

Engine Q&As

Some recent reader questions find answers

Rotax Engine Q&As

Q. What is the correct gap for 912 spark plugs? I have looked in my owner's manual, but cannot find this information.

Charles Nelson

A. The spark plugs for the 912, 912S, and 914 engines can all be gapped to 0.028 inches. For the 912 and 912S, this information is in the maintenance manual (line maintenance) for the Rotax 912 series, Section 6.2.

For the 914 engine look in the regular 914 maintenance manual under ignition system, Section 13.4.2.

The 9-series spark plugs should be torqued to 20 NM/177 inch pounds with the cylinder head cold.

Phillip Lockwood

Q. Why do the 912 and 912S use different spark plugs? I own two aircraft, one with a 912 engine and one with a 912S, and would like to use the same plugs in both of them. Can I do so, and if so, which one would be best?

Jack Nelson

A. Because of their different thermal loads, each 9-series engine uses a different heat-range spark plug. Thorough testing at the Rotax factory has determined the best spark plug for each engine type that will most efficiently burn off deposits without overheating the plug or causing pre-ignition. Use only the correct spark plugs that are recommended:

912—NGK DCPR7E

912S—NGK DCPR8E

914—Denso X27EPR-U9

Also, Rotax specifies changing the 9-

series plugs every 200 hours, but you may need to replace them sooner if you burn leaded fuel. Rough starting and increased magneto drops are signs it may be time to change your plugs.

Rotax recommends applying heat-conducting compound to the spark plug threads prior to installing the plugs. This greasy paste also makes the plugs easier to remove when it's time to change them.

Phillip Lockwood

VW Engine Q&As

Q. I recently purchased a Fairbanks/Morse magneto from Saturn Surplus, part no. 13215E1717. As you probably know, this magneto has four outputs rather than the two that I need for my 1/2 VW practice conversion. Will this mag work using two of the four outputs? If so, which ones? If not, what's the correct part number for the mag?

Incidentally, I've noticed that no one says much about removing that blasted flywheel gland nut from the engine. I have found some articles discussing various methods for attacking this problem, but with something more than 200-plus foot-pounds of torque on the thing, it's a bear. Now I need to find a 3/4-by-36-mm socket and a 3/4 breaker bar. My 1/2-inch-drive long ratchet bent when I tried to remove the gland nut with it.

George J. Kuppler

A. I have heard of builders using that four-cylinder magneto and doing several workarounds. Here's how the two-cylinder



The correct spark plugs for the Rotax 912, 912S, and 914 engine respectively.

magneto works. It has a double-ended coil with no center tap. When the single-lobe cam opens the points, each spark plug serves as one-half of the circuit, firing both plugs at once. Number one cylinder is on top dead center (TDC) compression and number two is on TDC exhaust. I set my engine at 26 degrees before TDC (BTDC). The centrifugal advance removes the advanced timing at any engine speed below 300 rpm to make starting easy and avoid kickback.

The four-cylinder model has a multi-lobed cam and a rotor and opens at each of the four positions, firing a single-ended coil (like on a car). It would be easy to select the correct two connections based on point opening and rotor position. However, the unused two connections will deny a discharge path for the coil when they fire. This causes a high voltage in the secondary of the coil and can lead to premature failure. There are two possible ways to make this work.

The first method would be to buy a cap, double-ended coil, and different cam. This might be difficult and expensive. A low-tech workaround would be to mount two shielded spark plugs and connect them to the spare locations. It's a homespun way to go, but then when the coil needs a plug to discharge through, it will have one. The shielding strategy should be airtight to avoid fire hazards and, of course, made of metal and mounted on the block (for grounding) near the magneto.

Bill Bronson

Corvair Engine Q&As from
www.flycorvair.com

Q. I'm plumbing my fuel system on a Dragonfly firewall, which, as you know, is tiny. I've changed my mind several times and ended up with the KISS principal, using a gravity feed from a header tank and a backup Facet pump in case gravity isn't enough.

Reading Tony Bingelis' *Firewall Forward*, he stresses that there should be no reversals in the fuel flow between the gascolator and the carburetor. I notice in your 601 fuel system you've got the fuel flowing up from the gascolator through two Facet pumps, then back down to

the carb. That sort of configuration may be one of the few that would fit in my airplane, but I wonder if the reversal will make the system vulnerable to vapor accumulation or other problems associated with the high spot.

You have a lot of flying time on different fuel systems. What is your experience with that con-

figuration? Are you able to do the reversal because your system isn't gravity-fed?

David Morris

A. Tony Bingelis stands out as the individual who did more to improve the quality of homebuilts than any other person in the first 50 years of homebuilding. His magazine articles and four books are the standard for



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detailed design information. Tony passed away several years ago, but most of his information is timeless.

After 15 years of homebuilding, I could point to a few items in his books that I'd disagree with in some circumstances. This doesn't mean Tony was wrong; it means that he was writing for all homebuilders and seeking to define systems that would work in all homebuilts.

