

A Radiator for the Rotax 582

by Rick Girard

If you're building a Rotax 582 powered airplane with a plugs up, tractor engine layout there's a solution to cooling the engine ready made right from the Austrian factory. Just hand your friendly local Rotax parts man about \$800 and you're set. Mounted on either side of the "C" or "E" gear-box (adding another \$700 to \$1400 to the price of the engine installation) the twin radiators mount with the form factor of the engine, carburetors, and exhaust. Being just behind the propeller the engine is always assured of proper cooling even during a long taxi on a hot summer day.

If your aircraft is a pusher layout you can use the tractor setup, although it's clunky to say the least, or you're on your own. You can purchase radiators, expansion tanks and radiator hose from Rotax and spend an equally large chunk of change, or go looking for some kind of custom cooling solution, most likely with a custom price, too.



Rotax system adapted to a pusher aircraft. Kinda clunky.

Since the Japanese motorcycle industry went from air to liquid cooling of their big bore models almost 35 years ago they have produced an array of radiator designs for on and off road two wheelers. When I was looking for a radiator for Zulu Delta, my Kolb Mk III, I figured there surely must be a Kawayamahonzuki unit that would fit my application. I didn't think I could just Google "what Japanese motorcycle radiator fits my Austrian aircraft engine" so I decided to let my fingers do the walking through the thousands of offerings on Ebay Motors.

First, some basic requirements and assumptions. I wanted a radiator with straight inlets on the upper right and lower left to match the water pump and thermostat housing locations on the 582. Second, I wanted about 100 sq.in. of radiator core area to match the Rotax units. I figured that the additional efficiency of the air flow through a single radiator would give me a little fudge factor, so....Third, I did a TLAR calculation that a 750 to 1000 cc high compression four stroke engine would need about the same

BTU capacity as a low compression not quite 600 cc two stroke. With these ideas in mind I started my search.

Within an hour I found a likely candidate. In 1982 Honda introduced its liquid cooled V-4 engines in the Sabre and Magna models in both 750 and 1100 cc sizes. The radiator for them met all three of my requirements. They were readily available from motorcycle salvagers in North America and prices ranged from \$20 to \$200. I decided on one with a "buy it now" price of \$30, just in case there was some problem I couldn't fathom from a picture on my computer screen. Within a week the UPS driver was knocking on my door.

The challenge now was to devise a mounting method. Unlike the Rotax radiators, that come with brackets, vibration dampers, spacers, and fittings, the Honda unit has four mounting tabs and the rest was up to me.

I began by looking over my strategic supplies (i.e. junk pile) for extrusion shapes and hardware for the project. Some angle extrusion and some U shaped extrusion and I was set. The brackets themselves were simple and straight forward.

I also looked over the requirements for coolant lines and an overflow tank. For coolant lines I went to Pegasus Racing for their line of silicone hose and fittings. 22 mm ID hose is a perfect compromise between the Rotax's fittings and the Honda's. You'll need one 90 degree elbow and one straight section (they come in 3' lengths). While running radiator hose is simple, the 582 has a head vent to prevent air from being trapped in passages that are higher than the thermostat housing. There are two ways to handle this. One is to have a radiator shop solder in a fitting on the right tank of the radiator, the other is to insert a "T" fitting into the hose coming from the thermostat housing. I've done it both ways and like the second better as it makes radiator replacement easier should it ever be necessary since it remains stock. The tee fitting can be made from a 1" X 1" X 1/2" tee fitting for PEX tubing. Just cut off the 1/2" side of the tee at its base and tap the hole 1/4" NPT. Smear solder flux on the threads of a 1/4" barbed fitting, screw it in and solder the two. I chucked the new fitting in my lathe to remove the part of the barbed fitting that projected into the bore of the PEX fitting.



