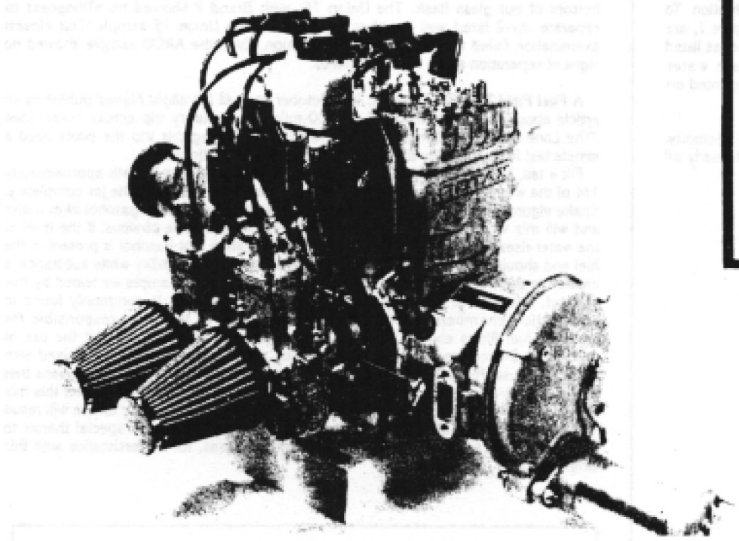

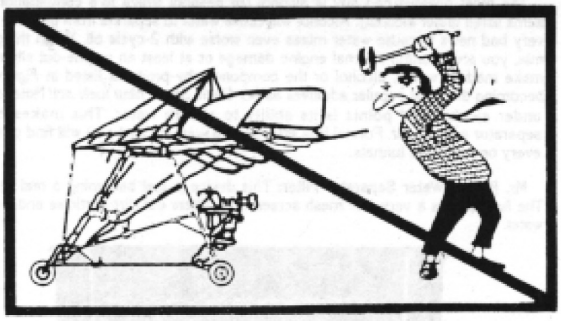

The Care & Feeding of the Rotax Motor - Part 20

by Mike Stratman

THE NEW ROTAX 582

True Dual Ignition Comes to 2-Cycle Aircraft Engines

Over the years, one of the most obvious differences between 2-cycle aviation engines and general aviation certified engines is redundancy, the most prominent feature being the ignition system. The thought of only a single spark plug being responsible for one's continued safety is a little hard for a seemingly large group of pilots to handle. Enter the new 64 hp Rotax 582.

I am happy to say that Rotax's latest addition to its line of specially engineered aircraft engines may just bring 2-cycle engines into a new era of acceptance and reliability. This month we'll take an in-depth look at the new Rotax 582, compare it to other current production engines, and find out first hand if true dual ignition reliability has come to the 2-cycle aviation business.

True Dual Ignition: The layout of the ignition system can be traced to two coil boxes with plug wires crossing to feed each cylinder from each box. While this appears to be redundant, the test of true dual ignition is to start at the spark plugs and work backwards to the source of spark, looking for a lack of redundancy. Our experiments on the 582 proved quite impressive. The CDI system made by Ducati of Italy subverted our best efforts at sabotage. First, bridging the spark plug gap (simulating a fouled plug) of any plug failed to affect the spark of the other three plugs in each of the two coils or, in essence, four separate coils—one to run each plug. This allows you a fouled plug without a loss of power.

Secondly, we disconnected the wiring harness to either of the two coil assemblies. (Note: Do not disconnect pick-up wire while the engine is running.) While this, of course, stopped the spark to two plugs (one in each cylinder), it did not affect the remaining two plugs. The ignition timing is factory set and has *no adjustment!* No parts to wear out or replace as in the Bosch point ignition systems. Trigger assemblies are mounted 180 degrees opposed to the inside of the starter housing. Rotating magnets mounted on the flywheel signal the plug firing as they pass the trigger assembly. While all four plugs fire every 1/2 rotation, spark at bottom piston stroke has virtually no effect on normal operation. Inside the flywheel is housed a

