Winter Operations ©

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You're on your way to the airport. It's CAVU and bitter cold out. You know that C-172 "Heavy" will climb like a homesick angle... if you can get it started and safely off the ground. Winter offers some of the most rewarding flying experiences peppered with the most challenging circumstances. Let's consider how we should deal with several of the challenges of winter operations, from pre-flight to take-off.

Preflight- The safety of any flight is strongly influenced by your preparation. Your pre-flight inspection is a fundamental opportunity to reduce the risk of equipment failure.

- Dress warmly. A pilot who is shivering his way through a rushed preflight is not as observant as one dressed properly for the cold.
- Wear gloves to protect exposed skin from cold aluminum, and sub-zero fuel which can easily spill onto your fingers during your sump drain inspection. Evaporative cooling of spilled fuel can freeze flesh more quickly than you realize.
- Everyone watches for frost and snow on top of the wings and tail. It is easy however, to overlook snow melt which re-freezes inside shade protected control surfaces and underneath the wing and tail. Controls unbalanced by ice can flutter and which can lead to sudden and catastrophic airframe structural failure. On retractable gear aircraft, look for slush which has frozen inside wheel wells and in actuator mechanisms which will interfere with gear retraction and extension.

Engine Start- There are as many old wives tails and urban legends about how to start a cold engine as there are variants of the O-320. For carbureted engines follow these simple precautions and you will succeed:

- Pre-Heat your engine according to the manufacturer's instructions. Why pre-heat? Doesn't the multi-viscosity oil take care of the lube? We don't pre-heat our aluminum engines in our car do we? If the temperature is below 20° F (30° for Continental powered C-182's) you really should pre-heat for several reasons, chief among these is the matter of clearances inside the air cooled engine. Cold causes metal to contract. When an engine is cold soaked several hundred degrees below normal operating temperature, the metal components have in some cases shrunk away from each other, loosening their fit, and in other cases they have tightened up against each other, hard! When parts bind they wear rapidly. Cylinder barrels are tapered, smaller at the top than at the bottom so when the engine is warm, the head expansion creates a straight cylinder. Cold pistons fit too tight in the cold cylinder barrel as they approach the head and too loose at the bottom of the stroke. Pistons scuff on cylinder walls and rings break, leading to rapid wear and premature failure. Another reason for pre-heat is to assist the vaporization of fuel, essential to achieving the ideal combustible fuel/air mixture the engine needs to run. More about that later.
- Conserve battery power, don't run any nonessential electrical items prior to engine start. Battery power declines remarkably in winter. A fully charged but cold soaked battery may provide as little as ¼ the cranking power as it would in August. If your battery is really weak, save 5 amps by leaving the alternator side of the master switch off until you have successfully started the engine. Then don't forget to switch it on after a successful start.
- Prime- Here is a simple technique I have found consistently starts cold engines. Wait until you are really and truly ready to crank the engine before you prime. Put the right key in the ignition, (test it). Open the window so everyone can hear you holler "CLEAR!" Set the throttle properly and advance the mixture, etc. per your checklist. Then, prime HARD. Let that plunger fill up, then push that plunger hard enough that it almost hurts. It's like a squirt gun, the harder you push the better job the primer can spray a fine mist of fuel into the intake valve area. After you have primed 3 strokes, pull the primer plunger out and crank the starter. As the starter turns the engine over, push the primer home one last time. At this

point the primer is acting like fuel injection, spraying fuel mist into the in-rushing air drawn into the combustion chamber. As the engine starts, lock the primer and regulate the throttle to obtain 1000 - 1200 RPM. If you follow this process, I'll bet it starts. If you delay cranking after priming even a few seconds (a very common error,) if you prime gently, or skip the primer and instead pump the throttle to prime, you invite a disastrous induction system fire, as the liquid fuel drains backwards down the intake manifold and collects in the intake plenum below the carburetor. Treat an intake fire per your P.O.H. emergency procedures. As always, read, study, and practice the emergency procedure before you try starting a cold engine, not after the smoke plume issues forth from the cowling.)

- ✈ Though some advocate the use of carb heat immediately after engine start to enrichen the mixture, I advise against it. This is a technique to be reserved for extreme conditions, temperatures lower than -20 dg. C. It's too easy to forget the carb heat as you taxi across the anti-skid.
- ✈ RPM and Oil Pressure- Your P.O.H. probably suggests in extremely cold weather, it may take as much as 30 to 45 seconds before the oil pressure indicator begins to reflect a rise in oil pressure. In reality, between multi-viscosity oil, engine pre-heat, and the not so extreme low temperatures we see in Pennsylvania, (-20° F is rare), you should see the oil pressure rise off the peg toward the top of the green within seconds. The most important thing about initial oil pressure and flow is proper RPM. Don't run the engine too fast or too slow. Keep the engine within 1000 to 1200 rpm for the first couple minutes. Then try not to use more than 1500 rpm to initiate taxi and for another 5 minutes until you get to the run-up area.

