O.S Max – 40FP STD

ENGINE TEST

O.S. 40 FPS: Mike Billinton checks out this control line stunt engine

The recently introduced plain bearing front induction schnuerle ported engines (the FP series) interestingly combine a return to simpler construction and less extreme performance together with a continuance of the excellent OS manufacturing quality.

Available from UK distributor Irvine Engines, in four capacity sizes, .20, .25, .35, and .40 cu. in. and intended mainly for the beginner and sports radio control flier, the .40 is also produced to control line aerobatic specification as the FP-S. The only differences between the 'stunt' and R/C versions are the simple open choke substituted for control line use, and a reduction of compression ratio to an unusually low 7.4/1 (5.66 Effective!) This latter point assumed some significance following in the test on this engine, and certainly linked in with comments by Claus Maikis in the July AeroModeller concerning criteria to be used in 'assessment' of control line stunt engines. There are difficulties as he rightly points out maximum hp. alone hardly meets the bill, if only because the control line stunt 'regime' is a largish propeller and/or rich four-stroke fuel setting, one or both of which naturally drag rpm way down away from the potential maximum. Torque/weight ratio at rich fuel setting is a far more useful parameter, though for an engine tester this presents the problem of accurately maintaining one particular rich fuel/air ratio (or four-stroking point). Of equal importance is a capacity to operate on those large propellers and rich fuel settings in the unfussy and steady manner so desirable to control line stunt pilots.

This particular test was conducted 'blind' in that the OS hp. figure, the actual compression ratio,

Right, the O.S. 40 FPS is a plain bearing engine, that should find a following in future stunt circles. Photographs this month are not by Mike Billinton (It shows…Edi) as he was away winning the 'Shell Marathon' well done Mike.

and the Claus Maikis data on the OS 35 FP, were all not known at the time of testing; in retrospect however, the above points were appearing in one way or another during the test and had indicated how well the FPS actually fulfilled its role as a light, low speed, flexible, easy handling and durable machine. The precise maximum hp. figure, though initially a matter of some surprise, eventually proved of little importance in the total package, and it is of interest that the manufacturer actually does not claim a hp. figure for this 'S' version, (a figure of 1.0 hp. at 15.000 rpm is however claimed for the 40 FP R/C engine)…they refer instead to the overriding importance of flexibility and ease of operation, and this clearly will include the normal four stroking mode of control line aerobatic operations.

This is a useful place to refer back to that low compression ratio of 7.4/1... clearly if the two-stroke engine spends much of its time four-stroking then cylinder filling (and thus cylinder pressures) on those strokes when combustion does take place becomes higher than normal as witnessed by occasional failures of big end bearings in model racing engines whilst four stroking. If, at the same time, rpm is at a low level (as a consequence of the use of large propellers), then for both these reasons, it can be seen that

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Loll, the normal O.S. type silencer when fitted makes a neat, complete assembly should be quite adequate tor most applications.

the ‘normal’ geometric compression ratios of around 10/1 could easily lead to ignition ‘over advance’ a dangerous condition, difficult to detect in the methanol burning engine.

Therefore the OS decision to set up the FP- S at a very low compression ratio makes a great deal of sense, because just as in the effectively supercharged tuned pipe two stroke (and the actually supercharged four stroke), compensating reductions of compression ratio are often deemed necessary to prevent excessively high cylinder pressures and the onset of detonation.

In the case of the FP, the consequence then, is that the normal open exhaust full two stroke performance is quite naturally somewhat restrained compared with the normal expectations of a .40 cu. in. engine... in fact it lacks the correct degree of ignition advance for the higher rpm and normal two stroke operations all of which points to the specialised nature of the control line aerobatic engine, why the power levels are quite low by usual standards, and the relative difficulty of ‘assessment’ as Claus Maikis pointed out. In passing, the rpm figures he quoted indicate power levels in the .5 to .6 area if relying on published rpm to hp charts; and the .8 hp he quoted from the Graupner catalogue is for the 35 FP R/C higher compression version. As can be seen, the dynamometer figures obtained during this test become explicable only in the light of the various

Lett, liner, piston, crankshaft all very 'clean' and fully up to the standards set by O.S.

points made above.

Mechanical detail.

Normal schnuerle porting is used, even though this has not yet gained wide acceptance in control line stunt circles. As previously featured in certain OS engines the liner is rotated 30° to cause exhaust to exit towards rear/side of engine - the main purpose of which is to allow the gudgeon pin to traverse un-ported sections of the liner and thus both simplify construction and improve reliability by elimination of the usual circlips. Instead, PTFE end pads are used at either end of gudgeon pin.

Crankshaft: has a modest timing period of 176°, with a bore size of 8mm. The carburettor bore at 7.5mm. is somewhat larger than operators may normally use, and certainly a considerable increase on the radio control version at 5mm!