In some instances, the reversal of the fuel line is not an issue. Here's why: think of the gascolator as a sink trap. Wherever it is in the fuel system, it will trap any water passing through that point until it is full of water. If I get more than a few cc's of water out of the gascolator, I'm going to drain a lot of fuel out of it and run the engine extensively to ensure the system is clear. If there were water in the reversal, you'd find it. One or 2 ounces of water going through a system will be strained out by a quality gascolator. If you have more than this much water in your gascolator, you need to stop and investigate before you go flying.

My personal preference for fuel systems is that there should be no fuel lines in the cockpit under pressure. The gascolator should be ahead of the firewall, but above the bottom edge of it. This is especially important on an aircraft like a Dragonfly, which could break the canard in a hard landing and land on its belly. Use a quality gascolator like the Andair. If you're going to use a fuel pump, it should come after the gascolator so the gascolator is not subject to pressure.

The main issue with the fuel line between the pump and the carburetor is that it be a quality, aircraft-grade AN line and have enough slack to allow for the movement (vibration) of the engine. Preferably, you would use a firesleeve on this line. This will give it additional resistance to heating the fuel with engine compartment air.

Keep in mind that fuel has a boiling point around 170°F under standard temperature and pressure. But it is significantly higher than this if it's subjected to only a few pounds per square inch. If you're using a float-type carburetor, the only good candidate for a pressure system is an MA3-SPA carb. Keep in mind that once the fuel gets to the float chamber, it is no longer subjected to pressure, and its boiling point would return to 170°F. In our airplane, the engine compartment air runs about 100°F hotter

A number of people who never thought about a Corvair car before have caught the Corvair collector's bug while searching for an airplane core.

than ambient. However, the MA3-SPA runs significantly cooler because the air flowing through it is outside ram air, and fuel vaporizes in it continuously while it's running. Let us know what type of carburetor you're thinking of using so we can discuss a few more details.

William Wynne

Q. I just purchased a 1965 convertible Spider. It's in above average condition with new carpets, seat covers, and a top in boxes! The previous owner replaced the turbo engine with a standard engine, but included the complete original turbo engine and parts with the car. I plan to rebuild the turbo engine and restore it back into the car (that will be my practice engine). After that I plan to convert the standard engine using your conversion manual. I won't be able to afford an airframe for a few years, but at least I'll have an engine. I want a Zenith 601XL.

Is there anything special that I should do to the engine when I build it so it can be stored for several years as I save for an airframe?

I plan to store the finished engine on a basic auto-type engine stand, wrapped and sealed in plastic. I will store it in my garage/shop in Southern California, so there won't be a great deal of temperature change or humidity to affect it. I might not adjust the valves until it's ready to run it. I've had some "car guys" say that I should use grease rather than oil/STP for assembly. I'm looking for a more reliable opinion. I'll bet there are other builders who build and store their engine before they build their airframe.

Dave Thompson

A. Congratulations on landing a nice Corvair project. A number of people who never thought about a Corvair car before have caught the Corvair collector's bug while searching for an airplane core. Dave Morris, in Texas, recently picked up a late-model turbo car, and Pat Panzera, in California, has a turbo coupe in his driveway to work on when his plane is completed.

I would not use grease in assembling an engine, even one that is to be stored. Not all grease is oil soluble, and it's easy to imagine it clogging a filter or lifter or restricting flow. STP and oil will cling tenaciously to machined surfaces. As an option, you could spray the external surfaces of the crankshaft and the rods with a can of ACF-50, available from Wicks or Aircraft Spruce & Speciality, before installing the top cover of the engine. ACF-50 is the last word in preventing corrosion.

You could take the option of not setting the valves, so that the ports are sealed, although I'd obviously advise wrapping the entire engine. We've stored engines for long periods of time, and if they're sealed up, they'll have no problems. Remember that you will prime the oil pump on the engine before you start it, so you'll be flowing plenty of oil through it internally before it runs. If you wanted to be extremely cautious, you could prime the oil pump intermittently over time, but I really don't think it's necessary.

William Wynne

Q. I have read your manual and am surprised how comfortable I'm becoming about building my engine. I have a core and have taken it apart.

After reading about the modifications you provide, I plan to use your system for a Zenith 601XL I'm building. I have completed my rudder and am pleased with the results.

My question is about the oil pan. I have what appears to be a good steel pan, but I have a question regarding your pan. What are the advantages of having additional oil if cooling is not a problem? It seems that using the stock pan and changing the oil more often would be an advantage for using the stock pan. Am I missing something?

For the future, I plan to use 100 LL, but if none is available, does it hurt the engine to mix auto gas with 100 LL until you can get to a location where the avgas is available?

John Butterfield

A. Traditionally, Corvair engines used a modified stock oil pan for Pietenpol flight conversions. This worked and a lot of hours have been logged in Pietenpols. Many Corvair cores have damaged pans because they occasionally functioned as the skid plate on the car, and careless mechanics used them as a jack point. Because of this, few stock pans are good candidates for the traditional welded modification. (This modification is available in plans form from the Pietenpol family.)

Today, the Corvair engines we build produce more power, and we expect them to last longer. Our oil-system modifications are based on these points. Our deep sump aluminum oil pans bolt right on and work with the aircraft motor mounts. The additional oil capacity has the effect of making the engine run cooler and extending the intervals between oil changes. The oil carried lower in the pan's sump allows the oil pickup to remain submerged in uncoordinated flight. For these reasons we install our pan on every engine we build.

