



SERVICE BULLETIN NUMBER 121

ISSUE 1

TITLE	Cooling System.
CLASSIFICATION	The CAA have classified this bulletin as Recommended
COMPLIANCE	Before further flight
APPLICABILITY	Pegasus Quantum and Quik flexwings with liquid cooled Rotax 912 and 912S engines.

INTRODUCTION

A case has recently been reported of a coolant radiator failure by splitting of the plastic header tank during engine warm-up before takeoff and also some cases of header tank distortion with leakage of the sealing bungs.

This has been found to be due to coolant boiling causing uncontrolled over pressure in the cooling system when using too low a concentration of glycol.

Tests have shown that when taxiing and warming the engine from cold before takeoff especially on a hot day and/or with a covered radiator, the coolant temperature rises up to 15°C more quickly than the indicated cylinder head temperature (CHT). This is due to the slow coolant flow rate and little airflow through the radiator compared to the time taken to warm the metal in the CHT probe area. Boiling over of a 50% glycol coolant will occur as low as 110°C indicated CHT with large quantities of hot coolant being expelled. The overflow system is not designed to cope with this flow and the cooling system pressure and temperature rises abnormally, causing possible radiator damage. If undetected, the CHT will then rise rapidly out of limits due to coolant loss. If the high CHT is not noticed, engine damage and possible failure will ensue.

A coolant must be used which has a boiling point at least 15 °C higher than the maximum cylinder head operating temperature (MAX CHT) which is 150°C for the Rotax 912 engine and 135°C for the 912-S.

ACTION

- 1) Inspect the radiator for leaks or splits. A small amount of rounding of the flat faces of the plastic header tanks is acceptable. Replace the radiator if defects are found.
- 2) Ensure the overflow bottle tube is clear, unknicked and that the vents are also clear. The overflow bottle must be ¼ - ½ full of coolant when cold.
- 3) Check both the expansion bottle cap seals are in good order (fig. 2). The original pressure cap relief valve setting was 0.9bar, after engine numbers 4405962 (912 engine) or 5643240 (912S engine) onwards, it was increased to 1.2bar. The higher pressure setting is not necessary but is acceptable.

- 4) The cooling system must contain 100% ethylene glycol (E.G.) to BS6580 such as Comma Super Coldmaster or propylene glycol (P.G.) based anti-freeze and no more than 20% de-mineralised water. An anti-freeze hydrometer may be used to check the ratio.
- 5) Alternatively, flush with Evans NPG prep. fluid and refill with 100% Evans Non Aqueous Propylene Glycol (NPG) coolant. In this case a placard must be applied to the radiator cap "Evans NPG Coolant – Add No Water". See fig 1. (Available from Skydrive Ltd, UK Rotax importer)
- 6) Fitment of the new all aluminium radiator (Part No.ELR-003) to P & M Aviation modification M156 part 2 is strongly recommended if luggage panniers are used and/or if the aircraft is operated at maximum weight and power in very hot conditions (30°C or over). It must be fitted if an engine cover (mod 156 part1) is fitted.
- 7) Adjust the neoprene radiator cover to maintain 80-110°C CHT temperature in the cruise. The carburettor heat system requires 80°C+ to be effective.

