

Engine



Engine

1. Change Oil and Filter

Time: 1-2 hours

How Often: Every 25-50 flight hours

Special Tools: Oil filter wrench, large drain pan, empty gallon milk jugs, safety wire pliers, oil filter opening tool

Skill Level: 1

AMT Assistance Required: No, Part 43 Appendix A (c) (6), (23)

Parts: Oil filter, oil drain plug gasket, possibly oil screen gasket, optional oil quick drain valve

Supplies: Oil, rags, paper towels, safety wire, DC-4 silicone grease

Tips: Some aircraft engines contain a lot of oil, make sure that your drain pan is large enough.

References: Lycoming SB 471-B, Lycoming SI 1409C, TCM SIL 99-2

Benefits: Prolong engine life

Related Projects: Oil Filter Adapter

Engine oil performs six important tasks in your engine:

- Cushion moving parts against shock
- Help seal the piston rings to the cylinder wall
- Reduce friction between moving parts
- Protect internal parts of the engine from rust and corrosion
- Provide cooling to the internal areas of the engine
- Keep the interior of the engine clean and

free of sludge, dirt, varnish and other contaminants

Changing oil is a frequent and easy task. Oil change intervals are usually every 50 hours for engines with an oil filter, and every 25 hours for those with only an oil screen. It can be expensive to have this done at a shop. The prior owner of my airplane spent over \$300 every 25 hours for an oil change, which represents \$12 per hour of flight. Performing this simple task yourself will provide considerable savings.

Oil brands, types, and additives are a religion for some people. In general, aircraft exposed to very cold or widely varying temperatures benefit from multi-viscosity oil. Single grade oil is fine for warmer climates, and is thicker at lower temperatures so it may stay on parts longer after engine shutdown to prevent corrosion. Some oils have synthetic components, which tend to flow better in extremely cold temperatures and tolerate extreme heat. Since you should not be starting a very cold engine without a pre-heat, that feature may be of marginal benefit. However, if you have a turbo, the high temperature tolerance may be of value to you. There are also oil additives with various claims, and some may even be true. I use a non-synthetic multi-grade oil because it accommodates the ambient temperatures I fly in, is inexpensive, and I have never had an oil related problem. I have not tried aftermarket additives.

Note:

- Automotive oils use detergent additives to keep the inside of an engine clean. Since aircraft engines tend to consume more oil than cars, detergents would build up ash deposits in the combustion chamber over time. Therefore aircraft use ashless dispersant (AD) additives instead of detergents to keep particulates suspended in the oil. You will see a reference to ashless dispersants on aviation oil bottles.

- Some aviation oil does not have ashless dispersant additives, and is commonly called "mineral oil". Some engine shops request that mineral oil be used during the initial break-in of a new or overhauled engine.

- Certain Lycoming engines require the use of an additive called LW-16702. The additive is expensive, although some en-

gine oils already have it incorporated into the oil at a much lower cost. See the latest versions of FAA Airworthiness Directive AD 80-04-03, Special Airworthiness Information Bulletin SAIB NE-06-31, Lycoming Service Bulletin 446D, 471B, and 1409C.

- TCM engines with a right angle starter adapter may have trouble with certain oils and additives. The oils may be “too slippery”, allowing the starter clutch spring to slip on the shaft, wearing out the expensive starter drive quickly. You may wish to use non-synthetic single or multi-grade oil for these engines.

To prepare for changing your oil, begin by flying your airplane at least once around the traffic pattern. Yes, it's a tough job, but someone has to do it! This will warm up the oil, help suspend contaminants, and greatly speed up the draining process.

