

## **THE SKYDRIVE 912 COOLANT CARBURETTER HEATER – MKIII**

**Please read these instructions thoroughly before attempting to fit or use the Skydrive 912 coolant carburetter heater.**

The carburetter heater is suitable for fitting t Rotax 912 UL and 912 ULS series engines fitted to 'Permit to Fly' (non-certificated) aircraft. The fitting of the carb heater constitutes a modification that requires approval. The purchaser should therefore consult with the appropriate organisation before fitting the carb heater (Aircraft Manufacturer, BMAA or PFA).

In operation the carburetter heater adds a small amount of heat to the carburetter body at its downstream end in order to keep the temperature of the body above freezing point. The intention is that any ice formed will not adhere to the carburettor throat. Because the heater block is adjacent to the throttle spindle, some heat is also transferred through the spindle to the butterfly, to prevent a thick build up of ice on the butterfly, which with the type of carburetter used, can be a cause of rough running and possible engine failure.

Because there is no significant heating of the intake air when hot coolant is circulating through the carb heater blocks, there will be a negligible loss of full engine power. For the normal English climate, the carb heater system can be left permanently operating, but a tap may be added so that the hot coolant flow can be turned off if desired. This should only be considered if the engine is operated in conditions where carb icing is extremely unlikely (very high temperature and low humidity). A suitable tap and additional tubing (so that the pipe work can be extended to fit the tap in the cockpit) is available as an optional extra.

Extensive testing of the system has been carried out during an English winter. It has been demonstrated that the system will prevent the formation of ice, and will also clear an ice build-up if the optional tap is turned on after the engine begins to run roughly due to ice formation. The system has not been tested under all possible conditions that may prevail, therefore its effectiveness cannot be guaranteed in all circumstances. Aircraft equipped with this device should never be flown in circumstances where a successful 'no power' landing cannot be made in the event of engine failure.

### **INSTALLATION**

#### **WARNING**

Incorrect installation of the carburetter heat system could result in engine damage or complete engine failure, which could lead to personal injury or death. Skydrive Ltd cannot be held responsible for loss or damage caused by incorrect fitting. If the procedure for fitting the system is not completely understood, please contact Skydrive for assistance before proceeding.

**NOTE:** The installation of the coolant carburetter heater will move both carburetters approximately 17mm further away from the power take off end of the engine. If your engine installation will not permit this small change, do not attempt to fit the system, as it will be extremely difficult or impossible to remove the heater blocks once fitted.

1) Disconnect aircraft battery. Drain all coolant from the engine and collect it in a suitable container. Turn off fuel supply from aircraft tank.

2) Remove air filters from the carburetors. Disconnect throttle and choke cables and fuel lines from the carburetors.

### 3) Carburetor Preparation:

Remove each carburetor from the engine by loosening the clamp round the rubber flange assembly, disconnecting one end of the support spring and easing the carburetor out.

Remove the float chambers from the carbs and empty out the fuel and dispose of it safely. Refit the float chambers ensuring that the floats are correctly fitted.

Look at the downstream end of the carburetors (where they fit into the rubber flanges) and you will see a small line of casting flash (Photo 1 below). Carefully remove the flash from both top and bottom of the spigot, using a small needle, file or emery cloth. Do not remove more than is necessary to smooth away the raised portion of the flash lines, and be careful not to get any metal particles in the carburetor throat. (Some carburetors will have only a negligible flash line which may not need removing). Clean and degrease the end of both carburetors.

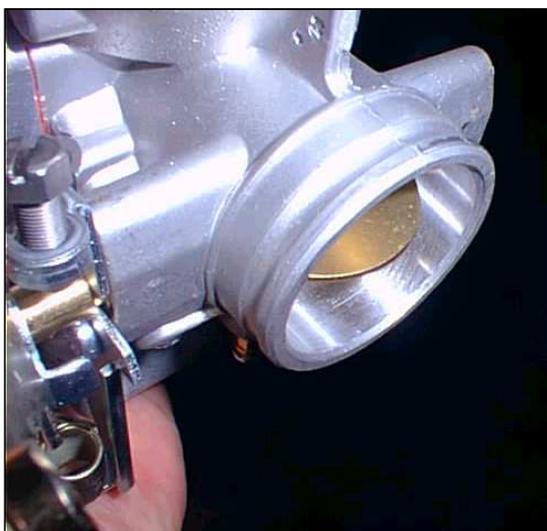


Photo 1



Photo 2

### 4) Fit Heater Blocks:

Clean and degrease the bore of each heater block. Position each heater block exactly square with the carburetor as shown in Photo 2 above. Tap the heater block very gently with a wooden or plastic mallet, just enough to hold it in position on the carb spigot. Position the carb and heater block in a wide jawed vice or under a suitable press. Protect both the heater block end and the inlet end of the carburetor with a piece of soft wood (thin plywood is OK if the jaws of the vice are not wide enough for anything thicker) (Photo 3 on the following page). Tighten the vice gently, checking that the heater block pushes on evenly. Only push the block on about 4mm, so it only just starts to overlap the groove in the carburetor spigot.

