Protect Your Engine!

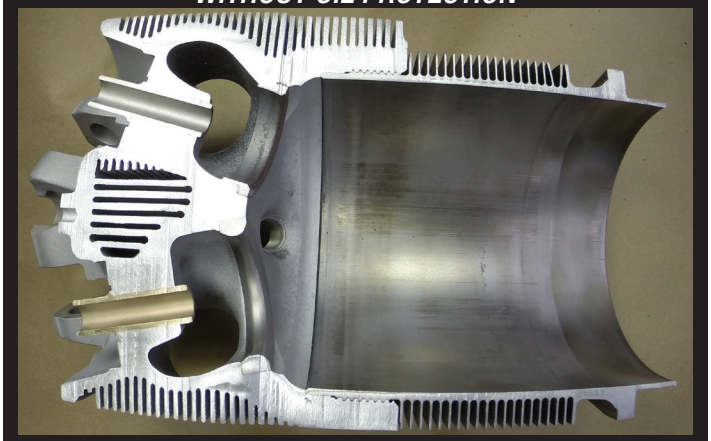
You'll never make TBO if you don't fly it!

Run it! Protect it! Or lose it!

Lack of lubrication and corrosion are devastating to piston airplane engines. These engines are nothing like your newly designed car engines that use the most modern alloys and that you drive every day. In fact there are many quotes from a number of notable sources that the number one reason for not making TBO (Time Between Overhaul) is engine corrosion! When you hear "corrosion" with regard to your airplane you probably visualize a bit of bubbling or rash visible on the wing or fuselage. That is not what we are talking about and is nothing compared to what happens inside an engine when it corrodes. Except for the crankcase, almost everything else inside of your airplane engine is made of steel components. The only thing protecting them is a film of oil put there the last time your engine was run. When that oil drains away or evaporates (yes, oil evaporates), so does any protection you may have had for your engine. It only takes a few days, if not hours, for the critical steel components in an engine to rust when unprotected. Rust is when iron in steel, water (moisture) and oxygen combine and change the tough strong steel into flakes of powder or small abrasive granules. If you're lucky enough to live or operate your airplane in a coastal environment you are also unlucky enough to add salt to that mix. Now you have added an electro chemical process to accelerate the chemical process of oxidation or corrosion. As corrosion eats away at your steel parts they change shape and lose their dimensional integrity, which no longer allows them to work, as intended, in harmony with the