A 1" PEX tee fits 22 mm radiator hose perfectly

A Radiator for the Rotax 582

by Rick Girard

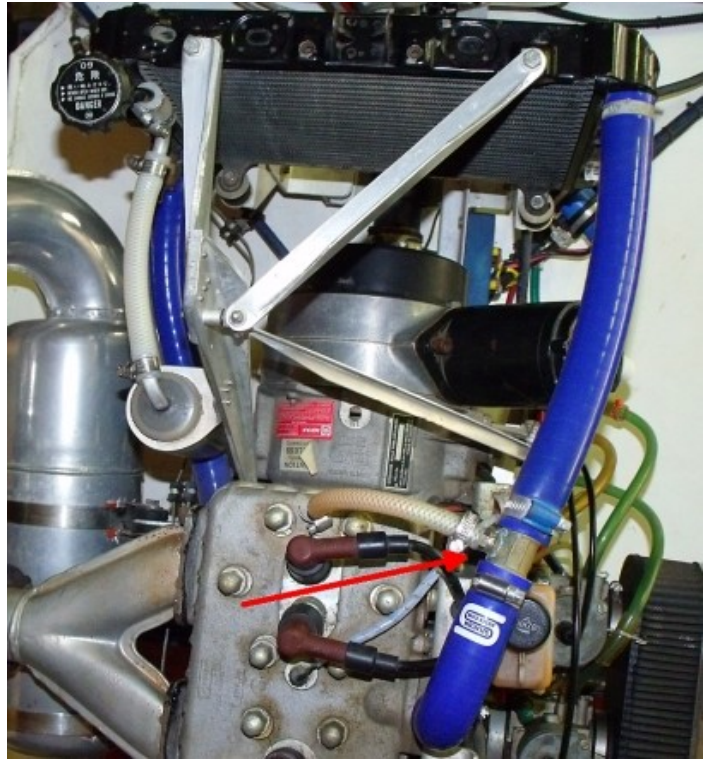
Trim 1 1/2" off one leg of the elbow and install it on the thermostat housing. The modified PEX fitting goes in the other leg. Cut a length of 1/4" ID radiator vent tubing to run between the head fitting and the barbed leg of the PEX fitting. Once the radiator is mounted run the 22 mm hose from the other side of the PEX fitting to the upper right radiator tank and another piece from the Rotax's water pump outlet and the lower left tank and the radiator is plumbed. All that's left is the overflow bottle. I used a one pint nalgene bottle and drilled a 3/8" hole in the center of the top and a 1/16" breather hole somewhere along the top's edge. Bend a piece of soft 3/8" aluminum tubing (3003 or 5052-O) into a 2" X 5" elbow. Insert the long leg into the nalgene bottle and run 3/8" breather hose from the radiator to the bottle once you have it mounted.

The Honda radiator has four ears with nutserts that are threaded 6mm X 1.0. By a happy coincidence so are the vibration mounts that Rotax uses for its radiators. JBM Industries makes a better version of them that cost less, too. I mounted one into each of the bottom ears. By another happy coincidence, the 6mm thread is close enough to 1/4-28 UNF that an MS 21042 flanged nut can be used as a lock nut to secure the vibration dampers.

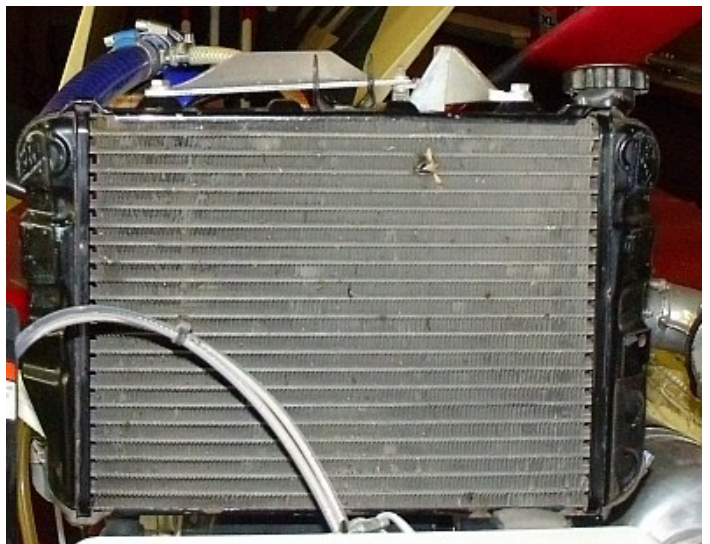
The actual mount for the radiator will be yours to create for your installation. Try to keep the upper right radiator hose as near horizontal as you can. A little lower than level won't hurt, but not so low that the radiator's filler neck is lower than the thermostat housing, otherwise you'll have trouble bleeding all the air out of the upper hose. When your radiator mounting is finished, cut two lengths of hose for the upper and lower connections. Once secured with hose clamps, fill the system with a 50/50 mix of DEX cool and distilled water, checking for leaks as you go. Fill the overflow bottle about 1/2 way and monitor it during the first few hours of running. You want to have enough so it doesn't run dry as the engine cools or so much that it is forced out when the coolant expands.

So how does the homebuilt system compare to that from Rotax? Even using the premium silicone hose and elbow (about \$60), I ended up spending less than 1/3 what the Rotax system sells for. How does it perform? In Kansas summer temperatures my engine has never over heated. In the winter, I block off half the radiator's area so I can keep the engine warm when the temps are down around freezing.

Last month I had the misfortune to run out of room to include two more pictures of the Honda 750 Sabre radiator installation for the Rotax 582 engine (a misfortune caused by submissions from the members that I would be happy to suffer every month :-}). So, here are the two missing pictures that should have been included with the article in the April issue.



The first, a view from above, shows the complete plumbing of the radiator. The arrow points to the modified PEX fitting used to connect the head vent into the system without having to modify the radiator.



The second shows how compact the radiator installation is. It has a foot print that compliments the dimensions of the engine nicely and cools it very well.