



RADIAL ENGINE MAINTENANCE RECOMMENDATIONS

Engine Oil, Type and Grade: One of the most immediate decisions you will make after purchasing your newly overhauled radial engine is **what type of Oil should I use?** In “breaking in” the R-985 & R-1340 engine Covington requires using mineral based oil for a period of 75-100 hours of operation & using an Ashless Dispersant for the remainder of the engines life. Break in time can be shortened due to the quick breaking in properties of the wedge ring piston. Two things to look for when determining when your engine is ready to switch to Ashless dispersant oil are:

- Reduced CHT's
- Steady, acceptable level of Oil Consumption

Note: Pratt & Whitney Aircraft Service Bulletin number 1183, Revision V contains the following statement: “Grade 120 (oil) is preferred in moderate and warmer climates”. “Grade 120 is preferred in all engines using “dispersant” additive type oils except in very cold climates where grade 100 may provide easier starting.”

Aftermarket Oil Filtration: Advances in engine oil chemistry have made it common for oils to become heavily contaminated with combustion residue before losing viscosity. These contaminants may be from wear; bronze, steel & copper or dust and dirt (Silica on your analysis result!) introduced through the intake. Engine component or accessory failures producing metal contamination can result in unrepairable damage to your engine! *Note: downstream damage due to not having an external filtration system is not covered under the Covington Aircraft's Engine Warranty!*

Currently there are several approved **external spin-on type filter kits** available. Some of these filters boast of 95%+ efficiency rating and have a flow rates nearly double the required 8 gallons per minute oil flow the R-985 requires & the near 10 gallons per minute oil flow rating that the R-1340 requires. Beyond filtering the engines oil, a filtration system can aid in keeping the engine cooler by eliminating contaminants from entering the engine oil cooler. The Spin-on filters installation, located in the scavenge side of the oiling system between the engine and cooler, helps prevent contamination produced by failures from reaching the oil cooler and tank! These fine filters can reduce major engine repair or replacement costs by reducing contamination of the propeller, oil cooler, and prop governor.

Oil Change Intervals: Having an external filter kit does keep the engine oil cleaner and for this reason we recommend **oil changes** at 35 to 50 hour intervals on aircraft so equipped. On engines without these filters our oil change recommendation remains at 25 hours. Spin-on oil filter canisters must be cut open at oil changes in order to determine contamination levels. The engine's main oil-screen need not be removed at routine oil change intervals on engine equipped with aftermarket spin-on oil filtration systems. Once a year at the annual inspection is sufficient, and then only to check the condition of the oil-screen check-valve and O-ring seal.



Pre oiling is also recommended before the engine's initial start or any start after the aircraft is stored for periods of time longer than two weeks. External, electric motor driven pre-oiling systems are available and can be an effective method of pre-oiling. However, an effective pre-oiling can be accomplished by removing the front sparkplugs and engaging or "bumping" the starter for 10-15 second intervals until oil pressure registers on the cockpit oil pressure gage.

Spark Plugs: Deciding what sparkplugs to use are also something you will want to give some thought to. Covington does not recommend a particular brand of sparkplug over another. However, we have used the Champion REM40E in our test cell for over 25 years and have experienced very few problems. Fine-wire sparkplugs are another option as they perform well and have a long operational life. Of course, a couple of drawbacks to the fine-wire sparkplugs are; the upfront costs and, they tend to "weld" into the rear spark plug boss when left installed for lengthy periods of time. Any sparkplug if left installed for extended periods of time (over 100 hours) can seize in the bushing. Fine wire plugs last so long the problem seems to show up more frequently.

Initial Start-Up: Covington Aircraft Engines test runs overhauled engines for a minimum of four hours in our test cell. The engine is then inspected and released for service. However, on **first startup of your engine following overhaul**, after everything is primed and pre-oiled, crank the engine and run the engine at 500 to 600 RPM for a minimum of two full minutes and then gradually increase the engine RPM to 1,000 in order to warm the engine oil. CAUTION: Monitor engine oil pressure so to ensure suitable oil pressure is obtained within 20-30 seconds after start-up! Cylinder Head Temperatures should not exceed 450 degrees Fahrenheit (ground running limits). The initial ground run should be at least 30 minutes in duration & include a mag drop check. The initial ground run should be made with no cowling or accessory panels in place. This will allow for easy access & inspection. Before installing panels or cowling inspect the installation for proper control function, all safeties as well as for fuel and oil leaks.

