is pulled out into extremely cold air. That's precisely what we had done prior to this Arctic-air flight.

**The winter *FLYING LESSON*** I learned from this experience is to check the fuel sumps and remove all water *before* pulling an airplane out of a heated hangar in extremely cold temperatures.

### ***The speed of heat***

**I'd been forced** to tie a Beech Baron twin down outside during a Christmas visit. There hadn't been any ice or snow, but the air was extremely cold. There was no enclosed hangar space and no provision for preheating at the little country airport near my family's home. But my resourceful father-in-law rigged up a couple of heat lamps on some long extension chords, so we draped the lines from an outlet across the ramp and set them in the cowlings of the frigid Baron to try to warm the engines.

**Yes,** knowing what I know now I'd be more concerned about the possibility of a fire doing this. But I'd read about using shop lights as ersatz engine heaters in Arctic operations, and I *did* confirm that the lights were away from fuel lines.

**After about** 30 minutes I removed the light from one cowling, climbed aboard the Baron and tried to start that engine. No luck. I reinserted the light, then repeated the exercise with the other

engine—thinking that if it started I could charge up the cold batteries. No luck there either. My plans to depart that morning were squashed.

**A local pilot** had watched my attempts from a nearby hangar. He offered to help me pull the Baron into an open T-hangar, the only shelter on the field, and plug in the shop lights for several hours. Although the temperature actually fell during the day, by mid-afternoon the engines both fired right up as if it were a warm spring day. All it took was getting the airplane in out of the wind and applying a little heat for a long period of time.

**The winter *FLYING LESSON*** I learned was that, when it comes to preheating, a little heat for a long time is far better than a lot of heat for a short period of time.

### ***Cold gyros***

**A student of mine** related he had flown his high-performance single on a cold winter day. He lives in the Northeast and is unable to hangar his airplane simply because there are no hangars available anywhere near his home. So winter flying means a lot of engine preheats.

**One day** he launched into cold, clear skies, and could hear a grinding noise from his instrument panel. Soon he realized his heading indicator was not working. On investigation after landing he learned that the extreme cold had frozen the lubrication to his heading indicator's gyroscopes. As the gyro spun up it broke, causing failure of the gyroscopic instrument.

**The winter *FLYING LESSON*** learned is that in extreme cold you don't only need to preheat the engine, you need also to route heated air into the cabin long enough to warm the instruments and avionics. Failure to preheat the gyroscopes especially can lead to failure of the instrument.

### ***Melting it off***

**The owner of a Piper Comanche** had his airplane pulled into a heated hangar to melt off a layer of snow and ice. He'd brushed off what he could with a broom but there was quite a bit that had stuck to the cold airframe.

**About an hour** later the snow had melted away. The pilot, by then impatient to begin his flight, asked the FBO to pull the airplane out for his departure. The manager balked, saying the snow had melted off but the airplane was not yet dry. The pilot insisted, so the manager had his crew open the hangar and pull the Comanche outside.

**It was quite cold** outside, and by the time the airplane was in place on the flight line, the pilot loaded his baggage and he prepared to board, the wet residue of melted snow had re-frozen into a sheet of clear ice. To his credit, the pilot admitted this was the result of his haste, and asked the FBO to pull his airplane inside to melt it off again.

**The winter *FLYING LESSON*:** If you must pull a snow, frost or ice-covered airplane into a heated hangar to melt it off, you must wait for the airplane to dry completely, or very thoroughly towel off all lifting and control surfaces, before pulling the airplane back out into subfreezing air. Otherwise it may re-freeze into a stubborn layer of clear ice that will delay departure substantially longer.

### ***The real objective***

**I learned another** cold-weather lesson somewhere along the way, not from personal or even second-hand experience, but because a mechanic told me and it makes perfect, logical sense.

**The object** of preheating an engine isn't to get the cylinders or the crankcase warm. The objective of a preheat is to get the engine's *oil* warm enough to flow smoothly, so it does not resist the motion of engine parts, and that it properly lubricates those parts so they can spin and move.

**Most engines** store their oil in a sump on the bottom of the engine. If the goal is to warm the oil, then the target of your preheat air should be the oil sump, on the bottom of the engine.

**Yet most of us** preheat an engine by shoving the heated-air hoses in the cowling's nose inlets. This send warm air across the top of the engine, but because warm air rises, it will be a long, long time before this heated air makes it downward to the oil pan, where it needs to be.

**Instead**, the winter *FLYING LESSON* is that the best preheat comes when you put the heater hoses not into the nose inlets, but up from the bottom of the engine, through cowl flaps openings in airplanes so equipped or simply from the rear lip of the cowling in cowl flap-less airplanes. It helps to keep cowling plugs in the nose air inlets so the heat doesn't escape, and to cover the cowling with a thick blanket.