Liner/piston: this combination is refreshingly interesting to this writer at least... pointing in any case to OS determination to provide long life to the engine. The liner is unhardened steel coated on all surfaces with their nickel/silicon process as used on the top OS racing engines. Although not the hardest of surfaces, it does provide low friction and good wearing properties when combined with the close grained plain cast iron ringless piston. This item also has slightly unusual internal detail.

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Right, 'ball blasted' crankcase and finely finished cylinder head all make this engine a pleasure to own let alone use.

To increase strength and improve symmetry of heat expansions together with low weight, the ferrous piston has thin internal ribs spanning the two normally relatively unsupported walls adjacent to the pin bosses. Indicative of OS computer controlled equipment is that both liner bore and piston mating surfaces are finish ground to a fit normally only obtainable with both internal and external honing. With this sort of quality at the very heart of the engine, reliability is ensured and continues to make OS engines a 'hard act' to follow for other manufacturers.

Crankcase: is die-cast to the usual OS high standards. Equally the phosphor bronze main shaft bushing is of fine finish and superb fit. So good in fact, that a groove runs along two/thirds of its length to ensure that some oil reaches the front end of the bearing. Both piston fit and crankshaft fit have resulted in a very solid leak-proof crankcase compression, and which must contribute to the engine's consistent and steady operation in this control line stunt format.

Connecting-rod: is hollowed, hardened steel super finished, with PTFE pads at either end.

A standard silencer is fitted, with nipple for fuel pressurisation. Exhaust final outlet is 6mm. (inside diameter)

Performance.

The rpm were checked on a variety of propellers covering a range from 4.000 to 12.000 using the OS recommended fuel, of 10% nitromethane, and 20% castor oil and 70% methanol, showed that because of the quality of fits, the running-in period was not going to be lengthy. The most immediate impression was of a lazily docile and flexible manner of operation at either rich or normal fuel settings. The graph shows the three separate tests undertaken, and which also include fuel consumption checks. Actual fuel/air ratios could be deduced from these, and obviously the motor becomes less economical of fuel when operated at the richer fuel settings. The fuel curves also indicate the usual fuel to power relationship, though the control line aerobatic flier will find the rich running curves of slightly more value.

The rpm point at which maximum power occurs when running at rich fuel settings is of some interest, coinciding as it does with rpm achievable when running the motor rich on the average stunt propeller sizes 11 x 5in., 12 x 6in. etc.

Future tests on specifically control line stunt engines should reveal just how the OS FP's torque/weight ratio (115 oz. in lb. on normal fuel setting and 72 oz. in/lb. with rich fuel setting) will compare with other engines, though its low weight of 10 oz. with silencer could well place it very high on any contemporary lists.

Summary

Having moved from reliance on hp. as a major criterion of model engine performance, allowed the OS FP to be viewed in a quite different light. In fact the early experience of the engine as a fine flexible performer on the dynamometer did sit uneasily with the quite low hp. figures, and it took this writer some time to come to terms with the underlying reality. Assuredly a control line aerobatic pilot would have arrived at a much quicker, less tortuous assessment of this motor's quality than in this present review. One awaits therefore the likely contest successes to come, and which represent the real test.

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Dimensions & Weights

Capacity	.396 cu. in. (6.49cc.)
Bore	.835 in. (21.2mm)
Stroke	.724 in. (18.4mm)
Stroke/Bore ratio	.867/1
Timing Periods	Exhaust 142°
-	Transfer 116°
-	Boost 82°
Induction	Opens 41° ABDC
-	Closes 37° ATDC
-	Total 176“
Exhaust port height	.18in.
Combustion chamber Volume	1.0cc.
Cylinder head squish	.028in.
Squish band angle	10“
Squish band width	.15in.
Crankshaft dia.	.4722 tn. (12mm)
Crankpin dia.	.216ln. (5.5mm)
Crankshaft bore	.315 in. (8mm)
Crankshaft nose thread	.247 In x 28 TPI-
-	(1/4 UNF)
Gudgeon pin dia.	.1968 in. (5mm.)
Connecting rod centres	33 mm
Mounting holes	40 mm. x 17.5 mm x 3mm
Width between bearers	32 mm.
Width	1.9 in.
Length	2.9 in.
Height	3.2 in.
Frontal area	4.1 sq. in.
Weight (bare)	8 ¼ ozs. or 10 ozs with Silencer

Performance

Max. bhp .58 at 11.000 rpm (open ex/10% nitro)
- .55 at 9.900 rpm (silencer/10% nitro)
- .18 at 5.800 rpm (silencer/10% rich fuel setting)

Max. torque 72 oz. in. at 5.600 (silencer/10% nitro)
- 69 oz, in. at 6.400 (opon ex/10% nitro)
- 45 oz, in. at 4.000 (silencer/10% nitro & rich fuel)