Steel Bore Cylinder Rust Demo - Day 1

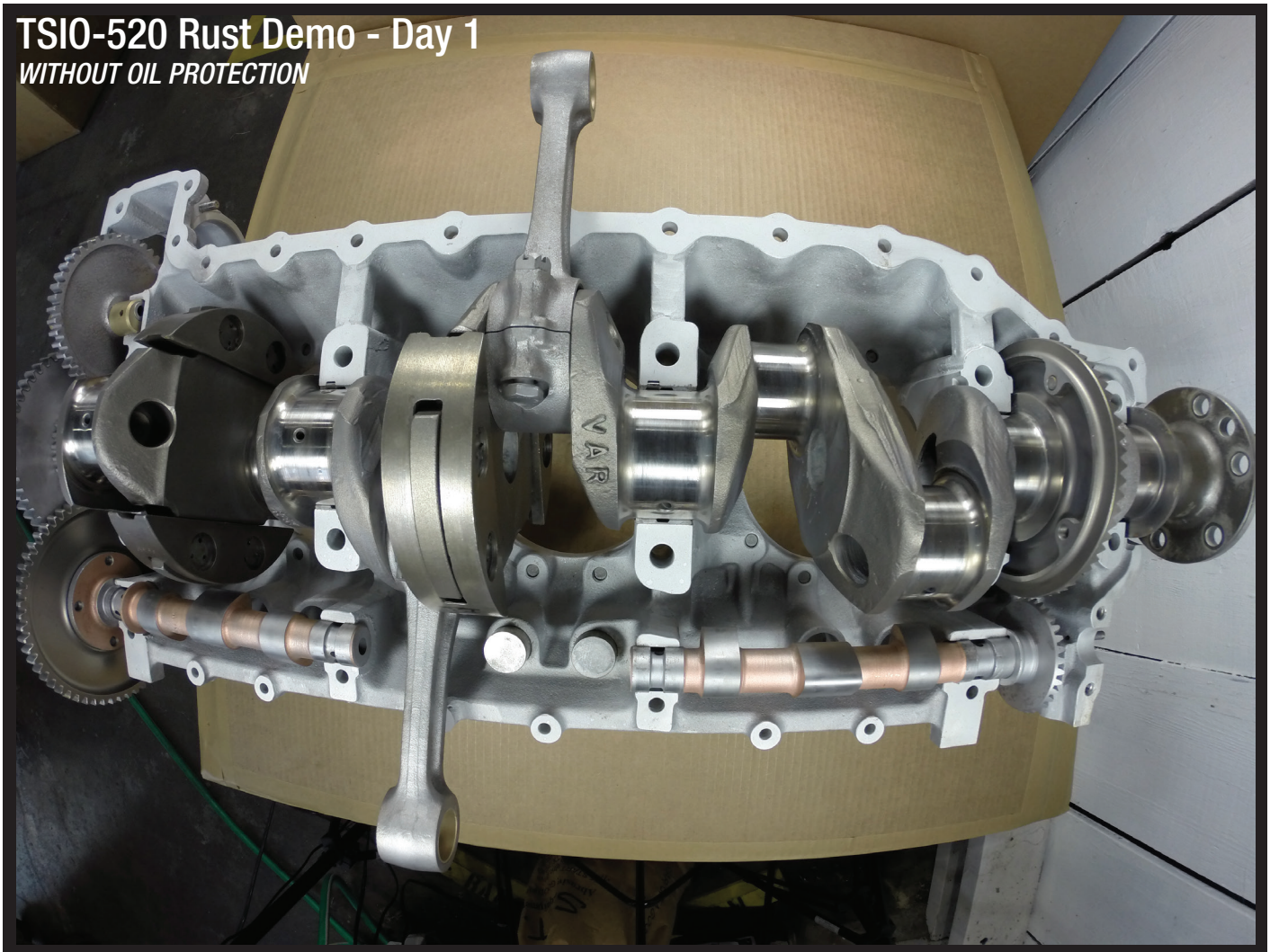
WITHOUT OIL PROTECTION



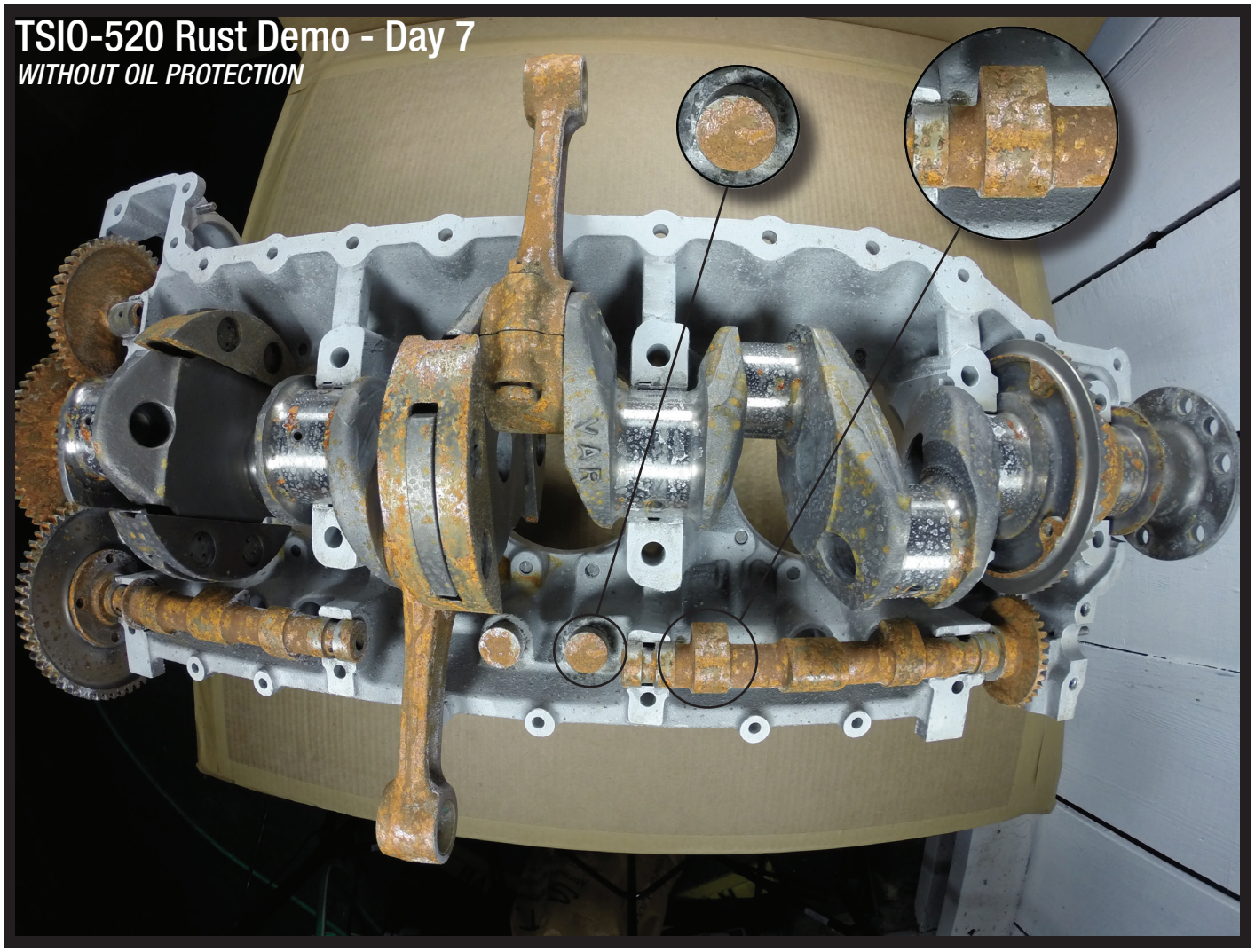
Continental (CMI) TSIO-520 steel cylinder half with valve guides. Cylinder was misted with saline spray to replicate atmospheric moisture of a coastal environment.

