



Turbocharged engine intercooler installation

Classification	Optional
Applicability	XS Europas with Rotax 914 engines
Compliance	N/A

Introduction

The turbocharger, fitted to the Rotax 914 engine, provides the engine with air pressurized sufficiently to give 115 bhp at altitudes up to approximately 9000ft, and 100 bhp up to 18,000 ft.

A disadvantage of the turbocharger is that it generates heat as it compresses the air. Above a certain temperature a risk of detonation within the cylinders exists, so the air box is fitted with a temperature sensor that causes the exhaust waste gate to open once the temperature threshold is reached or exceeded. The amount by which the waste gate opens is controlled by the T.C.U. and is sufficient to bring the air box temperature down below the limit. The result of this is that the engine will then operate at reduced power.

As altitude is increased the atmospheric pressure decreases, and so the compression ratio needed to maintain full power increases, and consequently the temperature also increases. It is therefore at high altitudes that the problem of high air box temperatures is most likely to occur.

This problem can be overcome by fitting an intercooler between the turbocharger and the airbox.

The following instructions assume that the engine installation is complete, therefore in cases where the installation has not been made, references to the removal of the oil tank from the starboard side may be ignored.

Action

Step 1 Moving the oil tank

First, move the oil tank to the port side. Be sure that there is 12mm (½") clearance between the oil tank and the valve cover. You will need to adjust the oil tank mounting bracket so the tank is flush with the port foot well to accomplish this. You may also need to install a longer bushing, or washers on the upper left corner of the bracket (For the prototype an SO3 bushing was used). See figure 1. You will also need to fit a new oil tank access door - the method and materials required are the same as detailed in the Europa Engine Installation Manual. If you are careful when cutting the aperture, you should be able to make the door from the piece that you cut out.

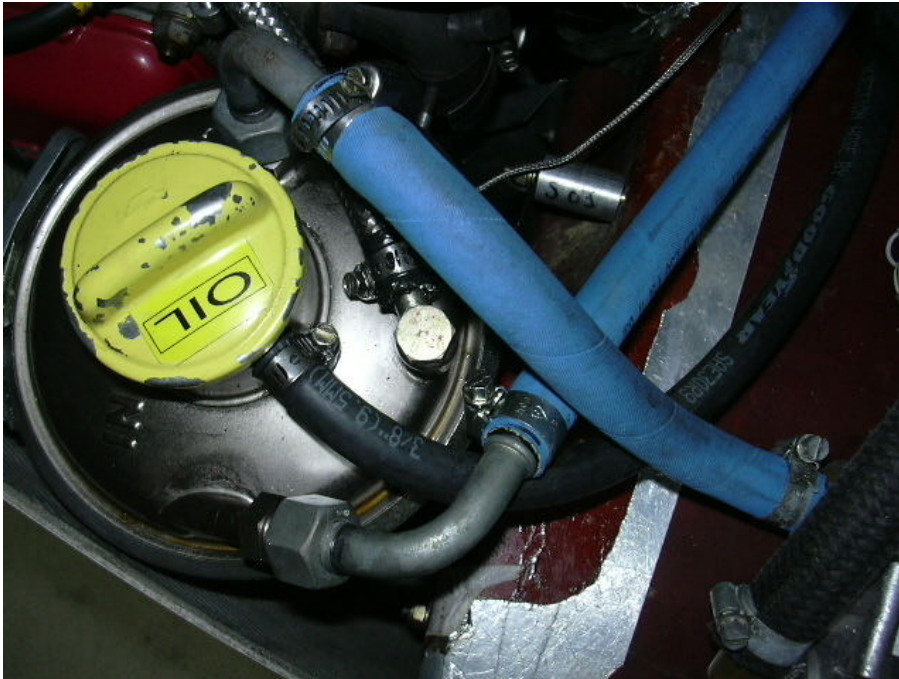


Fig 1. Oil tank moved to port side.

Next, remove the existing hose between the turbocharger and air box. Save the two clamps and discard the hose.

Step 2. Trimming the small hose

Temporarily install the small 90° elbow hose(part number 21473) on the turbocharger outlet. Install the intercooler on the hose - see figure 2. (The boss and probes seen in figure 2 were for testing only and are not included on the production units).

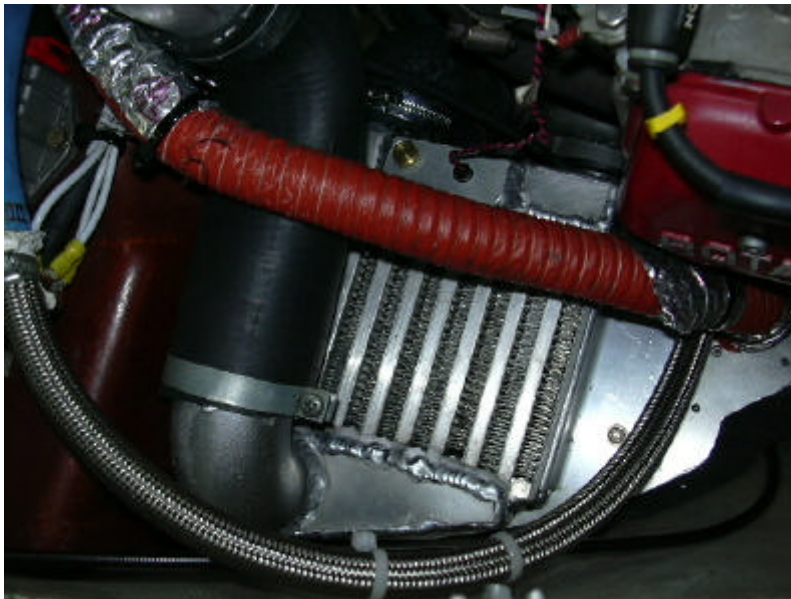


Fig 2. View of turbocharger outlet.