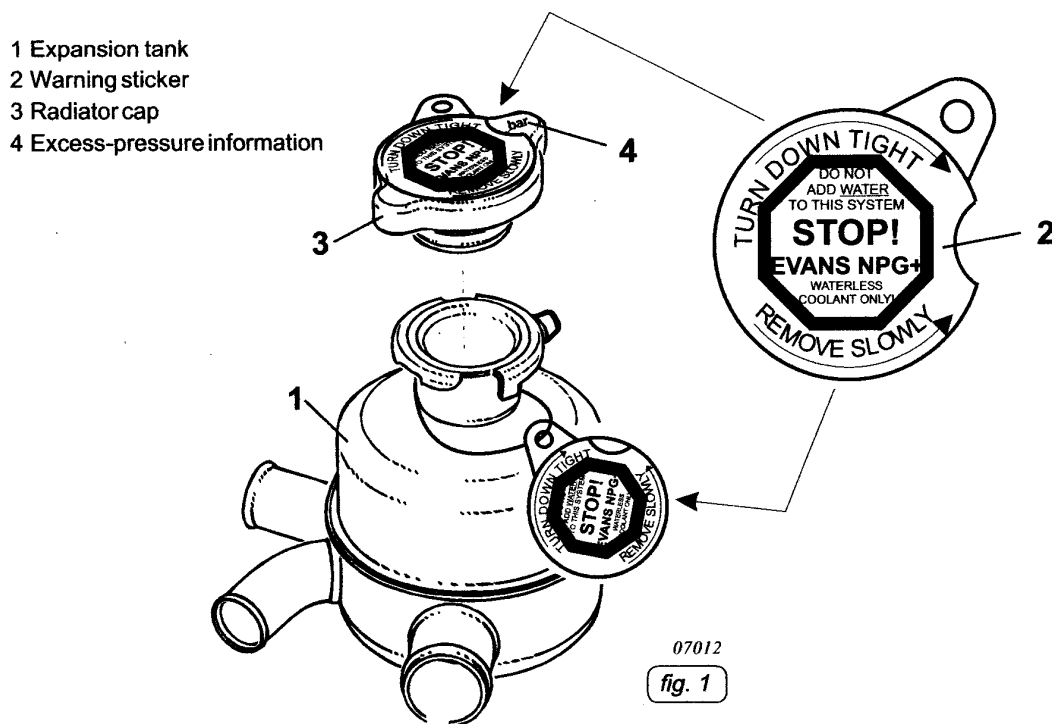


Fig 1 Placard required if Evans NPG is used.



Fig 2 Expansion bottle cap showing both rubber seals and compression spring

FLUSHING INSTRUCTIONS

- 1) Ensure the radiator area is clean.
- 2) Place a suitable container under the radiator bottom hose.
- 3) Loosen or remove the expansion bottle cap. Check the cap pressure spring and seals.
- 4) Remove and empty the overflow bottle. Check the overflow tube and vents are clear.
- 5) Undo the radiator bottom hose clip and pull the hose off to release the coolant. Dispose of it responsibly.
- 6) If discoloured or if there are particles in the coolant, unless using N.P.G., refill and drain the system with clean water. Then fill with 100% Ethylene Glycol or Propylene Glycol based anti freeze to BS 6580.
- 7) If using Evans NPG, fill and drain the system using Evans NPG prep fluid. Apply a placard to the expansion bottle cap "EVANS NPG COOLANT – ADD NO WATER". Fill the system with 100% Evans NPG coolant.
- 8) Tip the nose of the trike up by 20 degrees to expel the remaining air and top up the expansion bottle.
- 9) Half fill the overflow bottle with coolant and re-fit.
- 10) Run the engine, check the expansion bottle is full after a few minutes. Top up as necessary and check the system for leaks.
- 11) Record the type of coolant and the date in the engine logbook.

