SKYDRIVE

UK Distributor for ROTAX Aircraft Engines

Please read these instructions thoroughly before attempting to fit or use the pressure tester.

THE SKYDRIVE FUEL PRESSURE GAUGE KIT FOR ROTAX 912UL / ULS ENGINES – FPK 912/10

1) INTRODUCTION The majority of engine failures on microlight and homebuilt aircraft are caused by fuel system faults.

If the fuel system is incapable of supplying sufficient fuel to the engine the following problems could result:

(a) Total Engine Failure – caused by severe reduction in fuel supply.

(b) Full Throttle Power Loss – caused by a reduction in fuel supply insufficient to stop the engine, but sufficient to cause the engine to run on too lean an air/fuel mixture.

(c) Engine seizure – A lean mixture due to insufficient fuel supply will cause an engine to run hot. The engine may then seize. A seizure may be preceded by a metallic tinkling sound (pinking), or may be quite sudden, as if the ignition has been switched off. A seizure occurs when the excessive temperature in the combustion chamber causes the piston to expand, oil film on the cylinder wall breaks down, and the piston temporarily welds itself to the cylinder wall.

(d) Holed or Burned Pistons – A lean mixture can also cause a hole to be burned right through the piston. Such a failure will generally be preceded by a loss of power with a distressed sound, rather like a diesel engine, before total engine failure.

(e) Misfiring – A lean mixture due to insufficient fuel supply can cause an engine to intermittently misfire. This misfire may only be noticed when the engine is run on a single magneto due to the uneven mixture distribution within the combustion chamber.

Many of the above problems can be prevented by regularly checking the operation of the fuel system. The fuel pressure gauge kit is a valuable tool for checking whether the fuel system is functioning correctly.

If your engine has suffered any of the problems outlined above, then it is vitally important to determine the cause of the problem before the aircraft is flown again. The pressure gauge again is invaluable for helping to diagnose the problem.

The pressure gauge can also be permanently installed on the aircraft, with the gauge mounted on the instrument panel. In this case approval must be sought from the relevant authority if applicable in your country.

If the gauge is permanently fitted, these instructions should be included in the aircraft operator's manual, for future reference and for the benefit of future owners.