Remove the assembly from the vice and carefully recheck for squareness in all planes. If the position is not correct it may be possible to gently prise off the heater block and start again, but once it is pushed further on during the next stage it will be impossible.

5) Using the rounded end of one of the medium length cable ties as a spatula, smear a thin film of the Loctite 648 all round the visible portion of the carburetor spigot (Photo 4 on the following page). Be sure to cover the entire area between the groove and the carburetor end of the spigot with a very thin film. This is necessary to both bond the heater block in place and to prevent air leaks which would affect the running of the engine. Be very careful not to get any Loctite on the exposed end of the throttle spindle, as it would creep into the bearing, seize the spindle, and ruin the carburetor.



Photo 3



Photo 4

6) Reposition the assembly in the vice as before and tighten the vice until the heater block is pushed right home (i.e. until it contacts the carburettor body at the end of the spigot). Remove the assembly from the vice. Clean off any Loctite that has squeezed out, again being very careful not to get any on the throttle spindle. Hold the carburettor upright, put about 10 drops of Loctite 648 down the threaded hole on top of the heater block. It may take a few minutes for the Loctite to run down inside the hole, so be patient. Then screw the screw fully home using a 2.5mm allen key. Lay the carburettor in a warm place, on its side with the throttle lever uppermost so any seeping Loctite will run away from the spindle. Leave for a couple of hours for the Loctite to cure. During this time check for any Loctite creeping into the carb bore from the join between the carb body and the heater body. Clean off any that seeps through.

#### 7) Refit Carburetters:

The carburetters can now be refitted. Carefully push each carburettor into the socket of the rubber adapter. Make sure the clamp is positioned with the screw at the bottom. Tighten the clamp only enough to give a gap between the lugs of the carb socket as shown in Fig 1, 7mm for part number 267 787 or 8mm for part number 267 788 (a spacer is provided on 267 788 to prevent over tightening).

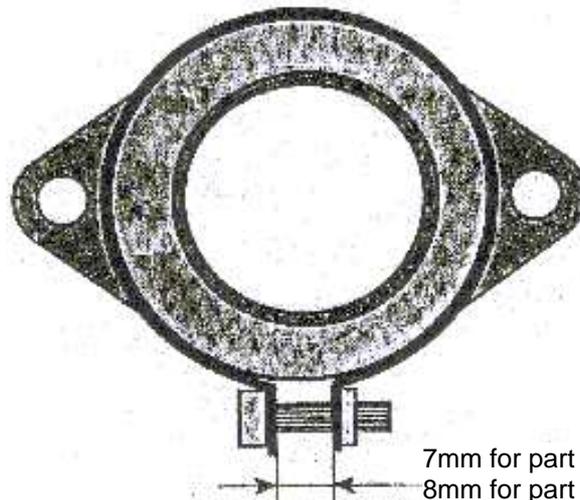


Fig. 1

7mm for part number 267 787  
8mm for part number 267 788

Completely remove the clamps on the end of the balance pipe. Each clamp also has a small bracket to retain the end of the support spring.

Turn the clamp completely round (so the head of the screw is towards the carburettor). Also turn the small bracket over so the slight bend in it helps to prevent the end of the spring from slipping off. Tighten the screw and refit the spring (Photo 5 on the following page). Reconnect the fuel feed pipe, choke and throttle cables, making sure that the throttles are exactly synchronised. Refit the air filters.

