Higher Class Aviation
2450 Montecito Rd
Ramona, CA 92065
(866) 974 -9222

SPORT HORNET S-LSA Fuel Flow Test

Objective:

This report will determined the flow rate in Gallons per Hour delivered do various portions of the Sport Hornet fuel system. This will contrast to the system's requirements in the flight envelope.

Introduction:

Tests done on both the old style plastic tanks (PL) and the new larger aluminum tanks (AL). The PL is 9 gallons total volume, 8 gallons usable. The AL is 12 gallons total and 10 gallons usable. Both systems have a 1.3-gallon header tank located in the aft fuselage below the main tanks in the wings.

The main tanks tested on the ground in wings and out to determine deviation in plumbing of breather line. The standard installation is a tube aft of the tank fill on the top of the tank. This tube is routed along the spar to a bent pitot tube that is directed into the air stream below the wing providing light positive pressure to the main tanks. The bank test was done with the tank out of the wing. Tests show that the tank in the wing or out and with or without a breather has little effect on the flow from the tank. **It should be noted that if the breather is closed off the tank is sealed and flow stoppage can occur.

Procedure:

1. Gather the Grand Rapids Technologies FloScan 201B fuel flow meter and Engine Information System.
2. Connect proper fittings for application, 1/4 inch fuel hose and barbs. A tight fit is all that is necessary; hose clamps can be negated for testing purposes.
3. FloScan should be 6 inches down stream of any connection. The exit of the FloScan can be either an open 1/4 hose barb or 1/4 tube.
4. Connect FloScan to EIS in a 12 V circuit.
5. Fill wing tank from empty to 5 gallons.
6. Measure flow from wing straight and level attitude, 10 degrees alpha, 10 degrees bank, 30 degrees bank, 45 degrees bank. Bank angles simulate uncoordinated turns were fuel sloshes to the low wing. *Note the bank testing should be done in a tank in the same configuration as in the wing but free outside the wing so as to simplify the movement. Take note that the fuel flow straight and level has not changed.
7. Fill header tank from empty by connecting one wing tank to plane.
8. Measure flow from header tank after electric fuel pump. *Note that this point is not flowing by gravity if the fuel is near empty in the header tank. In low fuel conditions the electric fuel pump is required as per the aircraft operation instructions.
9. Use geometry to calculate the angle of the two tanks versus amount of fuel. Take note of point at which fuel is no longer covering the drain in the tank.
10. Use Bernoulli to calculate the pressure required at the mechanical fuel pump to bring the fuel up from the near empty header tank.

Higher Class Aviation
2450 Montecito Rd
Ramona, CA 92065
(866) 974 -9222

SPORT HORNET S-LSA Fuel Flow Test

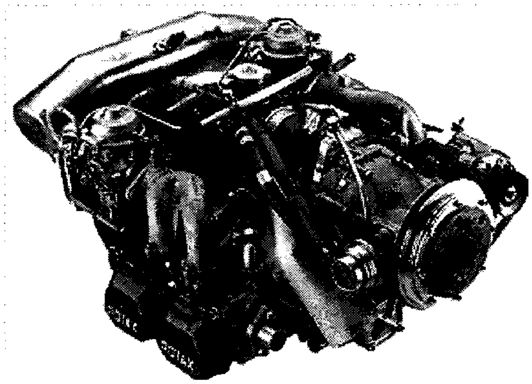
Results:

1. The table below shows flow rates in Gallons per hour at each station in the multiple configurations.
2. The graph shows the fuel level to bank allowance.