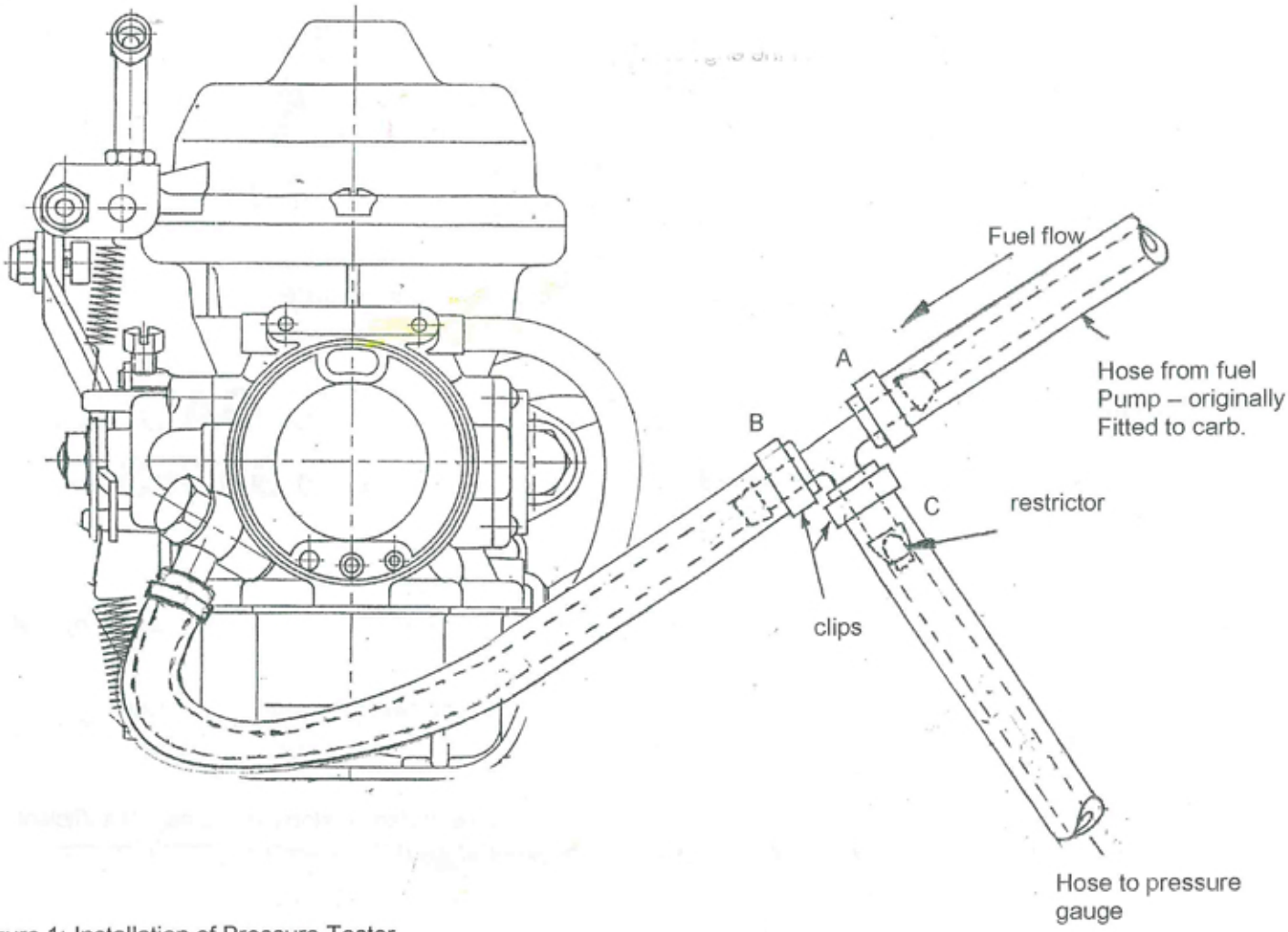

Figure 1: Installation of Pressure Tester

2) FITTING THE FUEL PRESSURE GAUGE

2.1 Procedure for ground testing only, during engine servicing or for fault finding

NOTE – It is advisable to check that the ignition is turned off, and the ignition high-tension leads are disconnected from the spark plugs, before working on the engine.

Remove fuel hose from one carburetter inlet – only on cool engine.

Fit the short hose (already attached to 'T' piece on the tester) to the carburetter inlet (see Fig.1). Connect the fuel hose originally fitted to the carburetter to the free end of the 'T' piece. For limited ground running the hose clamps supplied may be omitted provided that the push on connections are very tight. If in doubt, use the clamps.

IMPORTANT NOTE

The fuel flow to the carburetter must only be through the straight section of the 'T' piece (i.e. A to B, Fig.1). Connection C contains a restrictor to damp out pressure pulsations to the gauge, and to prevent very rapid loss of fuel in the unlikely event that the hose to the gauge is severed. On no account should the connections be altered such that the fuel supply to the engine flows through connection C.

Secure the pressure gauge in a position where it can be seen easily by the operator when ground running the engine. Make sure there is no possibility of the gauge and its hose getting drawn into the propeller, route all hoses away from hot surfaces, particularly exhaust parts, or severe damage and injury could result. If necessary secure the hose temporarily to the airframe using cable ties.

Before testing, secure the aircraft firmly to prevent it from moving when run at full throttle. Make sure that bystanders are kept at a safe distance.

Following normal start up procedures - start the engine. Visually check the connections for fuel leaks, including the connection the back of the gauge. Allow a minute or so for the pressure reading to stabilise initially. Thereafter the pressure should stabilise within a few seconds of an engine speed change.

Stop the engine and inspect all connections for leaks and hoses for chafing. Only continue once you are satisfied the installation is satisfactory.

Test the system as described in section 3).

2.2 Procedure for permanent fixing to Aircraft

NOTE – Approval must be obtained from the appropriate authority before modifying the aircraft. See introduction.

Fit the gauge on the instrument panel. The gauge should be positioned such that the pilot has a good direct view of it, and in such a place that in the unlikely event of a fuel leakage at the gauge, fuel will not fall onto the pilot or passenger.

A clamp is provided to secure the gauge. The hose should be routed to the carburetter in such a way that it is unlikely to be chafed or otherwise damaged. The cable ties provided can be used to secure it in various places.

Follow the previous fitting instructions (section 2.1) when connecting the hose to the carburetter, but note that hose clips must be used for all connections. As previously stated, do not alter 'T' piece connections.
Carry out the complete ground test procedure (section 3) and ensure that the fuel pressure is within the correct range before attempting to fly the aircraft. When in service, frequently check for damage to hoses and for fuel leaks.