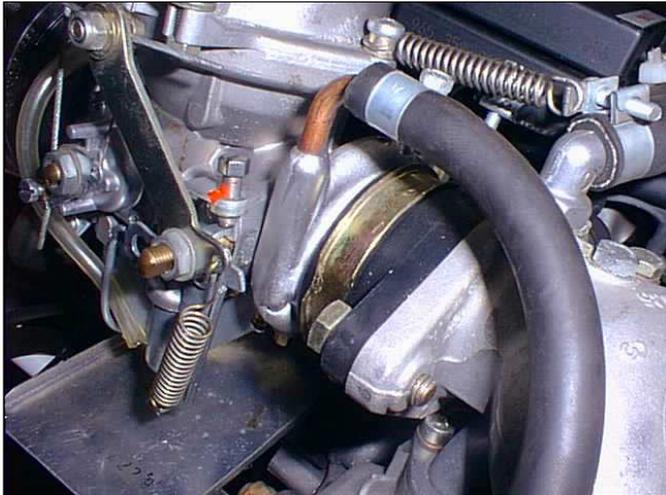


Photo 5

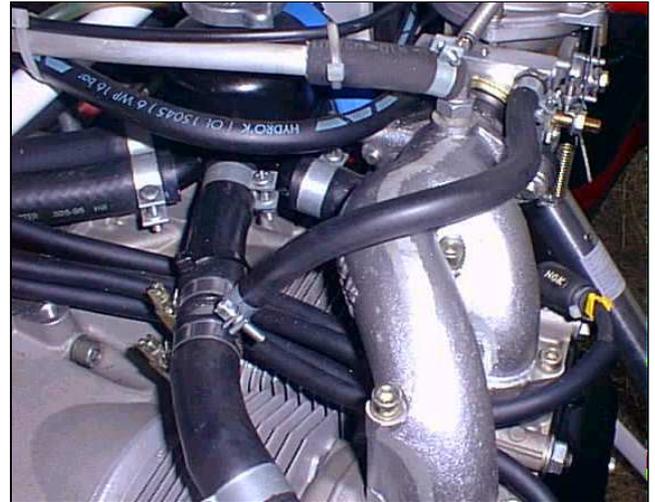


Photo 6

### 8) Fit Coolant Hoses for Heaters:

Cut the hose between the cylinder head of No 2 cylinder and the expansion tank and fit the smaller of the two 'T' pieces using the hose clamps supplied (Fig 2. below is for cylinder head identification). Angle the small outlet at approximately 45° so that the small feed hose to the heater block will curve smoothly (Photo 6 above). Cut a piece of the small hose to length and fit to the 'T' piece using one of the small clamps provided. Make sure that the hose is pushed fully home and the clamp is entirely beyond the flare on the outlet of the 'T' piece, to ensure that the hose cannot be pushed off by pressure in the cooling system. Observe this requirement for all small hose connections. Do not yet connect the other end to the heater block.

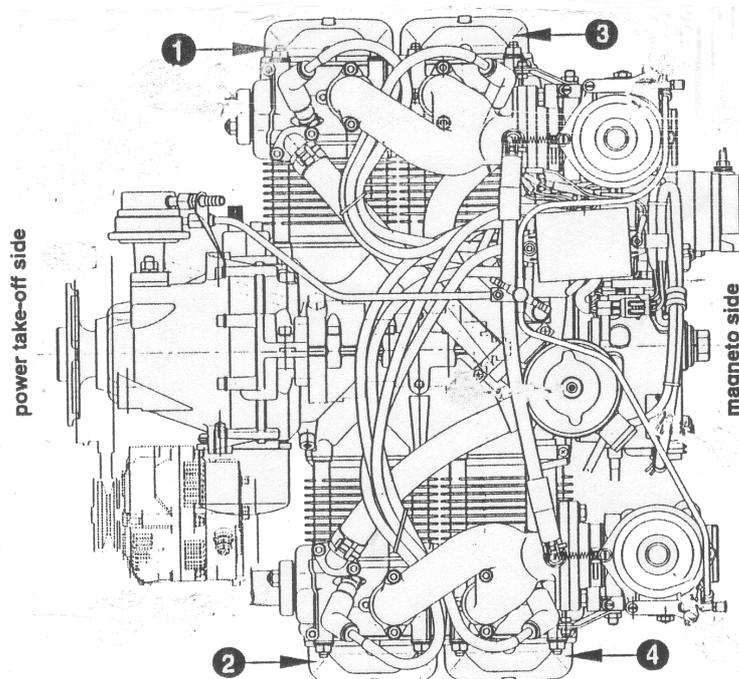


Fig 2.

9) Fit the larger of the two 'T' pieces in the hose just before the water pump inlet (underneath the magneto) using the hose clips supplied. The 'T' piece is fitted by cutting the hose and inserting it as close as possible to the water pump, but making sure there is space for the small bore hose to be routed away.

10) Cut a length of hose and connect between the inner connectors on the two heater blocks. Secure with the hose clips provided. Use some of the cable ties provided to firmly fix the hose to the balance pipe to prevent chafing.

