

Shopping for a used Rotax? Here's what to look for in your next four-stroke.

The Rotax 912, 912S and 914 are the dominant four-stroke engines in their horsepower class. Some of the most popular kits around depend on this Austrian engine for motivation, so it's quite possible that you'll be looking to buy some variant of the familiar little four-banger. Because this engine has been in the fleet for a while, it's possible to find a used one; new is not your only option. Getting a good one is largely a matter of knowing what to look for.

Kerry Yunck, engine guru at Lockwood Aviation in Sebring, Florida, offered advice about how to stay on the right track. "Check that all the service bulletins have been complied with," he said. "These are freebies from Rotax, until a certain time has passed. For instance, there was bulletin to change rocker arms. It was a freebie for



From top to bottom (as oldest to newest) are the various rocker-arm configurations used by Rotax. The top has the original steel bushing at the pivot. In the middle is the phenolic version that replaced the steel; it is still considered a serviceable part. At the bottom is the latest bronze bushing. The rocker shaft (at right) shows minor wear patterns.

a long time; now it costs about \$1500 just for the parts. The number one thing is to get the serial number, go to the Rotax owner's web site and research all the bulletins for that engine. Then ask the owner to see the logbook, and be sure they're all in there."

Mark Paskevich, president and owner of Rotech, the Canadian Rotax distributorship, concurs. "The best advice anyone could follow in evaluating the Rotax would be to start with a complete review of its technical/logbook records, and cross-check the information with all service bulletins, service information and service letters."

Paskevich added that it's a good idea to check for the latest upgrades, which, while not always mandatory, can increase value. Completeness isn't sufficient, however. Have a look at who did what, and when. Ask yourself whether they were qualified, had the right tools and whether the documents support the work that was done. Find out whether the engine has ever been in an accident, has been overhauled by a qualified overhaul facility or has received any unusual repairs. If you can't answer the questions with some certainty, move on.

Time On Your Side?

Run-time is not the most important criterion to consider when buying either, Paskevich said. "Low engine time coupled with high calendar time could be a false value due to the age of the components and [the potential for] corrosion."

Even though Rotax has pegged the TBOs at reasonable hours—as high as 1500 hours for the 912 version and 1200 hours for the 914 assuming applicable service bulletins have been complied with—mid-term servicing is recommended for Experimental engines and is required for certified engines. "Look at total time on the engine, and be sure it's documentable," Yunck said. "A 912 with 600 hours needs some service work."

Use Your Eyes and Ears

After verifying the paperwork, spot-check a few items. Ask the owner how he runs the engine. Then run the engine and listen for clues. For instance, Yunck says, "If it idles too low (below 1800) this can prematurely wear out the gearbox or the prop shaft." Have a look through the spark plug holes to check for scratches. You won't find rust, as the cylinders are Nikasil, but the rings and the crank may rust. Look to see if a specific upgrade has been attended to. Yunck offers an easy one: "Pull the dipstick. The new one came out in 2004. If they have not complied with that, it's



This is one of the two CHT probe locations on the 912. If the thermocouple is melted, the engine has seen a severe overheating and requires a thorough examination before being put into service.

Next Month

KITPLANES

THE INDEPENDENT VOICE FOR HOMEBUILT AVIATION



THE SKY RANGER II

This French-designed, easy-to-build kit aircraft might not be well known in the U.S., but more than 1000 are flying throughout the world.

BUYING A PARTIALLY BUILT KIT PROJECT: DOS AND DON'TS

We've already covered what to check for when buying a flying homebuilt secondhand, but purchasing a not-yet-complete kit adds a number of considerations to the list.

OSHKOSH AIRVENTURE 2005!

Didn't make this year's extravaganza in Wisconsin? Check here for the scoop on new kits and engines. Rumor has it we'll be reporting some interesting developments.

SCRATCHES AND BLEMISHES: WHAT TO DO?

Even wonder how you can prevent scratching on your windshield? And how 'bout removing them once the damage is done? Look no further than this product comparison.

PLUS...

**DIY INSTRUMENT PANEL
BUILD YOUR SKILLS METAL
ENGINE BEAT
KITSTUFF**

Available October 4

unlikely they've complied with anything." (See the accompanying photo for the details on the new dipstick.)

A tougher (and more expensive) item is the rocker-arm upgrade. Neglect here could cost serious money. You'll have to replace the rockers and probably the shaft to stay certified; and the "steel-lined" rockers wear prematurely. Upgraded parts are available—the phenolic-bushed versions are acceptable but the new bronze-bushed rockers are preferred.

Paskevich offered a good example of why you might want to send your engine to



This is your engine. This is your engine on a steady diet of 100LL. Any questions? (Lead deposits are hard on this engine, causing wear and corrosion. Try to determine the diet of any engine you're considering for purchase.)

a service center before you buy. "The Rotax 912/914 series engines run a pressed crank with Babbitt-style bearings, and a cam with non-replaceable plain case bearings," he said. "One should never take for granted that simply because they turn freely they are serviceable. Without completely disassembling the crankcase and taking the crankshaft apart, it

is impossible to deduce that the crank and cam are serviceable." This inspection can only be conducted at a qualified overhaul facility. Even then, the crank has to go back to the factory for overhaul.

Lockwood runs leakdown tests on every engine it considers taking in. (For those of you unfamiliar, a leakdown test involves pressurizing the cylinder through a spark plug hole with a set air pressure and, using a special instrument, measuring how much "leaks out" of the cylinder.) Yunck says his shop pumps 80 psi into each cylinder. "I've had engines with 1000 hours that hold 78," he said. "If it's down around 72 pounds, I know there's something to look at."

