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COMMENTARY / THE WORKBENCH



Pickle Your Engine

Preservation in high corrosion areas

"OUR EXPERIENCE HAS shown that in regions of high humidity, active corrosion can be found on cylinder walls of engines inoperative for periods as brief as two days."

—Lycoming Service Letter L180B

If you're not flying, you need to take steps to preserve your aero engine. There are many reasons for interrupted flying: relocation, work interruption, family priorities, airframe overhaul, or repair.

Let's say Joe A. (for average) Pilot flies 100 hours per year and being an exacting soul splits his flight time equally between months. The result is 8.33 hours per month. If every flier were a J.A. Pilot no one would ever have to preserve (pickle) an engine for inactivity. But few of us are that lucky. We fly a lot during some months and hardly at all other months.

I'll discuss engine pickling, but first here's a couple of don'ts.

Don't pull the prop through by hand during periods of inactivity. This actually displaces any existing oil film.

Don't idle the engine on the ground or do a ground run in lieu of pickling the engine. Both of these practices will ratchet up the likelihood of rust since the oil temperature will never be elevated long enough to boil off the moisture produced during the combustion process.

WHAT'S NORMAL ENGINE ACTIVITY?

If you put 50 hours on your engine soon after putting it into service, your engine will have some protection against corrosion (rust) due to a buildup of varnish. Once the varnish layer is there, in favorable (average) atmospheric conditions these engines may remain inactive for several weeks without evidence of damage by corrosion.

Lycoming states that the "desired" flight time for its air-cooled engines is at least one continuous hour with oil temperatures from 165°F to 200°F at intervals not to exceed 30 days.

Continental Motors Inc. (CMI) says, "The best method of reducing the likelihood of corrosive attack is to fly the aircraft at least once a week for a minimum of one hour."

So who's right? The answer for your airplane depends on the environment.

"If the airplane is operated close to lakes, oceans, or rivers and in humid regions, there's a greater need for engine preservation than those operated in arid regions."

—Lycoming Service Letter L180B

For those located in a high corrosion area, it's important to be proactive in protecting your engine, but it's not so hard.

One simple tool that's been proven to delay the onset of and reduce internal engine rust is CamGuard. I am now using it in my O-360. Using it adds about \$23 to each oil change.

If you know your engine will sit longer than 30 days, take additional steps. The new buzz word in engine preservation is vapor phase corrosion inhibitor (VPCI). Lycoming recommends Cortec VpCI-326. One quart is all you need to "pickle" your engine.

LONG-TERM STORAGE (30-90 DAYS)

Here's the short version of the long-term storage process:

- 1) Drain engine oil and remove the filter.
- 2) Install a new filter and fill the sump with oil conforming to MIL-C-6529 Type II (mix Cortec VpCI-326 with oil in the proper ratio).
- 3) Run the engine until the oil temperature reaches 180°F. If it's really cold outside, do what it takes—block off the oil cooler—to get the temperature to at least 165°F. Shut the engine down.
- 4) I prefer to remove the bottom spark plugs (instead of the top ones per the bulletins) before spraying an atomized preservative oil conforming to MIL-P-46002, Grade 1 (Cortec VpCI-326) at room temperature through the spark plug hole. Rotate the engine throughout the process to locate the piston in the cylinder being coated at bottom dead center.
- 5) Re-install the spark plugs.
- 6) Seal all engine openings (breather tube, carburetor or fuel-injection air inlet, exhaust pipes, etc.).

Add a "Remove Before Flight" streamer at each sealed location and a "Do Not Turn Propeller—Engine Preserved—Preservation Date ____" flag to the propeller.

INDEFINITE STORAGE (MORE THAN 90 DAYS)

Indefinite storage includes all the steps above plus two more:

- 1) Install dehydrator spark plugs (MS27215-1 or -2 or AN4062-1) in the upper spark plug holes.
- 2) Seal the openings listed above in Step 6 with a bag filled with silica gel desiccant beads. A 1-pound bag of beads, enough to dry up 32 cubic feet, can be purchased on Amazon for \$15.

It's recommended that the desiccant be inspected every 15 days to maintain the indefinite preservation. If the desiccant color changes from bright cobalt blue to a pinkish color between inspections, the desiccant must be dried prior to further use. Desiccant beads are dried by heating in an oven at 200°F to 220°F until the blue color returns.

HOMEBREW PICKLE OIL

The MIL-C-6529 Type II preservative oil called out by Continental and Lycoming can be purchased as Royko 482, Phillips Aviation Anti-Rust 20W-50 oil, and AeroShell 2F. These are termed "fly-away" oils since the engine manufacturers state that they don't need to be drained prior to the first flight when returning an engine to service. Continental Motors says this oil can be used during engine break-in for 25 hours or for four months, whichever occurs first; Lycoming for 50 hours over the TBO of the engine. Superior Air Parts doesn't recommend the use of any fly-away oil.

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Rather than buying one of these special oils it's easy to mix your own since you probably already have most of what you need right on the shelf in your hangar. Simply mixing one part of Cortec VpCI 326—about \$20 per quart at most aviation supply houses—with 10 parts of single-grade engine oil results in "pickle oil" that conforms to the spec. The remainder of the quart of Cortec VpCI is sprayed into the cylinders since it alone conforms to the top cylinder preservative spec.

I pickled my O-360 during a long period of inactivity using this homebrew pickle oil and silica gel desiccant beads.

RETURN TO SERVICE

To return the engine to flight status simply remove the plugs and desiccant bags, spin the prop through by hand to make sure most of the fluid is pumped out of the cylinders, install the spark plugs, change the filter, and drain and change the oil back to your preferred oil.

There are methods—that differ greatly from the Lycoming and CMI methods—of

preventing rust in an inactive engine. Let's take a look at a couple.

THE CAMGUARD TOOL

CamGuard (found at www.EAA.org/sports-aviation under This Month's Extras) is an FAA-approved engine oil additive formulated to provide rust and corrosion control. In normal use it's added to every fresh oil change and whenever a quart of oil is added at a ratio of 5 parts to 100 (5 percent or 1.6 fluid ounces per quart). More than one user has strongly endorsed this product due to oil analysis data showing it reduces engine wear and internal engine corrosion. When an engine rusts internally, oil analysis shows an increase in iron. This product was developed by Ed Kollin, a research chemist who has worked with ExxonMobil Research and Engineering. Ed explained why CamGuard is needed in today's aviation oils.

"Aviation oils lack the latest available lubrication technology because they are essentially blended to Navy piston engine requirements from the middle of the last century," he said.

I called Ed to find what he would recommend if he were pickling his engine. He agreed with the use of VpCI-326, but he also told me that Alaskan fliers—who must make do with what's available—have reported good results by upping the CamGuard-to-clean oil ratio up to 1-to-10 during long periods of inactivity.

A DEHUMIDIFIER

Tempest Plus sells an Engine Preservation System that uses an air pump to pull air out of an engine and then routes it back in after moving it through a canister filled with silica gel desiccant beads. This system requires 110 VAC power.

CamGuard helps—start using it. That will reduce rust during short periods of engine inactivity. But if your engine is going to be inactive for longer than a month or two, take steps today to make sure it'll be ready to go tomorrow. *EAA*

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