In the absence of manufactures specifications, please consider the following **operational recommendations:**

- Avoid extended periods of operation at idle for a minimum of 35 hours time since major overhaul.
- Use full-power take-off to help facilitate proper cylinder cooling (mechanical fuel-enrichment).
- Maintain at least one inch of manifold pressure for every 100 Engine R.P.M's on extended descents. Note: operating with too low manifold pressure can result in the propeller driving the engine causing to possible damage to the master rod bearing and blower gearing.
- Cruise Power should be no more than a "10 spread or less" between the manifold pressure & the engine R.P.M. Example: 2,000 RPM = 30 inches manifold pressure / 1,900 RPM = 29 inches manifold pressure, etc.
- Avoid Shock Cooling the cylinders upon shut down. Covington recommends cooling the cylinders to 320 degrees Fahrenheit if possible.



Hydraulic Lock: To prevent a hydraulic-lock of the engine rotate the propeller four to five revolutions by pulling the propeller through by hand. While pulling the engine through, if resistance to turning or a hard-stop is felt - STOP! Do not attempt to push through the resistance. Remove that cylinder's sparkplugs and inspect the combustion chamber for evidence of liquid. If the cylinder intake pipe is horizontal such as #7 or heading downward into the cylinder (#3, 4, 5 & especially 6) it is advisable to remove the intake pipe and inspect for liquid "hiding" in this location. Note: Due to the primer system's placement (top five cylinders), it is possible to have a liquid (fuel) lock on the upper cylinders. **CAUTION: ALWAYS TREAT A PROPELLER LIKE THE ENGINE COULD START ANYTIME YOU MOVE THE PROPELLER! LIVE TO FLY AGAIN!**

Valve adjustments: The manufacturer's recommended valve adjustment intervals are 100 hours Since Major Overhaul & again at 500-550 hours S.M.O. or the mid-point between overhauls. We recommend a valve adjustment at each annual inspection. Setting the valves using the compression method is simplest and has proven to be effective. This is accomplished by bringing #1 cylinder to Top Dead Center (TDC) on compression stroke. Set both the intake and exhaust to .012"-.015" cold. Set the valves on each cylinder following the firing order of the cylinders. Set number one cylinder first then go to #3, #5, #7, #9, #2, #4, #6, #8, and finally back to #1 to complete one full cycle. A *Cycle* equals adjustment / clearance check of all the valves on the engine one time through the engine firing order. It is important to avoid reversing the direction of rotation to obtain T.D.C. If the propeller is moved past T.D.C., continue forward movement until the cylinder comes back to T.D.C. compression stroke. To complete the valve setting, go through four full cycles and torque the rocker set screw at 350 inch lbs.

Magneto Timing: Maintaining correct ignition timing is another way to keep your engine running at its best. Check magneto timing using a *Time-Rite* unit and a timing-light (buzz box). It is important to verify that the Time-Rite scale is correct for the engine you are working on. Scale 23A and Arm A (hook end down) is correct for the R-1340 & Scale 24A, Arm A (hook end up) is used for the R-985 engines. The engine Maintenance Manual (PN: 118611) Periodic Inspection Tables say to "Check magneto timing and synchronization" every 100 hours of operation. Time-Rite settings should be between 25 & 26 degrees before top-dead-center, #1 cylinder compression stroke with no more that ½ degree split between the two mags. Always maintain the book limits regarding the straight-edge check (E-Gap) which is +/- .32 inch of the designated marks located at the rear of the magneto. Bosch magnetos should be maintained at .008" - .010" point gap setting. **Note:** restoring the point gaps on Bosch magnetos to the correct gap will often result in correcting retarded timing.

Thank you for choosing Covington Aircraft Engines, Inc., for your Radial Engine overhaul and maintenance needs! Please feel free to contact us at 918-756-8320, Fax: 918-756-0923 for parts, service or technical assistance at any time. We are also available on the web at www.covingtonaircraft.com .