

Cold Weather Operations at Aerowood

In less than a minute, a single cold start without proper preheating can produce more wear on your piston aircraft engine than 500 hours of normal cruise operation. If it's cold enough, a single cold start can cause the catastrophic destruction of an engine shortly after takeoff. Does that get your attention?

It's not just a matter of heating the oil, it's the dissimilar metals that cause the problem with cold starts. Read below to how we handle the issue at Aerowood.

Cold Start

With winter just around the corner, it is time to review winter operations. A cold engine does not want to start, and if you DO get it started using incorrect procedures, you'll hurt it. Cold starts done wrong are really hard on the engine, the starter motor, and the battery (they are usually equally hard on the pilot's ego, but that's another issue).

Avoid the embarrassment and inconvenience of an unsuccessful cold start, while at the same time saving wear and tear on the engines.

Here's how to do it right.

Plan Ahead

When forecast calls for nighttime temps below 40F for more than two hours, we need to heat the engines before start (see FOM 7.10.09). Some of our aircraft (Arrow, 2055E, 20052, 933P) are equipped with engine heaters – in the 172s the heater is a pad bonded to the oil pan. In the Arrow (98JG) there are heating rings around the cylinders. For those aircraft, if cold temps are forecast overnight, after the last flight of the day they should be tied down at the Quonset Hut and the engine heater plugged in using a drop cord.

933P, 20052, and 2055E have a yellow GFI that STAYS WITH THE BLUE heater cord in the cargo compartment when not in use. Plug them in after that last flight and in the 172s set the heater to "medium". Ben has the rheostat clearly marked. 98JG has an engine heater that has no rheostat, just plug the drop cord into the plug found behind the oil access door. It can then be left on overnight.

This process, keeping the engine warm rather than getting it warm, is better for the engine overall and reduces the risk of grinding the starter or running the battery down the morning of the flight. BUT, for our other airplanes, overnight plug-in isn't possible. Which takes us to...

Morning of the Flight

First, think of how cold and heat work

We've already talked about the airplanes that have built-in engine heaters (that also includes all the Cirrus fleet). For the rest of the fleet, we'll need to use the external forced air engine heaters that provide hot air to the engine compartment. **Hot air rises.** Put the heat source as low in the engine compartment as possible, and as near the oil pan as possible. For all the older 172s (most of our fleet) there is plenty of open space under the cowling to put the heater on the ground and then push the "Suck" and "Blow" hoses up into the engine compartment. As the hot air goes up through the engine compartment it will warm everything. For the newer 172s (like 5385J) the cowling has no open space

underneath the cowling near the nosewheel. For these airplanes (like 5385J) the heat source must be inserted high in the engine compartment (with the hoses pushed into the openings in the cowling beside the propeller). The preheat will be less efficient, will take longer, and the oil will never really get as warm as desired. So give yourself more time if your first flight of the day is in an airplane where the heater hoses have to be inserted high in the engine.

If you are scheduled for the first flight of the day, give yourself enough time before your flight to heat the engine. Upon arriving at the airport, set up the engine heater before you do anything else. How long should you heat? Depends: Depends on the type of heater, the overnight temperatures, and the airplane. You will learn from experience. A good starting point is at least 45 minutes, an **hour is better**.

We also have numerous blankets and an old sleeping bag. Drape one of these over the cowl while you're heating to minimize heat loss. If it's windy, you will need to secure this blanket. Keep a length of parachute cord or similar in your car to help with this.

Exercise the Engine

After you heat the engine but before you untie (and unchock for the Champ) the airplane, double-check that all switches are off, throttle closed, mixture to idle cutoff. Then pull the propeller through several times: five or six blades will loosen congealed oil and pull fresh, hopefully warm oil up into the "innards", thus making the start much easier on the engine, the starter motor, the battery, and the pilot.

Ready to Go

Leave the engine heater on during your preflight briefing and walkaround. You will have to cut the generator off if you need to call for fuel – the FBO fuelers will not refuel the airplane with the generator running.

After the walkaround, disconnect and stow the engine heater and generator. Try to plan your tasks so you minimize the time between heater shutdown and engine startup. These engines cool down very quickly.

Once the airplane preflight is complete and engine heated and exercised, take the ropes and chocks off and saddle up. Now, to the cold start:

This Procedure will nearly always work for nearly all aircraft engines:

Consult the POH – there you will find manufacturer approved cold start procedures. Here is some additional advice.

FLAPS: You probably lowered the flaps for your walkaround. Leave 'em down until after you start the engine. The electric flap motor on Cessnas and Beech take a lot of juice, and you may need all of it to start the engine. Raise flaps after engine start.

PRIME: A cold engine needs lots of fuel. Give it four or five shots of prime. The normal two or three is not adequate. Turn the BATTERY side of the Master on, and hit the starter.

Some have expressed a fear of fire if they over prime the engine. Use what you think is the minimum amount of prime for the conditions. If it doesn't start on the first try, you can give it another shot of prime.