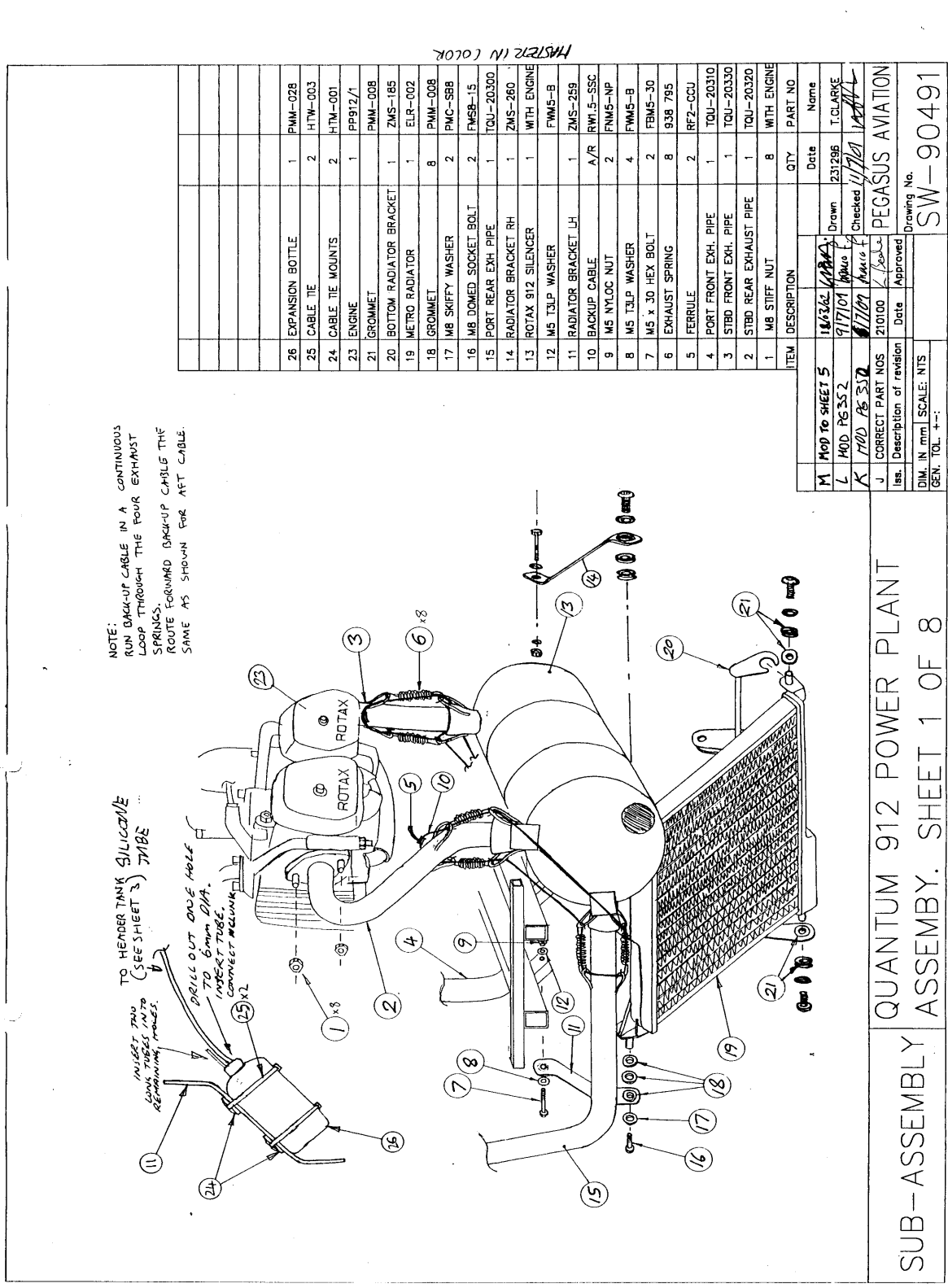


Fig 3 Power Plant Assy with Radiator Installation



INSTRUCTIONS FOR REPLACING THE RADIATOR (MOD M156 PART 2).

The new all-aluminium radiator part ELR-003, modification M156 part 2, is totally interchangeable with the original plastic header tank ELR-002 radiator and the same mountings are used. The weight and CG change is negligible.

- 1) Follow flushing instructions 1-5 above to drain the coolant.
- 2) Remove the top hose clip and remove the top hose.
- 3) Remove the top and bottom pair of M8 dome allen bolts (See fig 1 below).
- 4) Remove the radiator from it's mounts.
- 5) Inspect the mounting grommets, replace as necessary.
- 6) Re-fit using the M8 allen bolts, apply a drop of Loctite 221 to the threads.
- 7) Re-fit the top and bottom hoses.
- 8) Fill the system according to flushing instructions 6-11 above.
- 9) Record "modification M156 part 2, radiator part ELR-003 fitted" if fitting a new radiator, or "radiator replaced with original type ELR-002" as appropriate. Available from P&M Aviation.

WARNING

Ethylene Glycol is sweet tasting yet poisonous. Spills should be cleared up and used anti freeze disposed of properly. Propylene Glycol is less toxic.

DOCUMENTATION

- 1) This service bulletin must be attached to the operator's manual with reference to section 4.2, Powerplant limitations.
- 2) The above actions must be entered in the aircraft technical log "Service Bulletin 121 cooling system" and if carried out "modification M156 part 2, new coolant radiator installed". The work must be checked and signed by a BMAA or P&M Factory inspector who must be independent of the person who carried out the work.

ISSUED BY: Chief Engineer W.G.Brooks

A handwritten signature in black ink, appearing to read 'W.G. Brooks', is written over a light grey background.

DATE 10/07/06

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