Engine Break-In

Your engine was operated on a factory test cell before leaving Teledyne Continental Motors. However, complete ring seating has not occurred and must be accomplished during the first 25 hours of engine operation after installation.

A straight weight non-dispersant mineral oil conforming to SAE J1966 is recommended for the break-in period. If you fly less than once per week, a straight mineral oil with corrosion preventative (MIL-C-6529 Type II) should be used for the first oil change period (25 hours). The proper viscosity of the oil should be selected based on ambient operating air temperature. Refer to the Operation & Installation manual specific to your engine or the Airplane Flight Manual / Pilot Operating Handbook for the viscosity and grade of oil required. Refer to the most current version Service Bulletin SIL99-2 for approved lubricants.

Piston ring seating is paramount to proper engine break-in. Your understanding of the factors involved in the break-in process will aid in correctly operating the engine during this important time. Piston ring seating means the rings and the cylinder wall must *wear-in* together to provide an effective seal for the combustion chamber and to keep combustion gas blow-by and oil consumption to a minimum.

During ring seating, the basic purpose is to establish metal-to-metal contact between the piston ring face and the cylinder barrel. In order for this process to take place, the rings must breach the lubricating film of oil on the cylinder wall. As the rings begin to seat, the ring-to-cylinder wall surface area increases and it becomes harder for the rings to breach the protective film of oil. You can aid in this process by keeping the combustion chamber gas pressures at high levels during the early stages of break-in. The higher combustion gas pressures, as controlled by throttle position, force the piston rings to *expand* against the cylinder walls, breaching the protective film of oil and allowing the slight wear that we are trying to achieve. Refer to Figure 2. The top ring will be affected the most, so it is likely that the rest of the rings will take a little longer to seat.

During initial break-in it is not uncommon to have cylinder head temperatures above the normal range for several minutes. This elevated temperature is an indication that initial ring seating is taking place. As the rings begin to seat to the cylinder walls, the temperatures will drop. This usually occurs over a period of 10 to 20 minutes. Cylinder head temperatures can remain slightly elevated for several more hours until complete ring seating has been accomplished. Ideally, the rings should seat within the first 10 to 15 hours of engine operation as evidenced by stabilized oil consumption and decreased cylinder head temperatures.

Since this engine is either new or rebuilt, it has *"tighter"* running clearances than the engine you just retired. It stands to reason that cylinder head temperatures and oil temperatures can run slightly higher. While hot oil runs thinner and aids in ring seating, it is important that you do not let either temperature red line. The accuracy of your cockpit instruments becomes very critical. It is imperative that your cockpit gauges are tested and if necessary calibrated to insure that you do not exceed any operating temperature limits during engine break-in and normal operation.

During the production testing of your engine, the fuel system was adjusted to verify proper operation. Aircraft fuel system supply pressures may differ from those used in our production test facilities. These differences in pressure will affect fuel system adjustment. Optimum performance of the fuel system will play a vital role in engine break-in. You must insure that your mechanic has verified and, if necessary, adjusted the Fuel Injection System in accordance with the aircraft manufacturers and Teledyne Continental Motors maintenance instructions and the latest version of TCM Service Bulletin SID97-3.

Recommended Break-in Flight Tips:

1. Conduct a normal take-off with full power full rich conditions and monitor the engine RPM, oil pressure, cylinder head temperatures and oil temperatures.
2. Reduce to climb power in accordance with the flight manual and maintain a shallow climb attitude to gain optimum air speed and cooling.
3. Level flight cruise should be at 75% power with best power or richer mixture for the first hour of operation.
4. The second hour power settings should alternate between 65% and 75% power with the appropriate best power mixture settings. Vary the power setting every 15 to 30 minutes utilizing best power settings. Best power mixture settings are necessary to maintain high cylinder combustion pressures.
5. Engine controls or aircraft attitude should be adjusted, as required, to maintain engine instrumentation within specifications.
6. The descent should be made at low cruise power settings with careful monitoring of engine pressures and temperatures. Avoid long descents with cruise RPM and manifold pressure below 18 In. Hg. If necessary, decrease the RPM sufficiently to maintain manifold pressure.

Best power mixtures occur between 75 and 125˚F rich of peak exhaust gas temperatures. Mixtures richer than best power actually reduce cylinder pressures and cylinder temperatures and can increase the time required to properly seat the piston rings. Best economy mixture settings reduce cylinder pressures and should be avoided. Reduced cylinder pressures with increased cylinder temperatures can result in "glazed cylinder walls," which can only be corrected by removing the cylinders to re-hone the barrels and replace the piston rings.