Listen for escaping air. If the oil is bubbling in the tank, you probably need rings. Intake valve leaks show up through the carbs; exhaust valve leaks through the exhaust pipe. There should be no more than 20% difference from the highest to lowest compression scores.

These engines have life-limited components such as water lines, carburetor boots and diaphragms in the carburetor (there's a five-year limit on those). Yunck recommends, "If the motor's more than five years old, regardless if it's been run, you may need to change certain parts. It's recommended in the Experimental world; it's required in certified."

There is a potential pitfall that is specific to the 914. The turbocharged 914 is a bit more complicated, and one area warrants attention. "If it sits for any length of time, carbon can get into the wastegate arm pivots," Yunck said. "That's fixable, but it can be a pain sometimes." Try a good penetrant first, like Corrosion-X.

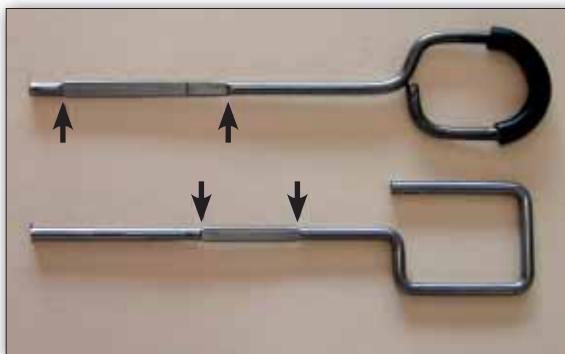
Beware of "Good Deals"

Paskevich explained that a "good deal" can turn ugly when the true cost of returning the engine to a safe standard costs more than a new engine. He noted that a lot of used military engines are getting sold to civilians. "Beware of the stripped drone engine cores being sold over the Internet with critical parts missing," he said. "Buyers purchase these, planning only to add a few inexpensive parts, and then they find they have an expensive boat anchor! We see customers buying old drone

engines, only to find they have internal corrosion and foreign-material ingestion." The military engines come from the Predator program, among others, and they are modified to generate a lot of electrical power. A bigger flywheel and alternator put additional strain on many components. Paskevich explained, "The military doesn't care about the greatly shortened life limit because they've factored that into their greatly shortened TBJ (time before junk)!"

In the Predator application (the most popular military use of the 914), the turbocharger is mounted on top. "The turbocharger mount is critical," warns Paskevich, "and unless it is exactly correct, it is practically guaranteed to cause a failure."

You won't know your used engine is airworthy unless you know what to look for. "No engine should ever be presumed to need 'just a few parts' to become serviceable unless it has been torn down and inspected, following a detailed measurement protocol where an expert checks for adverse wear, damaged parts and/or corrosion," Paskevich said. Many older engines have spotty or missing records, as well. Without those records, you are truly on your own.



The old-style dipstick (top) allows the permissible oil level to be lower than the new dipstick. These dipsticks apply to the certified and non-certified 912/914 engines.

Hints From the Experts

- Check the serial number and be sure all bulletins are complied with. Register (it's free) and you get all your notices immediately through e-mail.
- Look for ignition wires, the "black boxes." If the wires have been patched together, this may be an indication of other problems.
- Look for corrosion. Is this a saltwater engine? "There's a little corrosion in the atmosphere in Florida, for instance," Yunck said. "But there's a difference between atmospheric corrosion and an engine that's been a 'swimmer.'"
- Consider shipping your engine to a Rotax rebuild station for pre-inspection. It may actually be cheaper in the long run to have someone intimately familiar with the engine do the legwork for you.
- Examine the paperwork. "I can't say *logbooks* enough," Yunck advised.

Paskevich continues the cautious theme. "Unless you personally know the previous owner and are witness to the engine's specific operational and service history, never assume a used engine is OK," he said. "Quality overhauls by reputable shops are readily available on the market at very competitive prices. These engines come with a warranty that gives you a fallback position should the unforeseen happen. Generally they are a much better value in the long run than used engines you know nothing about."

Yunck offered one last bit of advice for kit aircraft builders. "When you're buying a kit, don't get the motor," he said. "Get the kit finished, and then get the latest, greatest warranted engine available." Makes you wonder when the Rotax 915 is coming out, eh? ✈

FOR MORE INFORMATION, visit the web at www.rotax-ower.com. Also, for a list of Rotax service centers, consult www.rotec.com/rslistpage.htm.

new



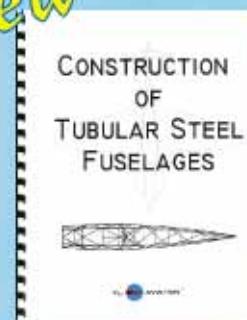
AeroElectric Connection

Revision 11 released May 2005.
By Bob Nuckolls. The best selling bible on how to design and install an electrical system in any project. Covers materials, power busses, circuit protection, grounding, etc., with sample schematics. \$32.00

KITPLANES BOOKSTORE

www.KITPLANESbooks.com
800 780-4115
Free US shipping on orders over \$50

new



Tubular Steel Fuselages

A detailed manual on the design, construction, and repair of steel tube fuselages including materials, techniques, and achieving a high degree of precision and symmetry in your finished project. \$34.95

400+ titles on building, flying, & maintaining your kit built aircraft