

**SERVICE INFORMATION LETTER**  
**Contains Useful Information Pertaining To Your Aircraft Engine**

**SIL 03-1**

Technical Portions FAA  
 Approved

**SUBJECT: COLD WEATHER OPERATION – ENGINE PREHEATING**

**PURPOSE:** To provide instructions for engine pre-heating during cold weather operation

**COMPLIANCE:** On release of this Service Information Letter during cold weather engine and aircraft operation.

**MODELS**

**AFFECTED:** ALL

**A. GENERAL INFORMATION:**

Preheating is required whenever the engine has been exposed to temperatures at or below 20° Fahrenheit / - 7 degrees Centigrade (wind chill factor) for a period of two hours or more. Refer to the *Pilot's Operating Handbook/Airplane Flight Manual* for specific instructions that apply to your aircraft.

**WARNING**

*Failure to properly preheat a cold-soaked engine may result in oil congealing within the engine, oil hoses, and oil cooler with subsequent loss of oil flow, possible internal damage to the engine, and subsequent engine failure.*

*Superficial application of preheat to a cold soaked engine can cause damage to the engine. An inadequate application of preheat may warm the engine enough to permit starting but will not de-congeal oil in the sump, lines, cooler, filter, etc. Congealed oil in these areas will require considerable preheat. The engine may start and appear to run satisfactorily, but can be damaged from lack of lubrication due to the congealed oil blocking proper oil flow through the engine. The amount of damage will vary and may not become evident for many hours. However, the engine may be severely damaged and may fail shortly following application of high power. Proper procedures require thorough application of preheat to all parts of the engine. Hot air must be applied directly to the oil sump and external oil lines as well as the cylinders, air intake and oil cooler. Because excessively hot air can damage non-metallic components such as seals, hoses, and drives belts, do not attempt to hasten the preheat process.*

The preferred method of preheating your engine is to place the aircraft in a heated hangar for a minimum of four hours prior to flight. Optional methods of preheating your aircraft engine are to use either a high volume combustion heater with ducts directed to the engine oil sump, cylinders and oil cooler or to install an engine mounted preheating system.

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Prior to operation and/or storage in cold weather, ensure that the engine is serviced with the correct viscosity oil for the ambient temperature. Refer to the latest revision of TCM service bulletin SIL 99-2A. In the event of temporary cold weather operation, consideration should be given to storing the aircraft in a heated hangar between flights.

**CAUTION:** *Attempting to start your engine with a partially discharged aircraft battery may result in damage to the starter relay, possible engine kick-back resulting in a broken starter adapter clutch spring.*

Engine starting during extreme cold weather is generally more difficult. Cold soaking causes the oil to become thicker (more viscous), making it difficult for the starter to crank the engine. This results in slow cranking speeds and an abnormal drain on the battery capacity. At low temperatures, aviation gasoline does not vaporize readily, further complicating the starting procedure. Always use an external power source when attempting to start your aircraft engine in cold weather.

**WARNING**

*Over priming can cause a flooded intake resulting in a "hydraulic lock" event and subsequent engine malfunction or failure. If you over prime, or flood your engine, make certain that all fuel has drained from the intake manifold and/or cylinder prior to attempting engine starting.*

False starting (failure to continue running after starting) often results in condensation on spark plug electrodes. This moisture can freeze and must be eliminated either by preheating the engine or removing and cleaning the spark plugs.

**B. APPLICATION OF PREHEAT USING COMBUSTION HEATER:**

If a heated hangar is not available and the aircraft and engine have been exposed to temperatures below 20 degrees Fahrenheit / -7 degrees Centigrade (wind chill factor) for 2 hours or more, and does not have an engine mounted preheating system the following procedure may be used.

The following procedure is required for preheating, starting, warm-up, run-up and takeoff.

1. Select a high volume hot air heater. Small electric heaters which are inserted into the cowling opening do not appreciably warm the oil and may result in superficial preheating.
2. Proper procedures require thorough application of preheat to all parts of the engine. Apply preheated air directly to the oil sump, oil filter, external oil lines, oil cooler, coolant radiator and cylinder assemblies. Continue to apply heat for a minimum of 30 minutes.
3. Start the engine immediately after completion of the preheating process. Since the engine will be warm, use the normal start procedure.

**CAUTION:** *If oil pressure is not indicated within 30 seconds, shut the engine down and determine the cause.*

4. Operate the engine at 1000 RPM until some oil temperature is indicated. Monitor oil pressure closely, if necessary retard throttles to maintain oil pressure below 100 PSI. If oil pressure is less than 30 PSI, or

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cannot be maintained below 100 PSI, shut the engine down and repeat the preheat process. Do not close the cowl flaps to facilitate engine warm-up.