TSIO-520 Rust Demo - Day 1

WITHOUT OIL PROTECTION



CMI TSIO-520 engine half with a portion of the camshaft cut away to reveal the lifters. Engine was misted with saline spray to replicate atmospheric moisture of a coastal environment.



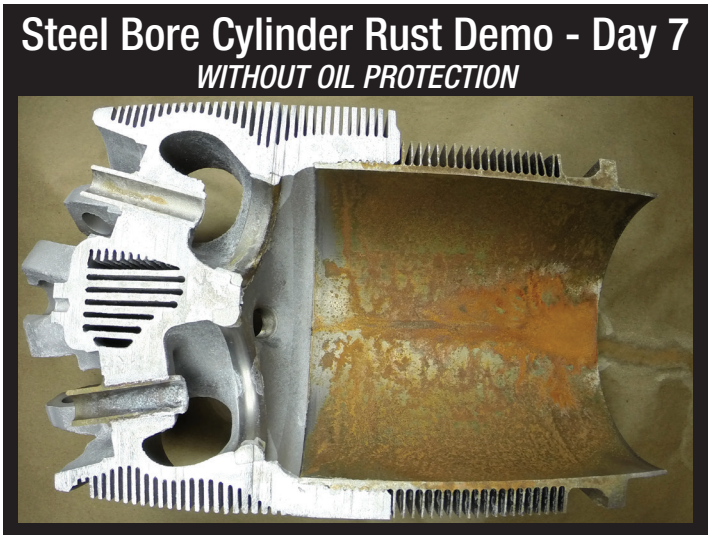
other components. This same dimensional change works on steel cylinder walls. After the corrosion is scraped off by the rings nothing fits tightly to the cylinder wall. Lost compression and increased blow-by of carbon and other destructive byproducts of combustion are forced into the oil supply. The blow-by increases corrosion on the other steel parts of the engine. Moisture is introduced through the normal combustion process as well as by condensation as your airplane sits through temperature changes. That blow-by and moisture in the oil introduces all of the necessary factors for more corrosion and adds at least three corrosive acids to the mix. Bottom line: The worst things you can do to your airplane engine are not fly it and not change the oil!

