Hard Facts About Engine Break-In

Most people seem to operate on the philosophy that they can best get their money's worth from any mechanical device by treating it with great care. This is probably true, but in many cases it is necessary to interpret what great care really means. This is particularly applicable when considering the break-in of a modern, reciprocating aircraft engine. Aircraft owners frequently ask about the proper procedures for run-in of a new or rebuilt engine so they can carefully complete the required steps. Many of these recommended break-in procedures also apply to engines which have been overhauled or had a cylinder replaced.

The first careful consideration for engine run-in is the oil to be used. The latest revision of Textron Lycoming Service Instruction 1014 should be consulted for this information. The basic rule which applies to most normally aspirated Lycoming piston engines is simple; use straight mineral oil of the proper viscosity for the first fifty hours or until oil consumption stabilizes. Then switch to ashless dispersant (AD) oil.

The exceptions to the basic rule above are the O-320-H and the O/LO-360-E series. These engines may be operated using either straight mineral oil or ashless dispersant oil, however, if the engine is delivered with ashless dispersant oil installed, it must remain on ashless dispersant oil. The Textron Lycoming oil additive P/N LW-16702 must be added to the O-320-H and O/LO-360-E engines at airframe installation, and every 50 hours thereafter or at every oil change. An FAA-approved lubricating oil that contains, in the proper amount, an oil additive equivalent to LW-16702 will meet the requirements for the additive as stated in Lycoming Service Instruction No. 1014M.

All Lycoming turbocharged engines must be broken in with ashless dispersant oil only.

When taking delivery of a new aircraft, there is another point which must be emphasized. Some aircraft manufacturers add approved preservative lubricating oil to protect new engines from rust and corrosion at the time the aircraft leaves the factory. This preservative oil must be removed by the end of the first 25 hours of operation.

Each new or rebuilt engine is given a production test run at the factory before the engine is delivered to an aircraft manufacturer or other customer. After installation in the aircraft, the engine is run again during the test flights. These test runs will insure that the engine is operating normally and will provide an opportunity to locate small oil leaks or other minor discrepancies. In addition, these test runs do the initial seating of the piston rings. The rest of the break-in is the responsibility of the pilot who flies the aircraft during the next 50 hours.

A new, rebuilt, or overhauled engine should receive the same start, warm-up, and preflight checks as any other engine. There are some aircraft owners and pilots who would prefer to use low power settings for cruise during the break-in period. This is not recommended. A good break-in requires that the piston rings expand sufficiently to seat with the cylinder walls during the engine break-in period. This seating of the ring with the cylinder wall will

only occur when pressures inside the cylinder are great enough to cause expansion of the piston rings. Pressures in the cylinder only become great enough for a good break-in when power settings above 65% are used.

Full power for takeoff and climb during the break-in period is not harmful; it is beneficial, although engine temperatures should be monitored closely to insure that overheating does not occur. Cruise power settings above 65%, and preferably in the 70% to 75% of rated power range should be used to achieve a good engine break-in.

It should be remembered that if the new or rebuilt engine is normally aspirated (nonturbocharged), it will be necessary to cruise at the lower altitudes to obtain the required cruise power levels. Density altitudes in excess of 8000 feet (5000 feet is recommended) will not allow the engine to develop sufficient cruise power for a good break-in.

For those who still think that running the engine hard during break-in falls into the category of cruel and unusual punishment, there is one more argument for high power settings during engine break-in. The use of low power settings does not expand the piston rings enough, and a film of oil is left on the cylinder walls. The high temperatures in the combustion chamber will oxidize this oil film so that it creates a condition commonly known as glazing of the cylinder walls. When this happens, the ring break-in process stops, and excessive oil consumption frequently occurs. The bad news is that extensive glazing can only be corrected by removing the cylinders and rehoning the walls. This is expensive, and it is an expense that can be avoided by proper break in procedures.

To summarize, there are just a few items to remember about engine break-in: (1) If a preservative oil has been added by the aircraft manufacturer, drain it not later than the first 25 hours of operation; (2) Follow the engine manufacturers recommendation regarding the oil to be used for break-in and the period between changes; (3) Run the engine at high cruise power levels for best piston ring/cylinder wall mating; (4) Continue break in operation for 50 hours or until oil consumption stabilizes. These simple procedures should eliminate the possibility of cylinder wall glazing and should prepare the engine for a long and satisfactory service life.