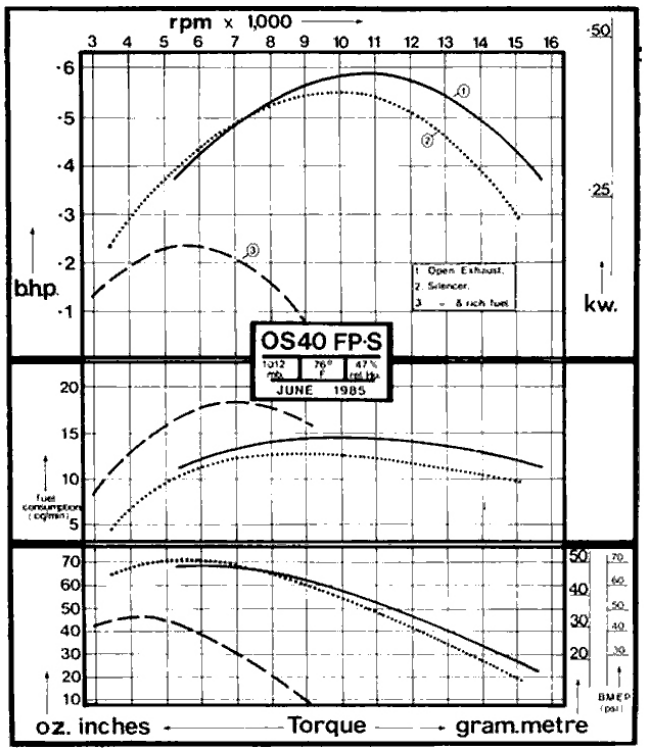
Rpm on standard propellers

	Open Exhaust	Silencer	Silencer/Rich
14 x 6 Zinger	6.141	6.181	4.226
13 x 6 Top Flite M	8.078	7.890	-
13 x 6 MK Glass	8.442	8.233	-
12 x 6 Graupner Nylon	8.678	8.461	5.462
10 x 8.3 Graupner 3 blade		8.900	
11 x 5 Top Flite M	10.650	10.340	7.277
10 x 4 Zinger	13.000	12.410	
9 x 4 Zinger	14.800	13.840	

Performance Equivalents

Bhp/cu. in.	•	1.46
Bhp/cc.	•	.089
Oz. in/cu. in.	•	181.8
Oz. in/cc.	•	11.09
Gm. metre/cc	•	8.0
Bhp/id(Bare)	•	1.12
Bhp/Kilo(Bare)	•	.234
Bhp/sq. in. frontal area		.14

Manufacturer O S. Engines, Osaka, Japan UK
Distributor Irvine Engines, New Southgate, London N11.



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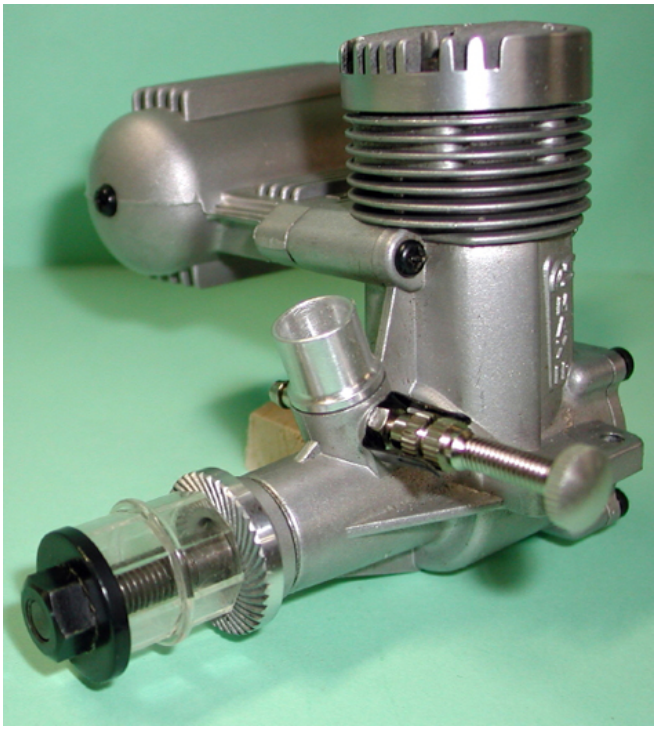

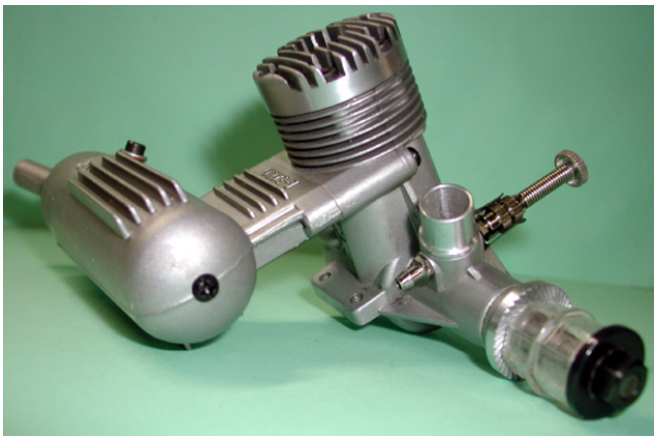

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