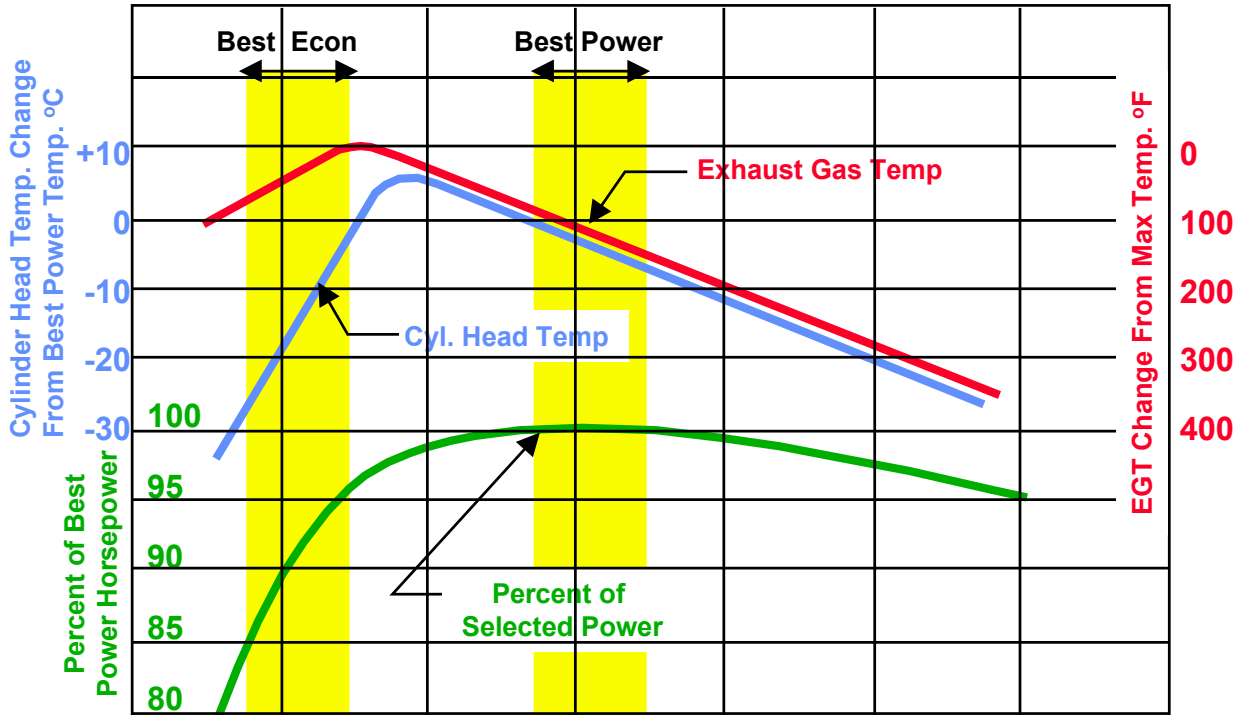

Figure 1. Power vs. Operating Temperatures

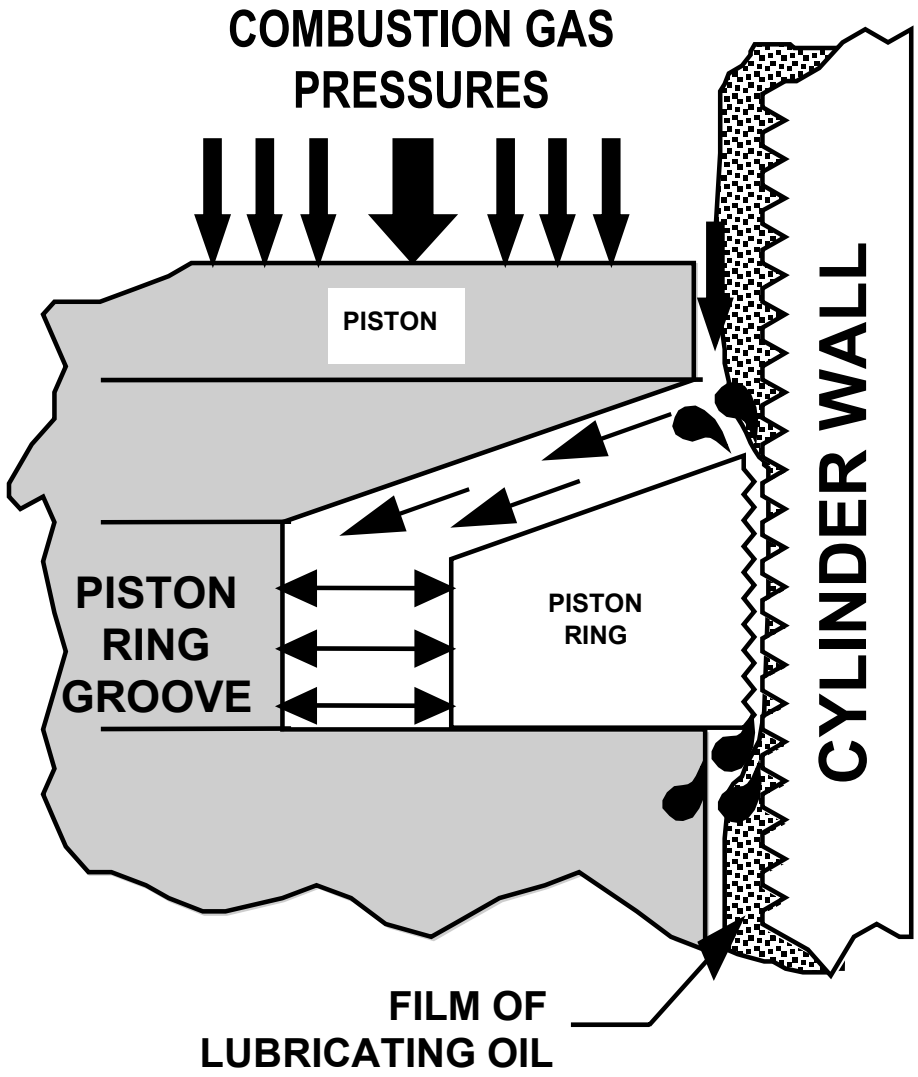

Figure 2. Breaching the Protective Film of Oil