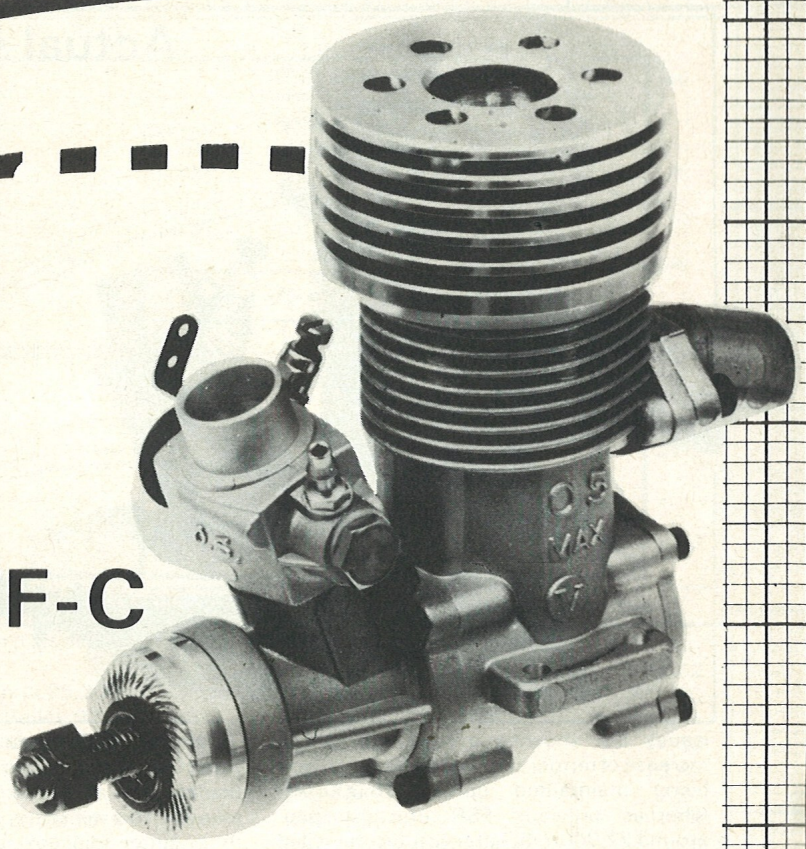
ENGINE TEST No. 10

by Mike Billinton



THE PACE OF DEVELOPMENT CONTINUES — with this most recent car engine from *OS* responding to pressures of competition, it improves on the 1978 3.5C side exhaust FSR model by being brought into line with the other larger capacity *OS* VR engines. The rear-exhaust crankcase for instance, is now a scaled down version of those very successful racing engines. In other respects the engine pursues a policy of small accumulating improvements, with a final result that in open exhaust format this engine now exceeds the 1BHP mark on standard five per cent nitro fuel to reach the highest figure in that layout yet recorded in this series of tests. However it is worth noting that this used the standard *OS* 2R carburettor with bore of 8.8mm; (earlier *OS* FSR, *Picco* and *OPS* tests used 7mm carbs for their open exhaust runs). From earlier tests, such change in carburettor size appears to be worth around 0.1bhp, so this still leaves this latest *OS* as a very powerful motor.

For car use though these figures are not the main interest — the engine's relationship to current tuned pipe designs being far more relevant. Although there is now a considerable move towards use of the full tuned pipe on car engines, it's of interest that *OS* do not list a tuned pipe recommendation for this latest car engine — leaving this quite significant choice to the user.

Advances in tuned pipe design continue, and these Engine Tests threaten continually to be left behind in the choice of 'Standard Equipment' to be used for top BHP comparisons; therefore to assess one of the more recent changes in this area, two-tuned pipes were used this time. The differences were quite clear to this operator (and reasonably so on the graph), but maybe of more interest was that during the tests the *OS* did not ever quite come 'on song' whilst using the *OPS* pipe (used in previous engine tests). Using for the first time the later style *OPS* pipe (with detachable rear silencer rubber muff) the result was improved smoother running and probably was only at a lower power level due to longer overall pipe length now being recommended by *OPS*.

From reports received the *OS* is not quite as highly regarded as the very latest *OPS* R/E and *Picco* engines, and it may be superior matching of pipe to motor is being undertaken by the specific racing organisations such as *OPS* and *Picco* and which is giving considerable edge to their recent competition results. There seems reason therefore to assume that with equally correct matching that the *OS* would equal recent results of the Italian concerns.