3) TEST PROCEDURE

Run the engine at various speeds throughout its range, from idling to full throttle. At all speeds within the normal range (say from 2000 to 5500 rpm), the pressure should remain in the range 0.15 to 0.4 bar. These limits are marked by radial red lines on the gauge. The normal pressure with a 912 engine is around 0.25 bar.

If during testing a low fuel pressure is indicated, this could be due to a number of causes. The fault-finding section should help to trace problems. In the event of low pressure, a further test is possible to assist diagnosis. Replace the short length of hose between the carburetter and the 'T' piece, with the short length of transparent hose supplied. Ground run the engine again. If air bubbles are seen to be travelling along this transparent section, and persist when the engine is operated at high throttle settings, then an air leak on the suction side of the fuel pump is indicated. See fault-finding section for further information. NEVER fly the aircraft with the transparent section of pipe fitted.

When the engine is stopped at the end of the ground testing, the pressure should slowly fall to zero on the gauge. This indicates correct operation of the restricted fuel return to the tank, which is a requirement for 912 engines to guard against vapour lock.

Ensure all pumps are turned off, the pressure has dropped to zero and the engine fully cooled, before attempting to disconnect any hoses carrying fuel.

4) FAULT FINDING

SYMPTOM	POSSIBLE CAUSE	REMARKS & RECTIFICATION
Fuel pressure normal for first minutes of operation, but then falls	Blocked fuel tank vent	Check & clear vent
	Debris in fuel tank or pipeline, gradually restricting fuel	Clean system & re-test
Low fuel pressure	Blockage at fuel tank outlet	Check fuel tank outlet. A strainer in the tank to prevent such blockage is highly desirable. If not fitted thoroughly clean tank and keep clean
	Restricted fuel connections	Check for the possibility of hose clamps crushing the items they are clamping – particularly plastic fuel filters whose inlets & outlets can be closed down by excessive pressure on hose clips
	Kinked fuel hoses	Check and ensure installation will not allow kinks to form
	Blocked pipe lines and fittings	Any change of pipe section may allow debris to collect and gradually block the pipe. Look particularly at inlets of fuel taps, quick release connectors, fuel filters and other fittings. It is possible for a 'flap' of rubber from the inside of the fuel hose to partially block the pipe when the hose is pushed onto a connection. Such a fault is not obvious when the hose is removed; check carefully. Clean system and renew all suspect components.
	Restrictive pipe lines & fittings	Check that the flow passages are all large enough. Some aircraft may have systems that are too restrictive. Check that fuel tap is fully turned on and bore is of sufficient size. Minimum recommended size of all pipework, taps and fittings is 5mm diameter
	Blocked fuel filter	The flow through the filter may be restricted due to the long-term build up of dirt. On new installation it is possible for the filter to quickly block with debris from the tank. In particular if the tank is made from polythene or other light coloured plastic, plastic dust may block the filter and be invisible if the filter is transparent
	Fuel pump faulty	Fuel pump diaphragm may be punctured. One way valves in fuel pump may be faulty. Fuel pump is non serviceable and must be replaced if faulty
	Fuel leak between fuel pump and carburetter	Check visually, repair as necessary
	Air leak between fuel pump and fuel tank	See below
Low fuel pressure combined with air bubbles in transparent section of pipe	Air leak between fuel pump and fuel tank	Air drawn into pipeline on suction side of pump will reduce its capacity. Carefully check all hose connections & fittings. Some hose clamps do not grip evenly all round the hose and encourage air leaks. A restriction or blockage on the suction side will also encourage air leaks, so check for more than one fault. Renew faulty parts
High fuel pressure	Blockage just inside carburetter	If fuel pressure is higher than normal, suspect a blockage just inside the carburetter, between the fuel inlet and the needle valve that controls the flow into the float chamber. Such a blockage may be caused by a small sliver or rubber, sliced off the fuel hose when it was pushed onto the carburetter connection. Remove float lever and needle valve, and blow backward through carb inlet with an airline or hand pump to clear the obstruction
	Partially blocked main jet	Remove float chamber and main jet. Clean jet by blowing through it. Replace

The above does not constitute a complete list of possible faults, but is based on our experience in servicing and trouble shooting.