Once back to your parking spot, open the cowl and remove any access panels needed to provide good access to the drain and oil filter areas. You may need a helper to assist with removing the lower cowling without damage. Place a large drip pan or piece of cardboard on the floor under the engine to catch any mess. Place the drain pan under the plane, and put on rubber gloves to protect your hands. When the oil drains it might splatter about. There are two ways to prevent this: place the drain pan on top of a case of oil to raise it closer to the engine, or install a quick drain fitting with a hose barb. Run a hose from the fitting directly to the drain pan or into a large closable container. Remove the oil drain plug, or open the quick drain valve, and let the oil drain out. The oil will be hot from your flight, so be careful not to burn your hands. Some owners like to take a sample of their used oil and send it to a lab for analysis. The lab can determine the levels of wear metals and combustion by-products that are contained in the sample. This information can be helpful to diagnose some engine problems early. Follow the lab's instructions for collecting the sample.

While the oil is draining you can remove the oil filter (if equipped). The oil filter is probably full of oil, so in most cases you will want to make a drip catcher out of an empty oil bottle or whatever else you have lying around. Remove the safety wire from the filter using a safety wire pliers or diagonal cutter. Use an automotive type



Oil quick drain valve with plastic drain hose attached



Oil screen cap on TCM engines without an oil filter. Note safety wire forming a reverse “S”, holding both ends tight.



Removing TCM oil screen for cleaning



Oil filter installed on a Lycoming O-320 engine. Note attachment of safety wire.



Examine filter media for metal contamination



Oil filter - hex end

strap oil filter wrench to remove the filter. You will probably make a mess, so place rags in strategic locations. Tip the oil filter up to reduce spillage, and remove it from the engine compartment. Drain the oil from the filter into the drain pan. Open the filter using the special tool made for this purpose. Open up the pleats of the paper element and look for debris caught in the filter. You may find black pieces of carbon, which can be broken up between your fingernails. These are generally not a problem. You may also find metal particles, which can be a bad thing. Try using a magnet to separate any ferrous metal from non-ferrous metal. If you find more than a very small amount of material, you should bring it to your AMT for evaluation.

Installing the new filter is straightforward. Clean the mating surface on the engine with a clean rag, apply a little Dow Corning DC-4 lubricant to the new filter gasket, and spin on the new filter by hand. The torque value is usually 18-20 ft/lbs. You can use a special torque wrench to tighten it, but I just use my hands. Safety wire the filter to the engine.

If your engine does not have an oil filter, then you need to inspect the screen. Prepare an oil drip catcher using an old oil bottle and place below the screen area – along with plenty of rags. Remove the safety wire on the oil screen and remove the screen. Inspect the screen for debris. You will be looking for the same things as described above for oil filters. I use a turkey baster to suction out as much old oil as possible from the oil screen compartment, typically a cup or so. I refill that compartment with fresh oil, which helps the oil pump generate oil



Oil filter, threaded end

pressure faster on the first startup. Clean and reinstall the oil screen using a new gasket, and install safety wire.

If your engine is not equipped with an oil quick drain valve, now is the time to install one. It makes oil changes faster and easier, and is worth the investment. The valve opens to drain the oil, and has a provision to attach a drain hose to control the mess. Aircraft Spruce sells several models; you just need to find one approved for your engine and airframe.

After the oil has completely drained, install a new oil plug gasket as specified for your engine, reinstall the oil drain plug by hand, and use a torque wrench to tighten it to the engine manufacturers specified torque value. Install safety wire as appropriate. Or simply close the quick drain valve and remove the hose. Dispose of the used oil at a recycling facility, do not pour it on the ground or put it in the trash.

Add oil to the engine, using the grade of oil specified by the engine manufacturer for the temperatures that you expect. While the oil is filling, clean up the drips and re-cowl the airplane. I normally add enough oil to bring the level to one quart below the maximum on the dipstick. Start the engine, then shut it down and check for oil leaks. When you first run the engine the oil level will drop slightly as the new oil filter is filled. Recheck the oil level and top off as needed. Some owners find that running the oil level a quart or two below the full mark will reduce oil consumption, although you may wish to bring the level up for a long flight.



Refill with fresh oil