Preventative Maintenance

Understanding what you need to do if you are not going to fly your airplane is both important and maybe somewhat difficult to understand. We have read everything from magazine articles to Pilot Operating Handbooks, Service Bulletins and Maintenance Manuals from airplane and engine manufacturers. There are a few common threads of wisdom from all of the combined sources that can be recommended.

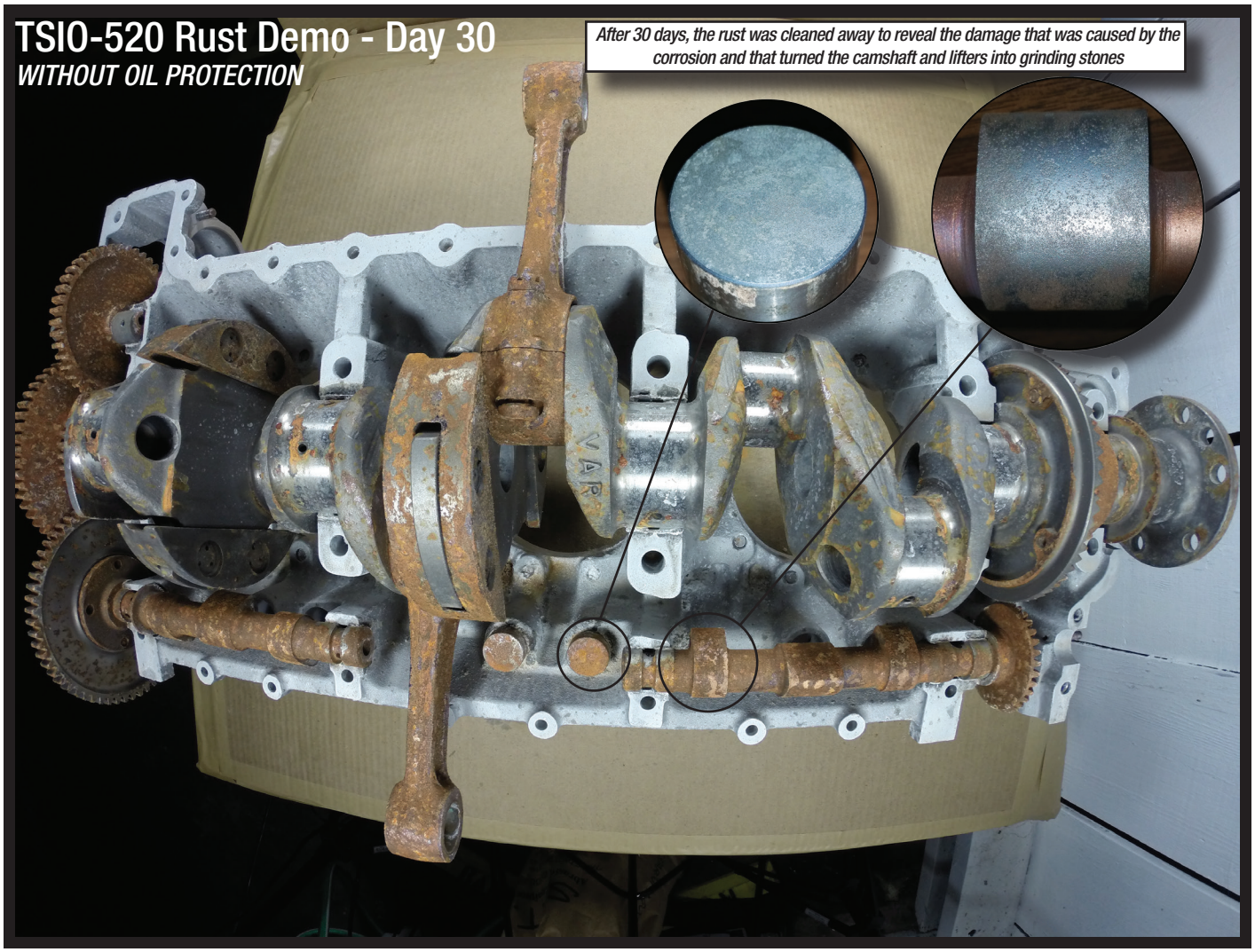
An **Active Flying Airplane** is an airplane that flies every 7 days for at least one hour at operating temperatures. Everything right happens when you actively fly your airplane from an engine point of view: • Parts are bathed in oil. • The oil is heated enough to boil off the moisture in the oil thus reducing the key component of corrosion. • O-rings and seals are exercised and moistened with fuel or oil. **These are all good things.** If you change the oil and filter every 50 hours or less, or every 4 months or less while flying once a week you have the best possible scenario a reasonable person could hope for.