Fuel flow calibration with 6 Gallons in main tanks	Straight and level (GPH)	Air speed (GPH)	Alpha 10deg positive	Bank 10deg (low tank stops feeding below 1 Gal)	Bank 30 deg (low tank stops feeding below 4.5 Gal)	Bank 45 deg (low tank stops feeding below 6 Gal)
Wing tank to header tank (EACH)	13.5	13.70	13.7	13.7	13.8	13.9
Total flow to Header (from empty)	27	27.4	27.4	27.4	13.8	13.9
Header (while filling from full tanks, volume in header at empty) with electric pump to height of engine	21.8	22	22	22	22	22

Conclusion:
Data collected shows that the breather tube application is possibly over designed and a simple breather to the cap would suffice. According to FAA AC 90-89A page 23 Fuel Flow required by a 100 HP engine should be 82.5 pounds (13.7 Gallons) per hour for gravity feed, or 68.75 pounds (11.5 gallons) per hour for a pressurized system. Fuel flow from one tank is 13.5 gallons per hour from test data. Should the pilot fly uncoordinated turns for a considerable amount of time, the pilot should take into account the slosh allowance in the tanks at low levels.
At positive angle of attack and coordinated turns, there is no evidence in this test of un-porting the fuel system or lack of flow for continued maximum engine fuel burn.

Rotax 912 ULS DCDI 100HP*



Shown here with air box, external alternator, hydraulic propeller governor and air guide baffles.

- 4-stroke engine specially developed for recreational aircraft. Also exists in a certified version: Rotax 912 S.
- 4 horizontally opposed cylinders, "boxer" configuration
- Free air cooled cylinders, liquid cooled cylinder heads with integrated pump and expansion tank
- Dry sump forced lubrication with integrated pump and separate oil tank
- 8 valves, automatic adjustment by hydraulic valve tappet
- Dual Capacitor Discharge Ignition (DCDI) with RFI noise suppression
- Two Bing Constant Depression (CD) carburetors
- Mechanically driven diaphragm fuel pump
- Integrated **heavy duty electric starter**
- Integrated reduction gearbox, ratio of 2.43:1 with **slipper clutch standard**
- Various liquid and oil radiators available
- Many option available such as: Vacuum pump, external alternator, hydraulic propeller governor
- Operates on automotive fuel with a minimum octane rating of 91 (Canadian standards)
- Time Between Overhauls (TBO): 1500 hours*

Performance

Maximum Power* (5 minutes)	100HP / 73.5KW @ 5800 RPM
Maximum Power (sustained)	95HP / 69.0KW @ 5500 RPM
Maximum Torque	94ft-lb / 128NM @ 5100 RPM

**100HP maximum power when optional air box and tuned exhaust are installed.*

Combustion Chambers

Bore	3.31" / 84mm
Stroke	2.40" / 61.0mm
Displacement	82.6cu.in. / 1352cm³
Compression ratio	10.5:1

Weight

Engine with carburetors	124.7lbs / 56.6Kg
Exhaust System	8.8lbs / 4.0Kg
Air Box	2.9lbs / 1.3Kg
Air Filter	0.7lbs / 0.3Kg
Liquid Radiator	2.2lbs / 1.0Kg
Oil Radiator	1.1lbs / 0.5Kg
Regulator-Rectifier	0.2lbs / 0.1Kg

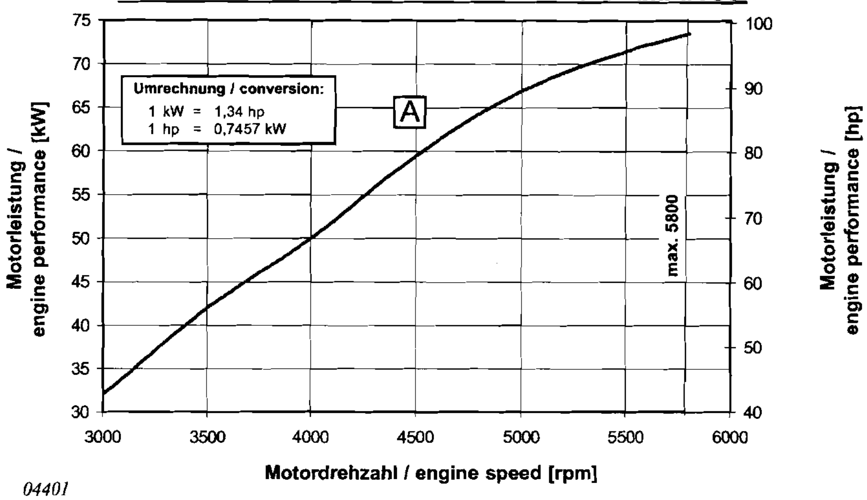
Installed Weight	140.6lbs / 63.8Kg
Weight/power ratio	1.41lbs/HP / 0.87Kg/KW

