Winter Engine Preparations

Tips to keep your engine in ready-to-fly condition

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Winter; it's a season that brings a variety of maladies to your aircraft and flying habits. While cold winter air helps make the plane fly faster by providing a denser charge of air to the engine, and denser air for the prop to pull itself through, there are problems with getting the plane dug out of the tiedowns, T-hangar, or for those lucky enough, a fully enclosed hangar.

If you are not prepared for those winter-flying challenges, you can actually damage your aircraft and, in a worst-case situation, end up setting yourself up for an accident. In an effort to help pilots prepare, here's a number of tips to help keep your aircraft in flying shape in the winter. The cost to implement these options will vary, and generally they can be implemented by anyone with a little mechanical skill. If you are not strong in this area, seek help from your airframe and powerplant mechanic.

Engine Preheat

Preheating a Continental, Lycoming, and even a Rotax aircraft engine is essential. These engines are assembled in an environment generally in the area of 70°F to 80°F. When the temperatures outside dip into the below-freezing range, some clearances in these engines can actually close to zero, or a hard metal-on-metal contact, due to the dissimilar metals used. In addition, oil becomes more viscous as the temperature drops and takes longer to flow through the engine. As a result, the valves farthest away from the oil pump may be starved for flow, which can cause damage.

Starting a cold soaked engine without preheating of some sort can cause everything from a spun bearing, where the bearing surface breaks the retaining pin and spins on the journal, to valve damage, and more. As a result, preheating your aircraft engine is essential to make sure it is not damaged when starting it up in cold weather. Keep in mind, most of the automobile-to-aircraft engine conversions are less susceptible to such damage, due to greater clearances between the bearings. However, if your engine has been "aircraft tuned" with closer tolerances between bearings and fits, these same provisions need to be applied.

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Heat It!

You can warm up your engine in a variety of ways. There are engine heaters that apply heat directly to the engine with pads and heating plugs. These devices run

on electricity, so if you have power available in your hangar or parking spot, they can be effective at keeping your engine warm. There are also heated covers for aircraft engines, which work on the same principles of the electric blanket.

There are also external heating systems available for engines. These systems use propane and, in some cases, battery power to blow hot air into your engine compartment. The hot air warms the engine over the course of 45 minutes to an hour and raises the bulk temperature of the engine to the point where it is safe to start.

These are the higher-cost options. The engine heaters are generally FAA-PMA approved, which means the price reflects the cost of that certification. The external propane heaters are generally not attached to the airplane and thus do not require FAA approval. However, since they are designed to work in the aircraft environment, they generally will cost you several hundred dollars.

Frugal Heating

There are other ways to effectively heat your engine and not spend a fortune. As an example, you can get a 100-watt incandescent light bulb and carefully direct it to sit in your engine compartment. Covering the engine compartment with an old comforter or a moving pad (a thick, insulated pad used to protect furniture while moving) can help to keep the heat dissipated by the incandescent light bulb in your engine compartment. This approach can be quite effective for pilots trying to keep a plane ready on a moment's notice.

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There are some caveats that come with using this approach. First, you need to make sure the light bulb is not in contact with the airframe, since the temperature generated can scorch paint or composite materials quite easily. Second, the colder the temperature, the less likely this approach will work for you. As the temperature drops, the heat transfer rate between the heated space and the exterior space increases proportionally. Unless you take action to insulate your engine compartment to prevent this heat loss, the light bulb approach will not be able to work for you.

You can use a simple thermometer in your engine compartment to validate this issue. Try the 100-watt incandescent light bulb in the engine compartment on a day where the temperature is below freezing, and with

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no insulation in place, see how hot the top of the engine gets. Try the same thing with an old comforter or moving blanket in place, and you will be able to see the difference.

Finally, be careful with the use of heat lamps such as 100- and 250-watt "brooder" lamps. While they are an effective source of heat, great care must be taken in where they are pointed. These lamps are designed to produce heat in the visible and infrared ranges, and as a result, they can generate sufficient heat to damage and scorch paint, may remove the temper from some metal materials with sufficient exposure, and may warp or melt some composites.

Again, a good insulating blanket will help to keep the heat where you want it.

Fan-driven space heaters can also be used to heat up aircraft engines. These units range from 500 to 1,500 watts or more. By using your skills, you can connect a flange and exhaust duct, and then port the hot air into your engine compartment, where it will warm up the engine compartment. Again, a good insulating blanket will help to keep the heat where you want it.

Always On or Timer-Controlled?

Looking at this issue from the sense of saving money, cycling the heating source on and off seems to make sense. However, looking at how this will affect the engine points in the opposite direction.

Consider this: As you heat the engine, the air in the engine is heated and expands. Since the engine has a breather, some of this heated air is pushed out of the engine. Later, when the heating source is turned off, the colder and moist air will be drawn into the

engine as the engine cools and the air in the engine contracts.

The problem with this is that it makes the engine breathe in moist air. The moisture can then condense out on the inside of the engine, promoting corrosion on any surface where the oil film has left the steel parts of the engine unprotected. This can cause excessive corrosion of the interior of the engine. As such, the recommendation is to keep the heater on when in use, except when the airplane will be flown.

Most of the professional-grade heaters for aircraft engines are internally thermostatically controlled and will cycle to maintain the proper temperature. Since the temperature band maintained is fairly tight, while some change in the air does take place, it generally is not enough to promote excessive corrosion, since the engine does not generally cool down to ambient temperatures.

No matter how you look at it, if you intend to fly your plane when the mercury dips toward the freezing range, it is very important that you take the necessary steps to preheat your engine. Failing to properly preheat your engine, whether using a light bulb, a heater, a propane blower system, or a custom-designed engine heater, can expose your engine to problems that can substantially shorten your engine life, or even damage the engine, requiring expensive repairs. The cost of avoiding these problems is fairly minor, when compared with the cost of the repairs necessary if the engine is not properly preheated prior to being started!

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