A **NON Active Airplane.** If you **don't** routinely fly at least an hour at normal operating temperatures every 7 days you have an airplane that is



TSIO-520 Rust Demo - Day 30

WITHOUT OIL PROTECTION



After 30 days, the rust was cleaned away to reveal the damage that was caused by the corrosion and that turned the camshaft and lifters into grinding stones

considered to be in one of three phases of storage: Flyable Storage, Temporary Storage, or Indefinite Storage.

Flyable Storage - If your airplane is not flown every 7 days (but with less than 30 day periods of inactivity) every source we found agrees that your airplane is, at best, in "flyable storage" and you should take the minimal action of hand rotating the propeller(s) every week. This is especially critical if you have steel cylinder bores instead of chrome or nickel because chrome and nickel do not rust. Cessna sources say 5 rotations and Beech says 6 rotations stopping 60 to 120 degrees from the position it was in. Additionally, and depending on how long she's going to sit you should:

Run the engine to get the oil hot and perform an oil and filter change replacing your oil with a mineral oil and MIL Spec preservative MIL-C-6529. Fill the engine to the proper oil capacity. Then run this preservative oil at normal operating temperature for at least 30 minutes to circulate and cover the entire engine interior and activate the ingredients of the MIL Spec preservative. AeroShell has a product currently available that you can add to your fresh mineral oil at a 3 to 1 ratio for meeting this preservative MIL Spec. It is called AeroShell Fluid 2XN. If you add 2XN to an ashless dispersant or multi-viscosity oil, it no longer meets MIL-C-6529 specifications.

Fly the airplane at least once every 30 days for a minimum of a one hour flight at operating temperatures. The MIL Spec preservative MIL-C-6529 can be flown for up to two hours of flight per storage season, but not to exceed 50 total lifetime hours on any engine. Be sure to read and follow AeroShell's instructions and make a logbook entry so you can track the time.

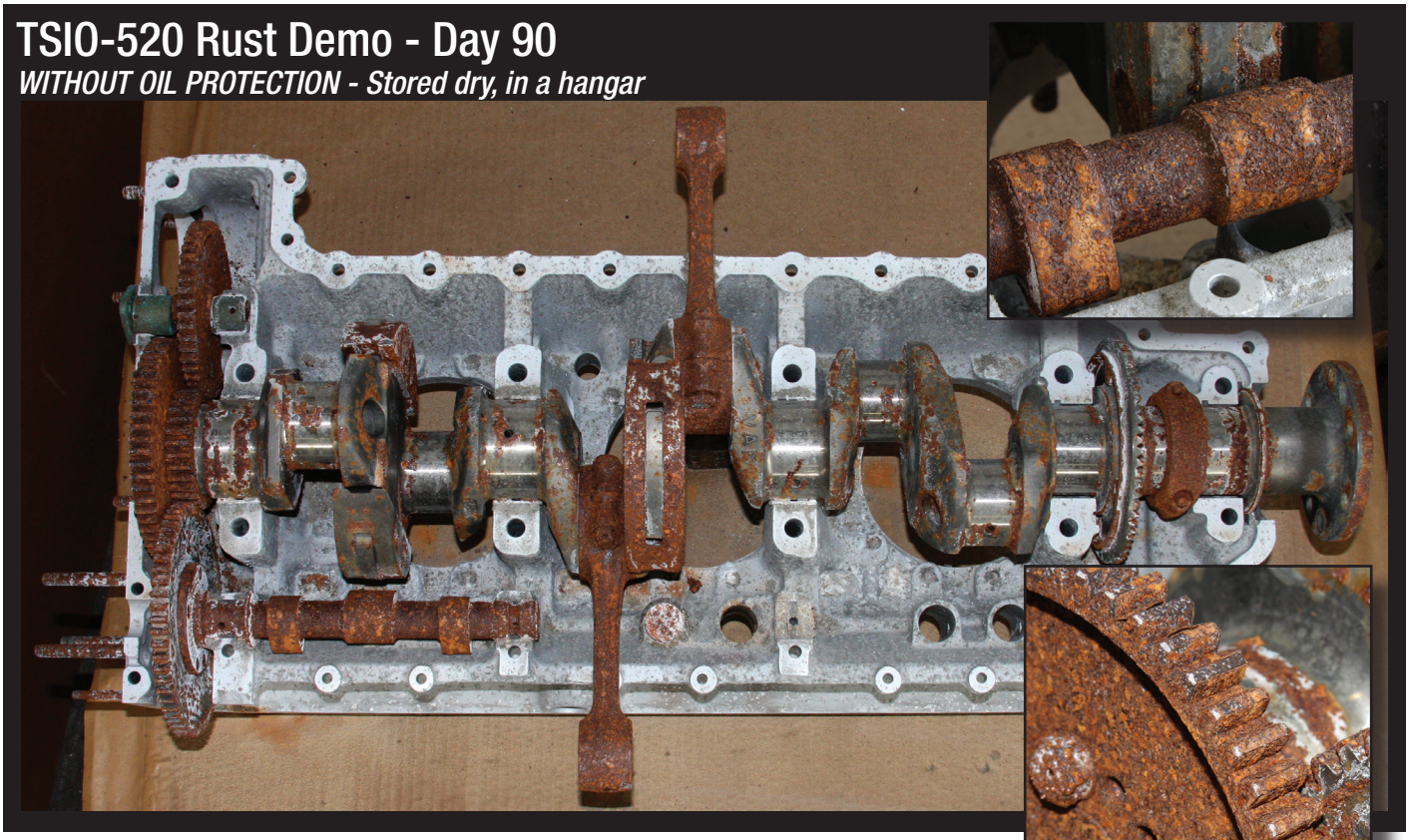
Temporary Storage - For airplanes that will **not** be flown for periods of 30 to 90 days, Temporary Storage requires the same attention as Flyable Storage, with the addition of spraying an additional preservative (conforming