Mechanical pointers

Amongst the now expected well-nigh perfect *OS* finish and fits lie the several changed features:

1. Separate front housing now used with 'pinch-bolt' carb mounting for greater security at high rpm.
2. Single boost passage in crankcase is widened to match the new twin-boost ported liner.
3. Crankcase now incorporates rear-exhaust layout.
4. Gudgeon pin circlips not used, nevertheless pin cannot escape through ports as PTFE pad at boost side bears against port bar, and stepped-down diameter of pin at Exhaust side prevents ejection there. This speeds production time and lessens rare possibility of circlip escaping to damage engine.
5. Liner remains 'Nikasil' coated but Exhaust timings are now reduced from 170° to 166°. Transfer is up from 123° to 130°. Boost still 121°.
6. Con-rod big-end eye increased in size to 9.5mm width.
7. Cylinder head squish band width increased from .1 to .125in. Angle now down from 10° to 2½°. Squish clearance increased from .007in. to .014in.
8. Off-set lubrication channel in front housing to maintain gas seal just ahead of rear race.
9. Standard carb increased to 8.8mm bore from 7mm.
10. Carb is now provided with a remote needle valve assembly to ease installation problems.

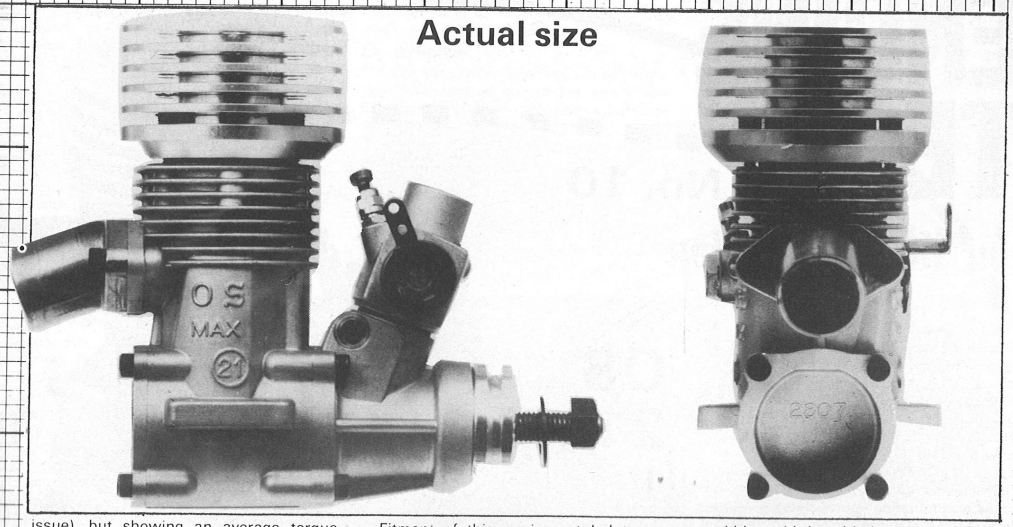
Other significant dimensions remain as for the earlier FSR model. The total result is a motor of almost jewel-like quality and with dynamic performance to suit — it now releases its power considerably higher up the RPM scale at 27,000rpm compared with the 22,000 of the FSR engine; with a commensurate BHP increase from .75 to 1.10.

RPM checks

These were conducted subsequent to the quite short running-in period required with finely produced ABC motors. RPM comparisons with the previous FSR model were enlightening, being some 2,000 up around the 14,000 area, and around 1,000 up at 22,000 area depending on carburettor size used.

Power Test 1

Open Exhaust/8.8mm OS carb/five per cent nitro and 15 per cent castor. General shape of torque curve was similar to FSR unit tested in 'Model Cars' (Spring 1981



