Part #57
Rotax Storage and Water Damage

By Mike Stratman

You push your aircraft back in the hanger and slide the doors shut. The sky grows darker as a cold wind whips in from the north. The first big storm of the fall closes in. Your flying season is done till spring. Before head for home you need to ask yourself , What have you done to prep your engine for the winter? Will she fire right up next spring or will you be dealing with a cold blooded beast?

Doing the right things now can assure you that come next spring you'll be out flying instead of fussing with common problems associated with an engine improperly stored. This month we'll look at what steps you need to perform to prevent rust and corrosion during long term storage.

Unfortunately we are still seeing a surprising number of incidents were the owner and the airframe find themselves swimming together. With the exception of a hand full of Certificated Rotax Four Cycle engines, these engines are not certified for use over water. Yet we all too often hear the sad story of engines submerged in fresh, brackish, or salt water. While your engine will never be same after a dunking there are things we can due to minimize the damage and get a marginal degree of dependability back. This month we'll also talk what you can except from water damage and believe it or not what you should carry with you when operating around water that could save you loads of money.

Long Term Storage: *Storing an engine pass one month requires certain precautions. Prior to shutdown run the engine at about 3000 rpm. Remove the air cleaner and spray a fogging oil (5-10 seconds) into the Carb. Engine may stop during this process. Stop engine and remove spark plugs and inject the same fogging oil into the combustion chamber (10 second spray per chamber. Turn the crank over 2 or 3 revolutions coating all top end parts. Replace spark plugs. Drain float bowl, fuel lines, and fuel tank. Drain coolant to prevent damage from freezing. Close all openings of the engine like exhaust end pipe, venting tube, and air intake to prevent entry of dirt and humidity. Remember, in storage the oil will evaporate. What is left behind is a sticky residue that does little to prevent rust while making start up more difficult next spring. The fogging oil referred to is a hydrocarbon solvent that provided a fine film on all internal parts. See Figure #1.*

Figure #1- Pennzoil Fogging Oil #1109 provides a fine film on engine parts that prevents rust and corrosion during shortage. CPS Part #9645

Sealing all ports will help prevent this as well as keeping humidity from promoting rust and corrosion. These steps are outlined in the operator's manual (Part #899-480) for all two strokes. Section 11.1.3.

To help fuel from forming gum and varnish Use a fuel system Cleaner and Stabilizer in the last tank for fuel for the season. See Figure #2.

Longer storage periods require the engine to be rotated periodically to recoat parts with oil. After two years all bets are off. What happens to parts after two years is literally a crap shoot determined by the climate conditions, humidity, etc. Chances are you will be dealing with pitted bearings, dried out seals, and gummed up piston rings. In the case of a Certificated engine the engine would have to be stripped and rebuilt with new gaskets and seals by an A&P to maintain it's airworthiness rating.

Figure #2 – A Fuel System Cleaner and Stabilizer helps prevent gum and varnish in tank, lines, and float bowl. CPS Part #9647

Figure #3 – Bombardier Lube is designed to displace water in holes and crevices and dries wet ignitions. CPS Part #9649

Warning! These are not certificated engines: *We all know that economical fun flying is at the heart of Ultralight Aviation. Along with freedoms we have to maintain our own craft come some basic personal responsibilities. While you may have hundreds of hours of trouble free operation, this may also lure you into doing something stupid, like chasing water skiers, flying up canyons and river bottoms, etc. It never fails to amaze me how frequently I hear someone tell me that an engine out situation is going to place them in " a really bad situation" and how I need to do everything possible to make sure he doesn't have a problem. Sorry, I tell them that this is not a certificated engine and if he wants to fly out over the water or in places where a forced landing becomes a deadly proposition he needs to invest in a General Aviation aircraft. This type of aircraft has the testing, certifications ,and parts traceability to determine just who and/or what caused the engine out.* ***Going down in the water or the tree tops is strictly the responsibility of the pilot and not the mechanic. Guys, you can't have it both ways!*** *Fly conservatively with a non-certificated engine or be ready to pay the consequences.*

But in all fairness not all submerged engines are not a result of pure carelessness. Float planes can capsize, runways can end in water, etc. Knowing what steps to take can make a lot of difference on how much damage you can expect.

Water Damage: Lacquered versus Marinized Ignitions: *Rotax uses what is known as a lacquered finish on all aircraft ignition parts including the Stator System. On inspection you will see a clear varnish type finish that is designed to protect the ignition only against normal atmospheric conditions of mild humidity and minimal dust. This type of ignition is not designed to be submerged.*

Rotax marine or watercraft engines (Sea-Doo) have an epoxy or marinized finish on all ignition parts that is designed to take an occasionally flooding. The block is also powder coated to close the porosity of the aluminum so water is not given a chance to penetrate the pours of the block. Rotax also uses seal retainers on these engines that prevent seals from popping under pressure.

In the case that your engine is submerged in fresh, Brackish (swamp or bayou water), or salt water there are a number of problems you will be dealing with. First the ignition and bearings will start to rust immediately as soon as it is removed from the water. Flush the engine immediately and start the engine as soon as possible and bring it to normal operating temperature. This will help burn off the water that has entered the pours of the aluminum block. Sea-Doo makes a spray oil (Bombardier #293600016) that helps prevent rust and disperses water. See Figure #3.This spray will help minimize the damage. Having a can of this on board with you when working near water could likely save you big money in the event of a dunking.

Experience has showed that the biggest problem you are going to experience is associated with the stator. Depending on the water and the minerals present (Fresh, Brackish, or Salt water) the coil windings are going to be penetrated. As the water dries contaminates left behind will cause very high ohms resistance in the windings and that will eventual short out. Stators will fail in less that 100 hours. Engines in salt water will fail in as little as 20 hours. ***You will have to replace the stator assembly to have any chance at reliability.***

Other items to consider after a dunking: Did thermal shock crack any parts. Water will dissipate heat so quickly that hot engines parts could likely crack on contact with water. Drain and replace all fluids. Gear box, RV fluid, radiator water. The depth of the water will also have an effect. The deeper submerged the more water will penetrate the porosity of the block. Oxidation will start as soon as the engine is brought to the surface. Oxidation is appear as a white flour flake. Remember the castings on these engines are not painted as they are on marine engines.

On 912 engines starting the engine to dry it out would likely cause more damage. The water will compete with the oil in the lifters and damage the push rods and valves if not completely drained. Water in the main (Babbitt type) bearings will compromise lubrication if started. Camshaft and lifter lubrication will be compromised by the water. Scoring will likely occur. On these engines drain the block and fill it with oil immediately and seal all openings. At the earliest possible time disassemble the engine completely. Relubricate all parts and reassemble as if you were overhauling the engine. Be advised that you will be hard pressed to find a reputable A&P to sign off your engine as airworthy. Flying over water can be extremely expensive.