Steel Bore Cylinder Rust Demo - Day 30

WITHOUT OIL PROTECTION

TSIO-520 Rust Demo - Day 90

WITHOUT OIL PROTECTION - Stored dry, in a hangar



to MIL-PRF-46002C) into the cylinders via the upper spark plug holes and engine interior through the filler tube, as well as sealing engine openings from the outside air. An old fashioned pump sprayer works for spraying the Tectyl 859B. This product is currently manufactured by Daubert Chemical Company Inc. and distributed by several companies as Tectyl 859B. Read and follow the instructions for using this product and make a log book entry! Interesting note: If you have nickel cylinder bores this step is not necessary for the cylinders as they are not unprotected steel…….. They are nickel and nickel doesn't rust!

Indefinite Storage - For periods when the airplane will **not** be flown for 90 days or more, an airplane should be put into Indefinite Storage. Indefinite storage is full on pickling and sealing. In addition to the steps taken for Flyable and Temporary Storage it's important to replace the bottom spark plugs with protector plugs (CMI part number 22671) and replace the top spark plugs with dehydrator plugs (CMI part number MS27215-2). Plug all openings, place dehydrator bags in the induction and exhaust, and tag the airplane for "NO FLIGHT". Don't forget your log book entry!

Continental 520/550 plug set for one engine

ADVICE: *Next time you go to look at an airplane for purchase, see how long it's been for sale and ensure it has been stored properly. If it hasn't been stored properly you shouldn't expect the engine(s) to last you very long. You must then decide how much an airplane that needs its engine(s) overhauled is worth.*

Useful Current References

- Continental Motors Maintenance Manual M-0
- Appropriate Pilot's Operating Handbook for your airplane
- Appropriate Service/Maintenance Manual for your airplane
- Appropriate Continental Engine Operator's Manual for your engine

PRESERVATIVE OILS PROTECT YOUR ENGINE

AeroShell Fluid 2XN is a corrosion preventative compound that meets MIL-C-6529 specifications

AeroShell Oil 100 is a straight weight SAE 50 oil that can be mixed with AeroShell 2XN to make a MIL-C-6529 preservative.

Oil conforming to MIL-PRF-46002C such as Tectyl 859B should be sprayed into the cylinders and engine for temporary & indefinite storage