11) Fit a length of hose to the outer connection on the heater block (cylinder 1 and 3 carb). This hose should then return to the large 'T' piece near the water pump. Use the hose clips supplied to secure the ends of the hose to the heater block and 'T' piece.

Fig 3 shows a schematic of the complete system. Ensure that all hoses are securely fixed with cable ties to prevent chafing and avoid contact with the exhaust system.

12) Optional On/Off Tap:

If the optional tap is fitted, it should be fitted in the suction line as in Fig 3. A lengthened hose may be used, so that the tap can be positioned in the cockpit within reach of the pilot. If the hose passes through a firewall it will be necessary for the installer to use suitable bulkhead fittings to prevent chafing and meet fire resistance requirements of the firewall. The tap must be securely fixed and its operation placarded. NOTE – we have found the tap is unnecessary for English climatic conditions.

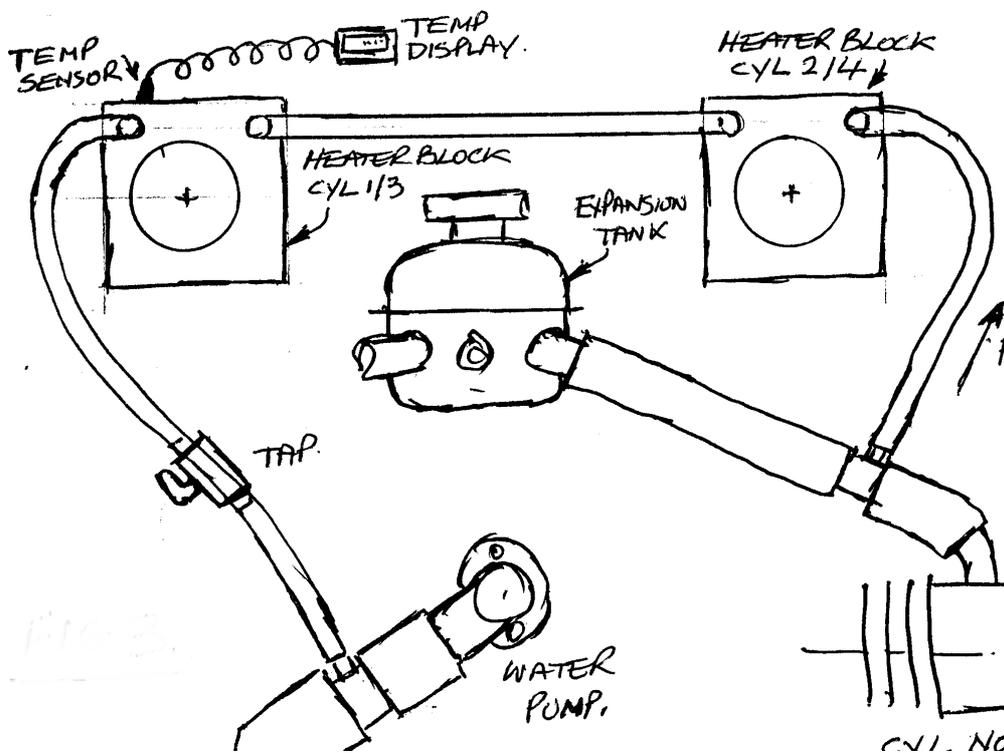


Fig. 3

13) Filling and Priming the System:

If a tap is fitted ensure that it is in the open position. Check that the hose from the upper 'T' piece is not yet connected to the heater block on carburettor for 2 and 4 cylinders. Raise the loose end of the hose higher than the filler cap on the expansion tank. Put a small container (e.g. a bottle cap) under the open connector on the heater block, to catch any small leakage. Slowly fill the cooling system with the correct water/antifreeze mixture (normally 50/50, but we advise that you check the latest Rotax service information for current recommendations). When the level gets close to the top of the expansion tank, coolant may start to seep from the open connector. If this happens, then connect the loose hose to the connector and clamp it up tight. Top up the coolant to the brim and refit the expansion tank cap. If no coolant comes from the open connector when the expansion tank is full right to the brim, this is probably because some part of the pipe work is above the level of the filler cap. In this case, push on end of the transparent plastic tube supplied into the open end of the rubber hose (see Fig 4 on the following page).

Check that the coolant is full to the brim and refit the filler cap. Blow gently into the transparent plastic tube until coolant drips from the connector on the heater block (DO NOT SUCK ON THE TUBE OR YOU WILL GET ANTIFREEZE IN YOUR MOUTH, WHICH IS HARMFUL) – if preferred a bicycle pump can be used to gently blow into the hose.