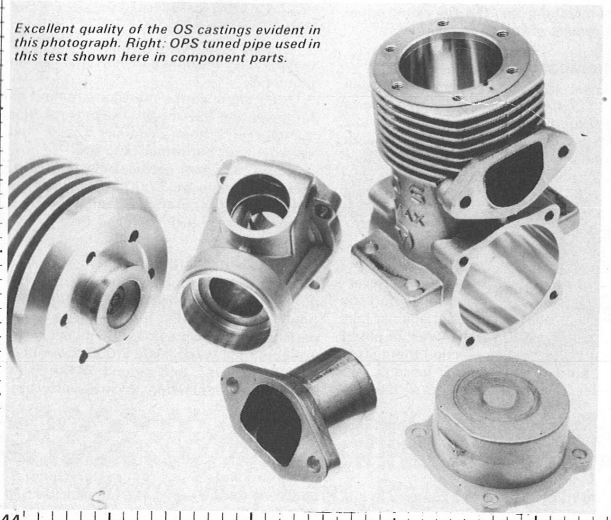
issue), but showing an average torque increase of ten per cent and with high torque being maintained up to 26,000rpm, whereas previous FSR unit 'stopped' around 22,000rpm. Later scrutiny revealed this result as being remarkably similar to the *Picco* 21 Open Exhaust figures.

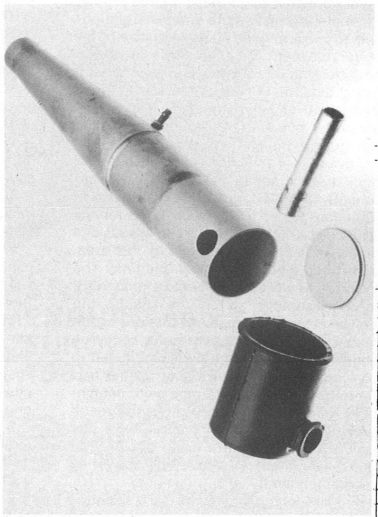
Power Test 2

OPS Tuned pipe at 9¾in. piston face to end of tail pipe inside silencer can/50 per cent nitro/Preston 9.5mm carb.

Fitment of this equipment led to unexpected sharp power increase at particular rpm area (here the pipe length allowed this to occur at 29,500rpm and thus quite adjacent to open Ex. peak). Maximum bhp of 1.40 was almost up to recent best recorded levels but of significance was that at no time did the motor sound correctly 'on pipe' — i.e. that recognisably clean note emitted when ignition/porting/squish clearance/compression ratio/pipe parameters are all in harmony. It could be said that this happy coincidence has not ever been reached by *any* motor, but is probably approached by some. Certainly the extra 20 per cent power achieved by adding the usual power-boosting equipment was fairly modest, so there is surely more to come with more effective matching of equipment. Whether specific timings and overlap, or more probably the large squish clearance caused the slightly ragged combustion note (on pipe) is not certain. What is likely is that *OS* continue the competitive fray handicapped by a less intensive motor/pipe matching programme than is being pursued by other manufacturers.

Excellent quality of the OS castings evident in this photograph. Right: OPS tuned pipe used in this test shown here in component parts.





During the course of these tests it would of course be possible for individual modifications to be made to some of the significant dimensions of pipe/squish/comp ratio, etc., but clearly would also be a minefield of varying effort/prejudices etc. Therefore as agreed editorially, engines are tested as provided by the manufacturer with considerable adherence to their advice, and in keeping with current competitive practice.

Power Test 3

Same equipment as Test 2, but with new *OPS* tuned pipe at 290mm from glow plug to end of rubber silencing can.

This followed information received that a small change in tuned pipe layout has occurred, with recent World Championships seeing much use of the new pipe. Its main virtue being a claimed increase of torque at lower rpm, without damaging effect on high power.

The built-up construction using rubber connector provides resilience against accidental impact and damage. From this test, the claimed advantages seem to have been achieved, with torque significantly improved below 20,000rpm and, because of the overall longer length of pipe recommended by *OPS*, the main power pulse was not too far distant at 27,000rpm. As this was also at a higher valve of torque the result was that from 14,000 to 27,000 the new pipe revealed distinct advantage. So, provided that higher rpm's than 28,000 are not being sought, this configuration appears superior. The actual bhp maximum was a little lower at 1.34, and throughout production of this last torque curve the motor sounded a little cleaner in combustion note.

Other relevant information

During the tests temperature was an unhelpful 80°F, so a required atmospheric correction factor of 1.05 has been applied to the bhp figures. *OPS* 300 plugs were used throughout and confirmed their great resilience under arduous duty — only three were 'lost' during the 26 separate runs on 50 per cent nitro and pipe.