Documentation

Information Sheet	**912Sinfo.pdf** / 436Kb / **Adobe Acrobat** format
Performance Graphs	**912Sperf.pdf** / 14Kb / **Adobe Acrobat** format
Technical Drawings	**912Sdraw.pdf** / 537Kb / **Adobe Acrobat** format
Manuals	Visit **www.rotax-aircraft-engines.com**
Service Documentation	Visit **www.rotax-owner.com**

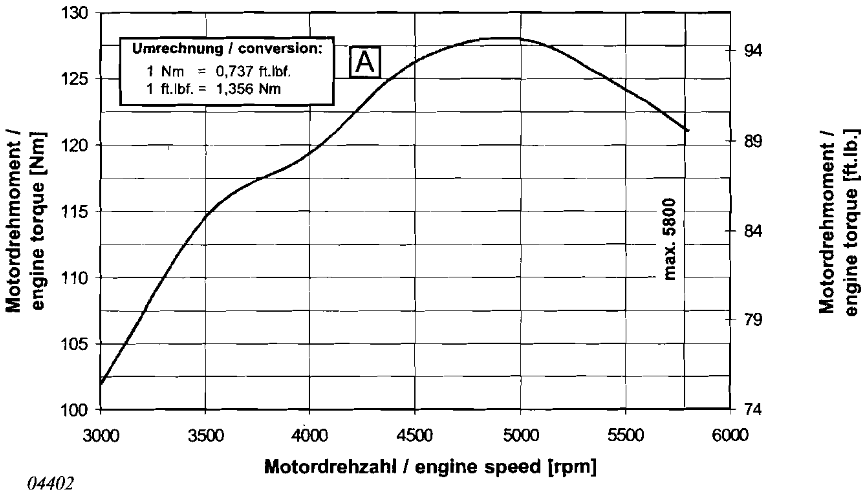
ROTAX 912 ULS DCDI

MOTORLEISTUNG / ENGINE PERFORMANCE



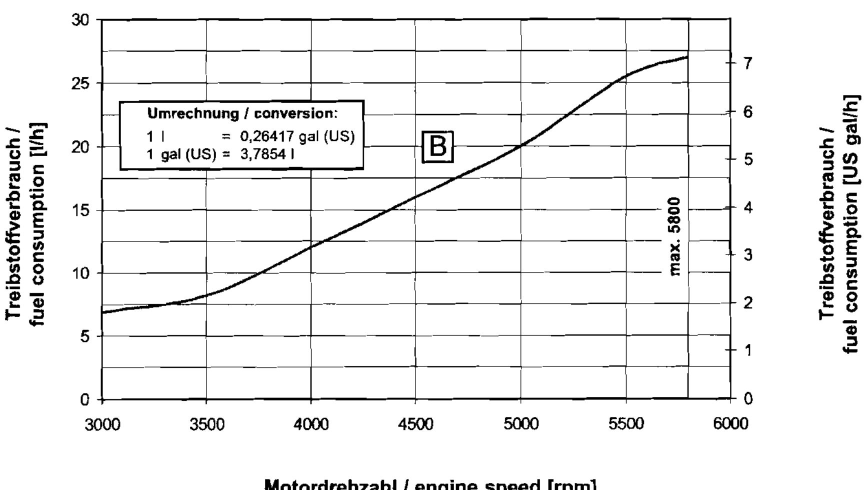
04401

MOTORDREHMOMENT/ ENGINE TORQUE



04402

TREIBSTOFFVERBRAUCH / FUEL CONSUMPTION



05037 **A: take off**
B: propeller curve

d01115