### ***In the gaps***

**Many's the time** during the years I taught primary flight training in airplanes stored outside all year long, that during preflight my student and I found bits of ice that impeded the movement of control surfaces. I remember teaching students to ensure all the ice was gone so a little check could not lodge in the aileron, rudder or elevator gap and prevent the control from moving fully if needed.

**I recall** one time when I moved a Cessna 152's elevator up and down and could hear bits of ice rattling around inside the control surface. My mechanic Herb Piper (still, I believe, a *FLYING LESSONS* reader), a great mentor early in my flying career, agreed that we needed to get the ice out before the airplane was safe to fly. Who knows whether the ice might move into a position to affect movement of the elevator or its trim? What affect might ice have on critical flight control balance, perhaps triggering control surface flutter that could make flying the airplane difficult or even rip the elevator off the airframe?

**Later in my career**, when I began flying a number of airplanes with control surface gap seals, I was advised to ensure the gaps' drain holes are clean and open as part of every preflight. If liquid water gets inside gap seals and can't drain out, it can freeze into ice that can obstruct movement of the control surface.

**I also learned** to do a full CONTROLS: FREE and CORRECT check before engine start, to doublecheck operation at the end of preflight; in the normal place during the Before Takeoff check in the run-up area; and one last time just before taxiing onto the runway as a final confirmation that I had not blown some snow or slush into the control surface gaps that has frozen to impede movement.

**The winter *FLYING LESSONS*** here are to ensure controls are free and correct during preflight, in your before takeoff check and just before takeoff, but also to be certain there is no ice anywhere in or near the control surfaces, and that water is free to drain out of controls and gap seals when flying in freezing conditions.

### ***Check the inlets***

**Another common** cold-weather preflight issue is snow or ice around engine inlets and inside cowlings. Check that there is no ice or snow blocking the air inlet filter. Check that snow hasn't blown into the cowling and built up on cylinder cooling fins and around the oil cooler or gyro air filters that blocks air flow inside the engine compartment.

**The winter *FLYING LESSON*** in this case is to inspect the entire engine for ice and snow as part of your cold-weather preflight. If your airplane's cowling can't be removed for inspection, use a flashlight to check through all available openings. If you can peer in with a flashlight, snow could have blown in the same way.

## **Cold to hot**

**It was -20°F (about -30°C)** actual air temperature when I was preflighting a Beech Bonanza for a trip from southwestern Colorado to Phoenix, Arizona, to deliver the recently modified airplane to its owner. Everything checked out OK and the engine started right up.

**A couple hours later** I was cleared to land at Phoenix Sky Harbor, happy to hear the ATIS report that the temperature was 24°C (about 75°F). Touchdown was normal and I hadn't even touched the brakes when suddenly I heard a loud bang from beneath the left wing. I knew right away I'd blown a tire.

**I had no trouble** maintaining runway alignment with progressively more and more rudder. But just as the airplane was nearly stopped, there was no longer enough rudder authority to resist the airplane's turning, and at a very low speed the Bonanza spun 180° to the left. As the airplane came to a stop the first thing I saw was an America West Boeing 757 doing a go-around over me.

**The airport manager** and her team had the airplane safely off the runway within half an hour. The airplane was not damaged except for the blown tire. On investigation, I learned the left tire had lost some air overnight in the extreme Colorado cold. One of our line crew had noticed this before my delivery flight and aired up the tire. He didn't use a tire gauge, however; instead he pumped air into the tire until it "looked right." We speculated that he had over-pressurized the tire and, when the air in the tire warmed significantly during my descent into Phoenix, the pressure inside the tire got excessively high. All it took was the added heat of spin-up on landing for the tire to overpressurize and blow.

**The winter *FLYING LESSON*** learned that time is to check tire pressure with a good air pressure gauge before taking off in extremely cold conditions, and to always use a tire gauge to fill a tire to the correct pressure.

## **Winter *LESSONS***

**The aviation texts** tell us to ensure all ice is removed from the wing and tail before takeoff in cold weather. Engine and airplane manufacturers' data recommend preheating the engines when the outside air temperature is cold. But there's a whole lot more to learn about flying in cold weather that's not usually written down anywhere. Hopefully my experiences and those of others' I've learned from along the way will help you prepare for and conduct safe, uneventful wintertime flights.

What have *you* learned about winter flying that's not in the usual texts? Help us learn from you, at [mastery.flight.training@cox.net](mailto:mastery.flight.training@cox.net)



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