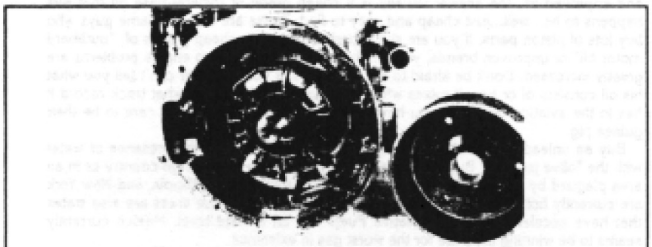

Photo 2: A look inside the mag housing shows the guts of the new Italian-made dual ignition. A 12 coil "radial" type layout provides 175-watt output as well as dual spark plug voltage; 180-degree opposed trigger assemblies are recessed into the mag housing; and two rotating flywheel magnets signal spark timing. There is no timing adjustment to set!

16 coil radial type electrical system. Twelve each of these coils power a full 175-watt A.C. While this is considerably more output than the 140-watt system used on Bosch ignition, it is a single output. A gray tach lead is supplied but needs a 12-volt D/C power source for operation. The other four coils are split to supply power to each of the ignition systems.

Ignition Switch Wiring: The power output of the CDI system is in the neighborhood of 250 volts requiring an appropriate quality ignition switch unlike the lower voltage output of a point ignition. Please note, the actual point system also has 250 volts (peak). The lighter yellow wires are the ignition kill wires; the heavier two yellow wires are lighting coil A/C output. One each wire connected to ground kills the single side coil. This allows two ignition switches and a "mag-test" feature just like the heavy metal boys when properly wired. It is best to use a three

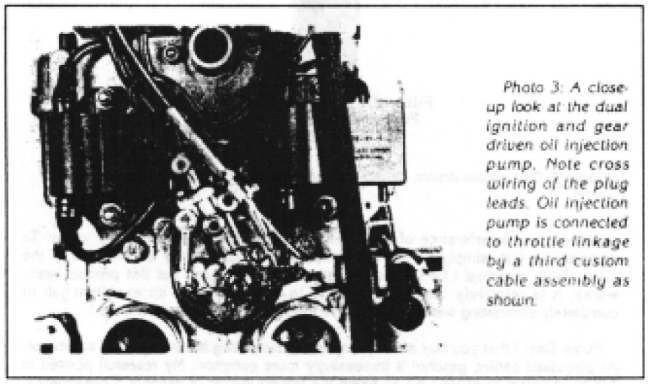

Photo 3: A close-up look at the dual ignition and gear driven oil injection pump. Note cross wiring of the plug leads. Oil injection pump is connected to throttle linkage by a third custom cable assembly as shown.

position switch that features a "down off" position, middle run, and a spring-loaded up position for mag test. One each switch to be used for each ignition system. The spring-loaded off/up position is important to avoid killing both systems accidentally during a mag test. Unlike general aviation engines, the Rotax 582 will show a max 300 rpm drop when checked at 3,000 to 3,500 rpm when a single side of the ignition is grounded, reminding you to reactivate the side before testing the other system. Without the spring-load feature in the test mode, it is surprisingly easy to kil both systems by mistake.

Built-In Oil Injection System: This feature is really quite common to snowmobile and jet ski 2-cycle engines. It is new to the aircraft business. Instead of mixing your lubricant with your fuel at a predetermined 50-to-1 ratio, the oil is injected on demand by a special pump. At idle speeds the ratio is around 70 to 1. After 5,000 rpm, the ratio is full open to about 50 to 1. The higher ratios at low rpm cut down on plug fouling and carbon deposits. The pump used on the 582 is a Mikuni brand pump gear driven off the same shaft that operates the rotary intake valve and the water pump. The oil is regulated by a "throttle wire" activated lever arm and pumped into the intake ports just after the carb mounting sockets.

This system has advantages as well as some obvious drawbacks. No premixing of fuel prevents a mistake on your part when figuring the ratio. Gas and oil mixing capabilities are no longer a concern. Less oil consumption makes for less plug fouling and carbon deposits. On the negative side, it is *not idiot proof!* You have to remember to fill the oil reservoir. If you don't, you will experience not only an engine-out condition, but a fried block as well. Running out of fuel only would be much less likely if not at least much less expensive. You now have a second tank to fill and monitor. Because the oil consumption is so slow, it is easier to forget than you might think.