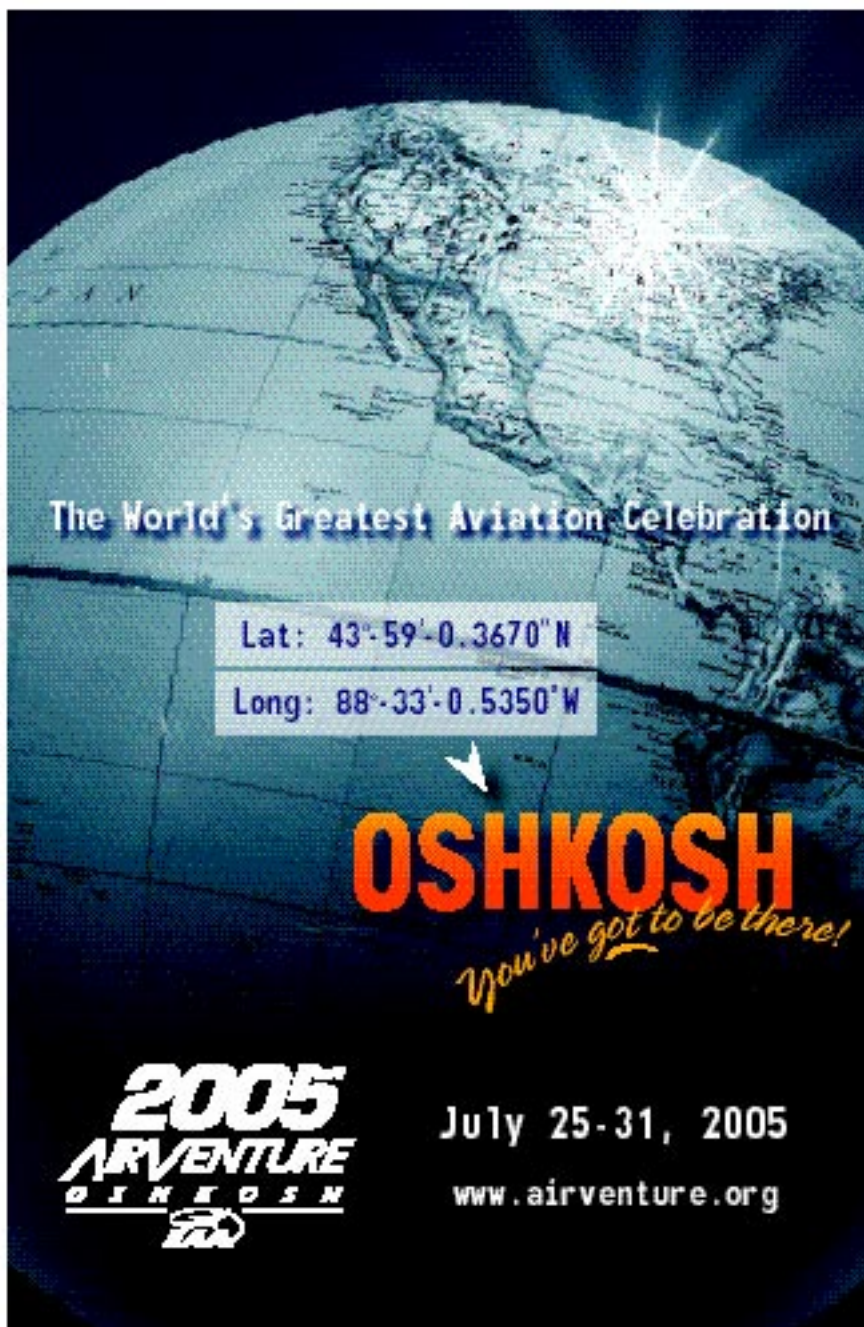
You can mix 100 LL and 93 octane auto fuel. The engine can be tuned to run on 93 continuously. I have more than 100,000 miles of driving Corvair engines on the road, and this was all done on unleaded auto fuel. I prefer avgas in flight, but people who have easier access to 93 octane fuel can use it with minor tuning changes to the engine.

William Wynne 

Each month in Power ON, Phillip Lockwood, president of Lockwood Aviation Repair (lockwood@digital.net, www.lockwood-aviation.com), will address common Rotax engine maintenance or operation issues. In addition, readers are invited to send their questions about various alternative engines to our panel of engine "answer men" or to editorial@eaa.org, or

- For HKS engines, write Dana Persiani, danapersiani@yahoo.com.
- For 1/2 VW engines, write Bill Bronson, onehalfvwguy@worldnet.att.net.
- For Corvair engines, write William Wynne, WilliamTCA@aol.com.
- For Subaru engines, write Don Bouchard, dbouchard@earthlink.net.
- For Hirth engines, write Matt Dandar, rpe@bpsom.com.
- For (non-Rotax) two-stroke engines, write Torello Tacchi, tacchi88@bellsouth.net.

We'll reprint questions and answers of interest in upcoming Power ON columns.



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