Remove the transparent plastic hose from the rubber hose, and connect and clamp the rubber hose to the heater block. Remove the filler cap, top up the coolant to the brim, and refit the cap.

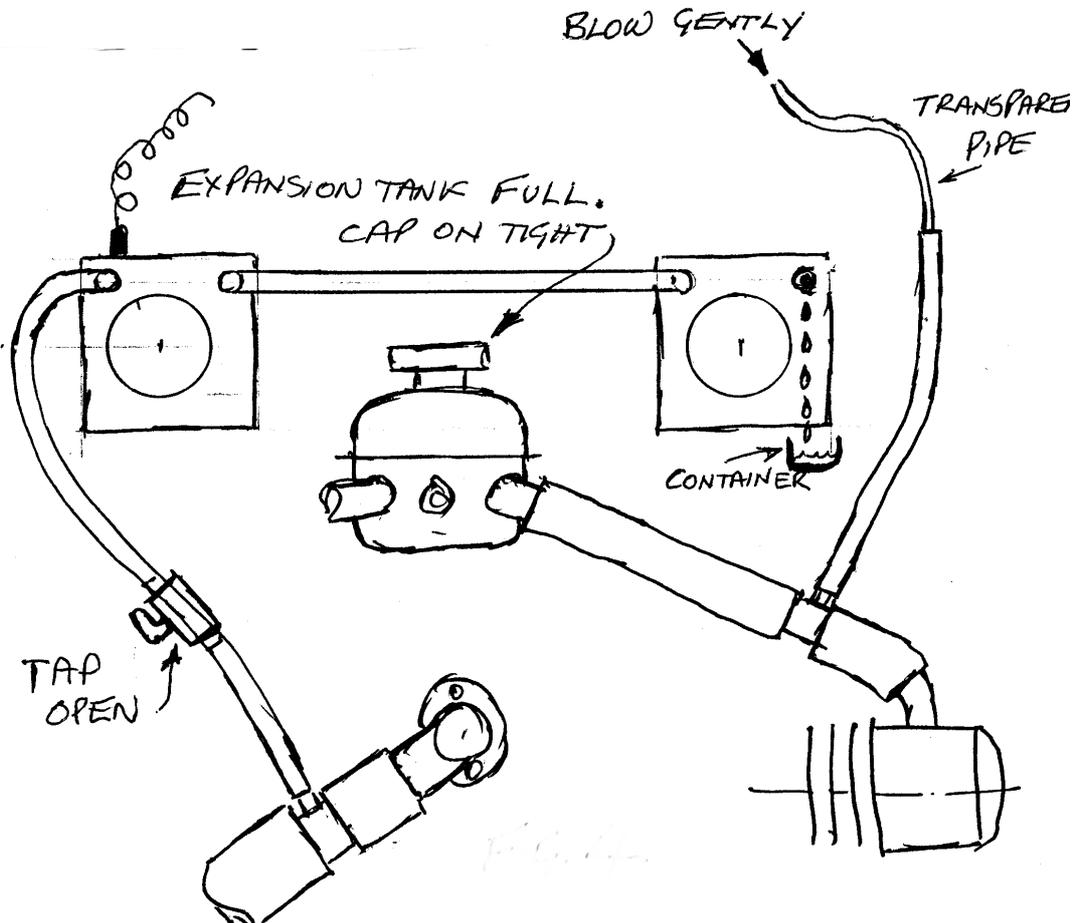


Fig. 4

#### 14) Final Check:

Check all hose connections for security, visually check for coolant leakage. Check all hoses for chafing and proximity to hot engine parts. If necessary use additional cable ties to secure hoses.

The engine can now be started, observing all the normal precautions. The heater tap (if fitted) should be open. Run the engine at around 2500 rpm. Stop the engine after about 10 minutes, check for leaks and security of all components and top up the coolant. Check that the heater bodies have become warm. If not, it will be necessary to repeat the priming (refer to earlier instructions).

#### 15) Operation:

The carb heat system will work automatically, but an occasional check that the heater bodies get warm after engine running is advisable.

#### 16) Maintenance:

Your daily inspection should include a check for coolant leakage, chafing of hoses, and security of all components. Check carburettor attachment and security of the support spring. Rubber hoses should be replaced if they show signs of damage or cracking. It is advisable to change all hoses after 5 years even if no deterioration is visible.