This will give you an idea of how much you need to trim the hose to make the intercooler fit over the CD7 plate without contacting the cowling. Trim the small 90° elbow as necessary, leaving 50mm (2") for the turbo outlet, and 32mm (1 1/4") minimum for the intercooler inlet. You may have to trim the hose quite a bit at the intercooler inlet, that's fine. If after trimming, you still notice an overlap, or conflict with the cowl, try installing the hose clamp and hose only on the turbo outlet side. Push the intercooler on the hose, and push the unit towards the turbocharger. Make sure that the flat bracket is flush against the foot well. There should be enough flex in the hose to allow everything to fit.

Step 3. Cutting a hole in the CD7

Leaving the intercooler in place firmly against the foot well, take a marker, and mark the points at the front corners of the intercooler core. Remove the intercooler, and make two more points in line with these 6mm (1/4") in front of the foot well. Draw a line between these points. The line will probably intersect the oil drain hole, that's fine. Starting at the oil drain hole, cut out an opening just inside the line on the CD7. See figure 3. (The ramp and filter shown in figure 3 are optional; in testing they only produced a small decrease in temperatures)

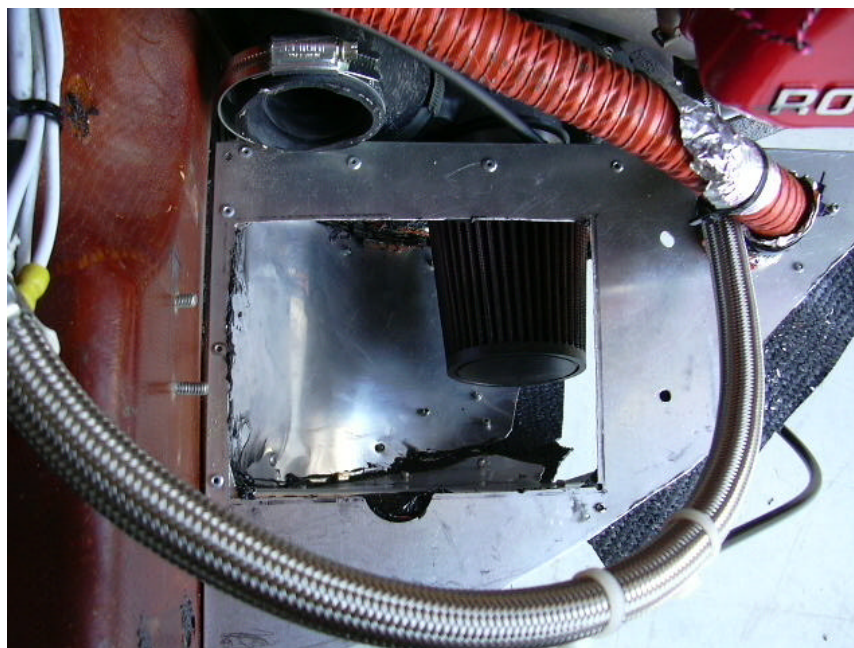


Fig 3. View showing CD7 after cutting opening into air inlet chamber.

Step 4. Trimming the large hose

Trim the larger hose (part number 60914) to fit over the air box inlet, and intercooler outlet leaving a min 63mm (2 1/2") overlap on the air box inlet, and 31mm (1 1/4") overlap on the intercooler outlet. It is important to trim the hose to allow it to fit as far up on the air box inlet as possible, this will keep the hose from bending too much. It should not be necessary to trim the aluminum air box inlet pipe.



Step 5. Drilling mounting holes

Next, remove the intercooler, and drill two holes in each bracket to fit the supplied bolts and washers. Pick a convenient location for the holes. Reinstall, and mark and drill the holes on the CD7, and the foot well.

Step 6. Final installation

Finally, put some RTV silicone around the hole you cut in the CD7, to seal the bottom of the intercooler. Install the hoses, and use the longer AN3-4A bolts supplied for the foot well. Install the larger AN970-3 washers on the inside of the foot well, and the bottom of the CD7. Use the AN960-10L washer on the outer sides. The position of the MS21042-3 locknuts is not important.

Recalculate the Weight and Balance figures, or carry out a re-weighing of the aircraft.

Step 7 Testing (Optional)

To verify the operation of the intercooler, compare air box temperature readings before and after the installation, at the same OAT, density altitude, and power settings. If no air box temperature gauge is fitted, then you may read the air box temperature from the TCU by using the Rotax computer programme TLR 4.5, or 4.6 as appropriate. See the 914F Maintenance Manual for details.

The intercooler is designed to give 37% efficiency in high altitude cruise, and up to 60% at lower altitudes, and power settings. This should allow 100% (34.5" Hg) power to be maintained up to a minimum of 18,000' density altitude. While it is possible to get higher cooling efficiencies (greater temperature drops) the resulting increased power would be insufficient to overcome the weight increase required.

For technical assistance please call John Hurst at the Lakeland, FL office. (1)-863-647-5355