This pump must be *gravity fed!* Yes, the reservoir *must* be uphill from the injection pump. While this reservoir needs to be only about three percent of your

main fuel capacity, positioning may be a problem for some aircraft layouts. This tank must also be vented to atmosphere just as a fuel cell.

The injection pump must be activated by cable linkage timed by throttle valve opening. This is best accomplished with a three-way splitter block assembly. Two of the lines going to each carb while a third lead provides linkage to the pump regulating arm as

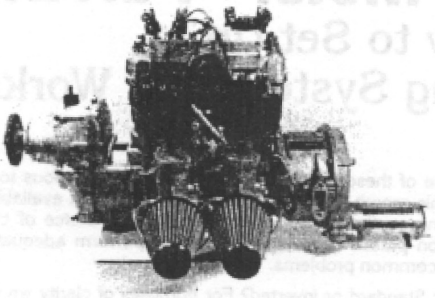

Photo 4: A side view shows the new gear box mounting. No adapters. All new production engines use this simplified and versatile system.

pictured in several photos shown. Marks on the pump arm and housing indicate idle and a position to be reached by 5,000 rpm.

New Gear Box Mounting: The new Rotax 582 uses the same gear box as now produced on all new production Rotax engines. This new style box slides directly on to four 8mm studs.

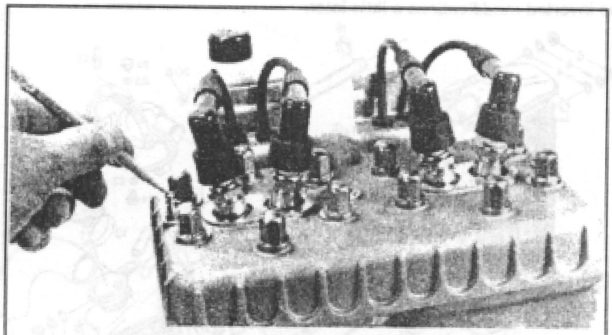

Photo 5: A top view shows a close-up of 15 percent angled dual plugs. Nipple on the left is for direct steam bypass to fill tank reservoir to prevent air pockets from forming in cooling system.

No tricky adapter plates or hard-to-remove bolts. This system allows gear box mounting at 12 and 6 o'clock positions without additional parts. A single O ring seals the box to the engine block. If you are wondering if your old style gear box will fit on the new system, forget it, it won't! It is a different housing assembly on *both* sides of the separation gasket.

Improved Torque Curve: While the 582 boasts the same 64 hp of the Rotax 532, its low range torque is much better suited for a fixed-pitch prop load. Aircraft of 90-100 mph cruise speeds need high-pitched props to minimize engine rpm during cruise. Applications using the 532 often experience poor throttle response in the lower rpm ranges. The extra 60cc displacement (about 10 percent more) of the 582 makes throttle response crisp throughout the rpm range, even with smaller diameter high-pitch props. This opens up a whole new class of high speed aircraft to the lightweight 2-cycle engine. Super sleek 200 mph cruise speed aircraft at 3 gallons per hour are now theoretically possible. Awesome!

Specifications:

Engine Type	*Rotax 582*
Displacement	*580cc Twin Cylinder*
Bore and Stroke	*76mm x 64mm*
Cooling System	*Liquid Cooled*
Carburetor	*2 x Bing 36mm (Slide Valve)*
Horsepower	*64 hp at 6600 rpm*
Max Torque	*65 ft. lbs. at 5700 rpm*
Fuel Consumption	*2.2 gpm at 4300 rpm*
Weight	*64 lbs. (77 lbs. as shown)*

Mike Stratman is a contributing editor for *Ultralight Flying!* magazine, and is a factory-authorized and trained Rotax mechanic. Mike is also owner of California Power Systems, a full-time ultralight aircraft parts and service dealer.