

Break-in Procedures

(First 100 Hours)

A new or overhauled engine is an expensive investment. Break-in is the most important time in the life of your engine and is critical in determining its performance capability. Seventy-five (75%) percent of the total normal wear of an engine occurs during the break-in period. According to Federal-Mogul (the leading authority for engine bearings throughout aviation's development era) new piston rings, pistons, and refinished cylinder bores will be more sensitive to break-in than any bearings. Any break-in procedure acceptable for rings and bores will be agreeable to the bearings. Therefore, the first consideration in the break-in mode should be to accomplish the ring to bore seating.

The operator should become informed about the type of ring faces and cylinder bore materials which are installed on the overhauled engine. The value of the information lies in two areas, 1.) the susceptibility to overheating, and 2.) the time in the break-in period when oil consumption will most likely stabilize.

Porous chrome plated cylinder bores are the most susceptible to overheating. Depending on the grade of cast iron used in the top compression ring, the degree of taper on the face of the ring, the ring tension, the geometry of the cylinder bore, ring finish and a great many other factors, experience has shown that porous chromium is the least forgiving. Therefore, proper break-in procedures must be followed if optimum oil consumption levels are to be realized over the life of the engine. On the other hand, cylinder bore surfaces other than porous chrome, i.e. steel, impregnated chrome, Nickel+Carbide™ and Cerminil™ process, can tolerate some deviation from ideal break-in conditions and still give exceptional performance.

While ring to bore seating will normally take place within the first several hours of operation, optimum oil consumption is frequently not achieved until 50 hours or more of operation have been accumulated. However, there are times when cylinders will glaze or prematurely lose their ability to "grind-in" the ring face. This condition is usually marked by lack of any reduction of oil consumption (oil is usually found on the belly of the airplane due to a pressurized crankcase) during the first 10 hours of operation. By removing the spark plugs and checking for fouled electrodes, the offending cylinder(s) can be identified. The recommended remedy is to remove the cylinder(s), rehone the bore for ring finish and reinstall using new rings.

CAUTION: The operator should be aware that the porous type chrome plated cylinder bores have more critical cooling requirements than other cylinder bore surfaces.

There are many techniques that have been advocated to enhance break-in or rejuvenate porous chromium plated cylinders over the years. We do not recommend any techniques beyond the procedures put forth herein.

We recommend these procedures to break-in a new or overhauled engine:

NOTE: The following information applies to all types of cylinder bores:

STEEL/CAST IRON - Plain, nitrided, through hardened
CHROME - Porous, silicon carbide impregnated
NICKEL COMPOSITE - Cerminil™ process or Nickel+Carbide™

1. Verify that the engine has been run-in (See the section entitled "Run-In vs. Break-in.") If this procedure has not been performed, follow run-in

instructions contained in the section entitled “Lubrication for Run-in and Break-in.”

2. Assure that all precautions contained in the section entitled “Critical Precautions for New and Overhauled Engines” have been observed.
3. For the initial flight, fast idle (850-1,000 RPM) engine for three to four minutes. Shut down and inspect for oil leaks. During ground runs, do not permit cylinder head temperatures to exceed 400°F or oil temperature to exceed 200°F.
4. Start engine, run up normally, taxi, and take off immediately. (Minimize ground time.) Reduce manifold pressure as soon as practical. Slowly reduce engine speed to maximum continuous RPM (top of green) for fixed pitch propellers, reduce power to 75%.
5. Cycle the propeller before flight only enough to verify control. This will ensure the propeller hub has oil pressure prior to take-off.
6. Maintain a shallow climb to keep cylinder head temperatures as low as possible. Maximum permissible cylinder head temperatures are published in each specific engine’s type certificate data sheet. These maximum permissible temperatures range from 450°F to 525°F, depending on the engine type. Consult your specific engine’s type certificate data sheet for maximum operating temperature.
7. Level off at altitude and maintain 75% power for at least 30 minutes. During the first 50 hours of the break-in period, piston rings will seat best if cruise is maintained at 65% to 75% power. Oil consumption will also be optimized under these operating conditions. Normal ground idle may be used after the engine temperatures and oil consumption have satisfactorily stabilized.
8. Keep flying weight to a minimum to reduce power requirements during take off.
9. Follow break-in lubrication procedures in the section entitled “Lubrication for Run-in and Break-in.”
10. Should you encounter problems, refer to ECi Service Instruction No. 89-5-1, “Engine Trouble Shooting Guide” at <http://www.eci.aero/servicedocs>.