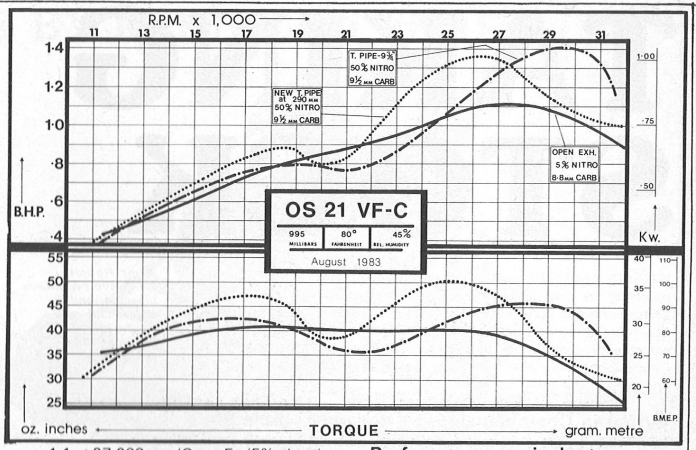
Also used throughout was the remote needle valvee provided by *OS* for this engine. Resultant fuel tube length from this needle unit to carb was approximately 6in., which gave sufficiently quick response to needle movement when using the pipe pressure system to fuel tank. Unless much shorter than this though, the method always results in *some* delay in motor response, so up to five seconds or so is necessary to evaluate precise effect of a change in needle valve position.

Summary

This latest 3.5 car engine from *OS* is produced to the same unsurpassed high quality level which this factory has incredibly brought to all of their products during this decade.

Of more importance to the active modeller however, is that this *OS* quality is bearing dividends on the reliability front — until recently the problem area for many manufacturers of the Open Car class racing engine. The days of boxes of engine parts being required to complete a race are mercifully coming to a close, and this latest *OS* contributes fully to the new high levels of reliability.

OS 21 VF-C



Dimensions and weights

Capacity — .2113cu.in. (3.4627cc).
Bore — .654in. (16.6mm).
Stroke — .630in. (16.0mm).
Stroke/Bore ratio — .96/1.
Timing periods — Exhaust 166°.
— Transfer 130°.
— Boost 121°.
— Front induction opens 35° ABDC) closes 63° ATDC Total 208°.
Carb bore — 8.8mm.
Exhaust port height — .230in.
Combustion chamber volume — .28cc.
Compression ratios — Geometric — 13.3/1.
Effective — 8.8/1.
Cylinder head squish — .01 4in.
Squish band angle — 2½°
Squish band width — .125in.
Crankshaft diameter — .4722in. (12mm).
Crankshaft bore — .342in. (8.7mm).
Crankshaft thread — .25in. × 28 TPI.
Crankpin dia. — .196in. (5mm).
Gudgeon pin dia. — .1572in. (4mm).
Con rod. centres — 29mm.
Piston weight — 3.5gms.
Weight overall — 10oz (.283 kilo).
Mounting holes — 15mm × 38mm with 3mm holes.
Height — 3.4in.
Width — 1.78in.
Length — 2.8in.
Frontal area — 4.57sq.in.

Performance

Max BHP — 1.4 at 29,500rpm (OPS pipe/50% nitro/Bailey 9.5mm).
— 1.1 at 27,200rpm (Open Ex/5% nitro/OS 8.8mm carb).
Max Torque — 50oz.in. at 25,200rpm (OPS new pipe/50% nitro/Bailey 9.5mm carb).
— 41oz.in. at 18,800rpm (Open Ex).

RPM standard propellers

8 × 6 Zinger — 15,960 (Open Ex/5% nitro/8.8mm carb).
7 × 4 Taipan — 23,640 (Open Ex/5% nitro/8.8mm carb).
7 × 4 Zinger — 23,230 (Open Ex/5% nitro/8.8mm carb).
7 × 4 Taipan — 24,500 (OPS pipe early style/50% nitro Preston 9.5mm carb).

Performance equivalents

BHP/cu.in. —	6.62
BHP/cc —	.40
Oz.in./cu.in	236.0
Oz.in./cc	14.40
Gm metre/cc —	10.48
BHP/lb —	2.24
BHP/Kilo —	4.94
BHP/sq.in. frontal area —	.306

Manufacturer

OS Engines, Osaka, Japan.

UK Distributors

OS Products Ltd., New Southgate, London N11.