Caution: Avoid “pumping” the throttle if the engine is not turning. Carbureted Cessnas have an accelerator pump on the throttle. When you “pump” the throttle while the engine is not turning fuel will be sprayed into the carburetor throat. However, these Cessnas have an **updraft** carburetor. Air comes in the air intake, below the prop spinner, and then makes a 90 degree turn to go **UP** into the carburetor throat where the air is mixed with fuel and sent on to the cylinders. If you “pump” the throttle with the engine not turning, gravity takes over, that fuel that is sprayed into the carburetor throat will then run **DOWN** the carburetor throat, and can pool up in the air intake or even (if you pumped a lot) run all the way out to the ground. If the engine is over primed and backfires, that excess fuel will catch on fire and it will be way more exciting than the pilot wants. Crack the throttle and let the primer take care of getting fuel directly into the cylinders.

A cold aircraft engine needs lots of fuel or it will not start!

After the engine starts and stabilizes, adjust power to 1000-1200 rpm, turn on the Alternator side of the Master, and proceed with your piloting chores. Go flying.

Winter Flying Review

Winter just around the corner, and some of you have not yet had the privilege of properly preparing the airplane in the cold. You need to keep in mind that winter flying takes more patience, more time, and more work than warmer days. Give yourself plenty of time to get the airplane ready.

There are weather conditions that affect every non-hangared airplane with ice, snow, and beautiful icicles dangling from wings and control surfaces. ALL that ice and snow MUST be removed COMPLETELY before attempting flight. Yes, it’s not just a good idea but a regulation. FAR 91.527. And it is required by our FOM 7.10.10. So how to go about it?

First, **DO NOT scrape it off.** Those deice scrapers they sell at Walmart and NAPA are fine for your Ford windshield, but will badly mar the plexiglass on any GA airplane and will damage the surface on wings, fuselage, empennage. Don’t even use your driver’s license or credit card. They will scratch the surface.

By far the safest and easiest way to deice the airplane is with **sunshine**. It is wonderful what a few minutes of sunlight will do for an ice-covered airplane, especially if the airplane is a dark color. Untie it, point the tail at the sunlight, plug in the heater, and by the time the rest of your preflight is completed the airplane may well be clean.

You can use the brush end of that deicer, or a good broom, to get the loose snow off. We have a pushbroom on the fence beside the generators for this purpose. Given the large surfaces involved, it makes the job of cleaning a foot of snow off a lot quicker. Brush gently. The more loose snow or frost you can get off, the quicker the sun will do it’s work.

One good way to get the frost and ice off is with liquid deicer, a.k.a. alcohol. HEET, that fuel additive you’ll find in yellow bottles at the auto supply store, is 99% glycol and works great (applied with a squirt bottle) but it’s expensive. We’ve found an RV deicer that is almost straight alcohol, therefore will not damage the airplane surface or react chemically with the plexiglass. We keep that in a garden sprayer near the heaters. More recently we found that RainX windshield washer fluid is 14% alcohol. Less alcohol, less effective, but also less expensive.

Do not deice with hot water. It'll get the ice off, but water running down into the control surfaces could freeze, leaving you with no control once you're airborne.

Don't forget the underside. Remember, lift is DOWN on the horizontal tail surfaces. Take off with frost on that nearly-invisible spot and you are a test pilot. There's no telling what the airplane will do, but you are certain not to enjoy the ride.

So, you're deiced and heated the engine and cranked up. Now what? Well, that's the easy part. ALL your performance parameters improve when it's cold. Shorter takeoff roll, quicker climb, better fuel burn....but you knew that already.

What if there is ice or snow on the runway and taxiway? Sounds like a good day to leave the airplane tied down and do ground training instead.

If you arrive back at EQY (or a winter destination away from home) you may find that your only choice is to land on a runway that appears to have gotten some snow or ice contamination while you were in the air. Use a soft-field technique. Keep it flying as long as you can to maintain aerodynamic control as long as you can, and avoid braking. If the runway is a solid sheet of ice you won't have any braking action anyway; and if it's patchy ice, you may have braking action on one side but not the other. Even gentle braking under those circumstances could jerk you toward the dry side. Best to leave your feet off the brakes. Roll on past that nearby intersection and don't try to turn off until you know you've got traction.

Happy winter flying!

Operating the Generators

Many of you have asked about the protocol for operating the forced air heaters. We have four generators - they are just inside the chain link fence beside the gate is behind the fuel trucks. The heaters, extension cords, and blankets are in the gray cabinet – or sometimes in the Aerowood office. Just in case any of you have never operated a generator, the steps for getting it started go as follows:

- 1) Make sure the fuel valve is in the "On" position
- 2) Flip the power switch to "On"
- 3) On the choke, slide the lever to "Start"
- 4) Pull the starter rope to start the engine (this should only take one pull)
- 5) After engine start, on the choke, slide the lever to "Run"
- 6) Plug the heater into the generator. You can have **no more than TWO** preheaters running at one time on each generator. Running one heater per generator is preferred. The heaters must be in SEPARATE duplex outlets (plug them in "side by side", not two in the same duplex outlet). On some generators, they will only run one heater on one side. If the breaker for one side stays popped out, please let an Aerowood staff member know so we can have the generator serviced.

Since this is a gas powered generator, we have a several red gas jugs for your use. If a jug is getting low on gas, please notify Amber, Meghan, Marianne, or an instructor.

IMPORTANT: Please do not unplug or move a heater to your airplane that is running on another airplane unless you check with the pilot of that other airplane first.

If you have any questions, please give us a call at (980) 263-9025.

Take care, and be safe during the wintry weather!