Warm-up. It will take a little bit longer than in summer to warm the engine to minimum operating temperature.

- ✈ If the oil temperature is off the bottom peg on it's way to the green arc, and the oil pressure is well within the green arc, the engine will probably accept full throttle without stumbling.
- ✈ If, on your take off roll the engine falters when you open the throttle, abort the take off and warm that engine another 10 minutes.

Taxiing in winter can be one of the most dangerous activities you can engage in. Ramps and taxiways are often contaminated with ice, snow and melt water. The winds are often higher than other seasons, and there are many snow banks, berms, clumps, etc. to avoid. Ramps often are more congested because the snow just cannot be plowed off every where, reducing parking space.

- ✈ Taxi slowly and with full back elevator unless winds dictate otherwise. Keep your prop up out of the snow and your nose gear strut unloaded and extended. Avoid deep snow, frozen snow berms and clumps, remember your prop runs within a few inches of the ground. Even light contact with snow or frozen ice lumps can damage a prop tip. If you suspect you hit something with the prop, stop where it is safe to do so, shutdown and inspect for damage.
- ✈ Stay near the center of the taxiway and plan for generously wide turns. Watch out for high snow banks, reduced wingtip clearance, and obstructed visibility at intersections.
- ✈ Avoid standing water, taxi on dry or snow covered pavement to stay out of puddles. You should avoid throwing slush into wheel wheels, onto flaps, into retraction mechanisms and wetting the brakes. Wet brakes may freeze solid shortly after take off, resulting in a locked wheel on the next landing.
- ✈ In high winds, beware of "weather-cocking" where the plane slides on the ice and pivots into the wind. I've seen conditions where the ramp is so slick you cannot negotiate a turn directly to the downwind because the wind against the vertical stabilizer wins out over the poor traction of the wheels on ice. Generally speaking, if you find it difficult to taxi because of poor traction, you shouldn't attempt a take off. It is not so much the take off if all goes well, it's the stopping if you must reject the take off.

Run-up

- Survey the runup area and stop facing into the wind on the best spot you can find. Give yourself plenty of room in case you slip.
- Stay "heads up" as you advance the throttle for magneto checks, ensure you don't break loose and slide toward the taxiway lights or the tail of that Baron in front of you.

Take-off and Contaminated Runways

Traction is essential for directional control and braking. Adjust your operational minimums to accommodate poor traction. You can't simply slow down as you do when driving on slick surfaces, your flying speed is the same whether operating on dry pavement or ice, therefore your stopping distance if you have to cut the engine prior to lift-off will climb exponentially.

- If possible, consult NOTAMS or ATIS for runway conditions prior to even touching the aircraft. The worst traction is on ice near freezing. Snow at -10° provides at least fair traction. Carefully consider the necessity of the flight before attempting to fly when braking action is reported as poor or when MU friction reports are less than 20% in either the first or last thirds of the runway. in such conditions. These conditions are universally unappealing. No matter how much experience the pilot has, physics wins. Training and proficiency flights are not appropriate. Even the experienced pilot will refuse a flight when braking action is reported as nil.
- Your greatest concern should be uneven surface friction combined with a crosswind. Until you are really good at Bob Hoover style one wheel operations, maximum permissible crosswinds must be adjusted downward as traction deteriorates. Side loading of landing gear can become significant if you weathercock on ice and can't straighten out before you hit the dry pavement ahead. Side loads lead to airframe stress and wear, collapsing retractable gear, upsets, and off runway excursions. Many pilots have drifted sideways to the point the down wind gear gets sucked into the heavy snow along the edge of the runway, resulting in a wrestling match which sometimes results in loss of control and upset. If there is a significant cross wind, favor the upwind side of the runway centerline and don't be meek about applying heavy crosswind control technique.
- Often you face the choice between a short, narrow, poorly maintained runway aligned with the wind or a clean, long, and wide runway with a cross wind. Before you automatically choose the runway aligned with the wind remember, not every take off roll ends in flight. Some take off runs must be aborted, you must consider your stopway before you attempt to launch. If you were to abort, could you safely stop with marginal braking? Could you abort a take off and stop before the intersection if you found someone crossing your path?

These are a few of the many considerations (we didn't even get airborne yet) each pilot must face when assessing winter weather risks. Don't be frightened by these factors, learn to deal with them. The successful pilot develops good judgment, makes safe decisions, and operates his aircraft with finesse. Study your individual situation, talk to some of the older, not so bold pilots who have done this a few times, and if you still feel uncomfortable, get a good instructor to keep you out of trouble and practice! You'll come to enjoy it when you know what to look for.