**CAUTION:** *Do not operate the engine at speeds above 1700 RPM unless oil temperature is 75° Fahrenheit or higher and oil pressure is within specified limits of 30-60 PSI.*

5. Run the engine up to 1700 RPM, approach this rpm in increments to prevent oil pressure from exceeding 100 PSI.

**WARNING**

*Operation of the engine above 1700 RPM before reaching minimum oil temperature may result in engine malfunction, engine failure, injury or death.*

6. At 1700 RPM, adjust the propeller control to Full DECREASE until minimum governing RPM is observed, then return the control to Full INCREASE RPM. Repeat this procedure three or four times to circulate warm oil into the propeller dome. If the aircraft manufacturer recommends checking the propeller feathering system, move the control to the FEATHER position but do not allow the RPM to drop more than 300 RPM below minimum governing speed.

**CAUTION:** *Continually monitor oil pressure during run up.*

7. Check magnetos as specified in the aircraft POH/AFM.
8. When oil temperature has reached 100 degrees Fahrenheit and oil pressure does not exceed 60 PSI at 2500 RPM, the engine has been warmed sufficiently to accept full rated power.

**C. APPLICATION OF PREHEAT USING ENGINE MOUNTED PREHEATER SYSTEM:**

If a heated hangar is not available and the aircraft and engine have been exposed to temperatures below 20 degrees Fahrenheit / -7 degrees Centigrade and has an engine mounted preheating system the following procedure may be used.

Engine mounted preheating systems should include individual cylinder head heater thermocouples, oil sump heater pad and crankcase heater pad. The use of a nacelle blanket will increase the effectiveness of engine preheating.

1. Follow the specific instruction provided by the manufacturer of the preheating system for its operation.
2. Begin preheating of the engine at least 5 hours prior to expected departure. However, do not leave the engine preheating system in operation for more than 24 hours.

**NOTE:** The use of an approved thermal blanket or cover will help to reduce the effects of wind and cold air circulation when the aircraft is not hangered. Normally the manufacturer of the preheating system has thermal blankets available for purchase.

3. Start the engine immediately after completion of the preheating process. Since the engine will be warm, use the normal start procedure.

**CAUTION:** *If oil pressure is not indicated within 30 seconds, shut the engine down and determine the cause.*

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- Operate the engine at 1000 RPM until some oil temperature is indicated. Monitor oil pressure closely, if necessary retard throttles to maintain oil pressure below 100 PSI. If oil pressure is less than 30 PSI, or cannot be maintained below 100 PSI, shut the engine down and repeat the preheat process. Do not close the cowl flaps to facilitate engine warm-up.

**CAUTION:** *Do not operate the engine at speeds above 1700 RPM unless oil temperature is 75° Fahrenheit or higher and oil pressure is within specified limits of 30-60 PSI.*

- Run the engine up to 1700 RPM, approach this rpm in increments to prevent oil pressure from exceeding 100 PSI.

**WARNING**

*Operation of the engine above 1700 RPM before reaching minimum oil temperature may result in engine malfunction, engine failure, injury or death.*

- At 1700 RPM, adjust the propeller control to Full DECREASE until minimum governing RPM is observed, then return the control to Full INCREASE RPM. Repeat this procedure three or four times to circulate warm oil into the propeller dome. If the aircraft manufacturer recommends checking the propeller feathering system, move the control to the FEATHER position but do not allow the RPM to drop more than 300 RPM below minimum governing speed.

**NOTE:** **Continually monitor oil pressure during run up.**

- Check magnetos as specified in the aircraft POH/AFM.
- When oil temperature has reached 100 degrees Fahrenheit and oil pressure does not exceed 60 PSI at 2500 RPM, the engine has been warmed sufficiently to accept full rated power.

**WARNING**

*Do not leave an engine-mounted pre-heater system on for more than twenty- four hours prior to flight. Continuous operation of engine-mounted preheater systems may result in aggressive corrosive attack internal to the engine.*

**D. COLD WEATHER START WITHOUT PREHEAT:**

At ambient temperature between 20 and 40 degrees Fahrenheit the following procedure is recommended.

- Use an external power source or ensure that the aircraft battery is fully charged.

**CAUTION:** *Attempting to start your engine with a partially discharged aircraft battery may result in damage to the starter relay, possible engine kick-back resulting in a broken starter adapter clutch spring.*

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- Use the normal start procedure, as detailed in the aircraft manufacturers POH / AFM, being careful to not over prime the engine.

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**NOTE:** **Continually monitor oil pressure during run up.**

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