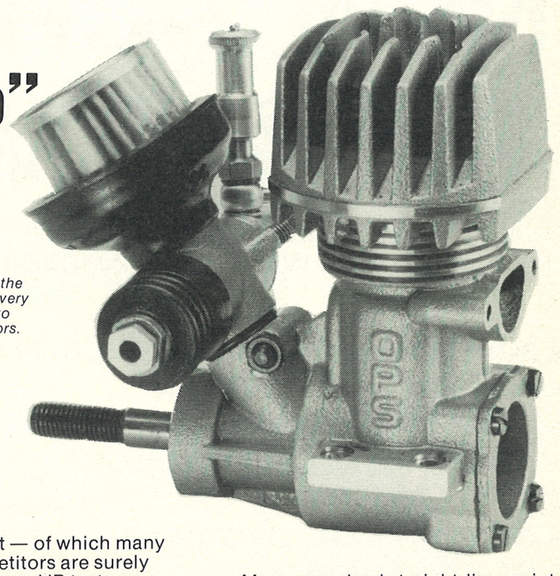
OPS 3.5 "Competition Pro"

IN THE FACE OF strong, authoritative competition during the past year from *Rossi, Nova Rossi* etc. the *OPS* car engine has maintained its firm hold on the top international racing honours with the World Championship results in Tokyo this summer being the highlight. The statistics seem an impossible act to follow: of the first ten placings eight were *OPS* engines; only Koma in second place and Kishi in tenth place (both with the new *OS* VF-R) dented a possible *OPS* first to eleventh whitewash.

These results clearly have much to say for the sheer reliability of the current *OPS* 3.5cc engines and the associated consistency of performance between each sample "out of the box."

There seems some evidence that in order to achieve this very consistency of engine performance, *OPS* may have opted to avoid the extreme measures of a seductive HP chase — though for commercial reasons higher power figures are still being *spoken* of (certainly than of those reached during this test at least).

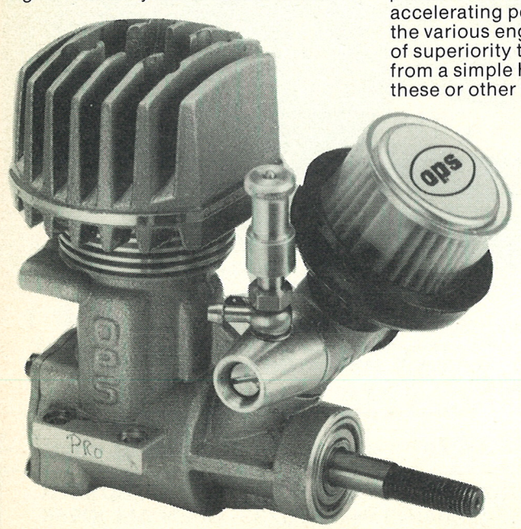
It must be said that at present the achievement of around 2HP is only likely to result from a narrower rpm band of useable power and which may follow the raising of exhaust timing towards 180° and moving of the HP peak higher, towards, say 33,000rpm rather than the current 27,000rpm area. These changes are unlikely to make a 1/8th scale car easier to drive, quite apart from the likely erosion of engine reliability which would result.



Right; a casual glance at the OPS 'Comp/Pro' reveals very little external difference to previous OPS 3.5cc motors.

One further point — of which many experienced competitors are surely already aware — these HP tests inevitably show the result of motors in flat-out full-throttle conditions because, to measure HP using current techniques requires the rpm to be fixed at the point under scrutiny. In practice the variation of rpm is often no more than 50 or so at a typical 30,000rpm. In track use the engine is rarely, if ever, in that 'stationary' situation — it is either accelerating or decelerating. This means that these HP tests are not revealing the relative performances of all the 'top' engines as they accelerate, whether with gradually compensating throttle openings or with throttle fully snapped. Open from the start. It is possible therefore that such relative accelerating performance might place the various engines in a different order of superiority than might be evident from a simple HP list garnered from these or other tests.

More organised straight-line sprints (drag-races) would answer some of these points, though so much would come to depend on tuned pipe length, carburettor design and settings, rate of throttle openings. This veritable minefield of variables would equally affect a possible dynamometer simulation. One thought might be to use a large rotary mass on the crankshaft — somewhat representative of the real car's inertia, and then to monitor the "time to accelerate" from a particular low rpm point to a final, much higher point. Other ideas from readers would be welcome.



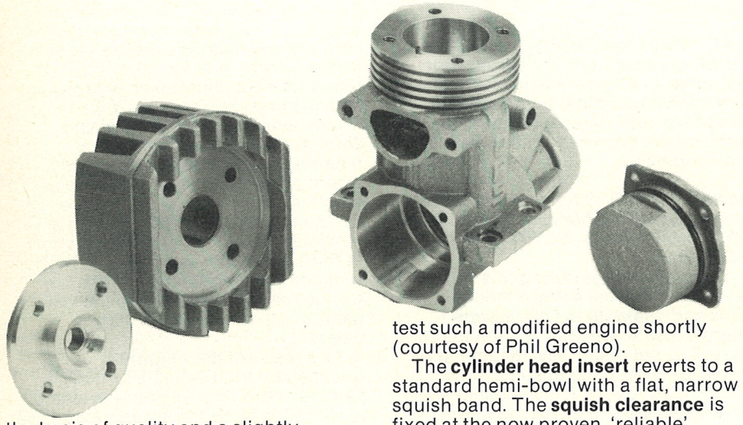
Left; typical high quality of manufacture and attention to detail is a hallmark of this latest OPS unit.

Mechanical points

Interestingly, the 'Professional' variant of the *OPS* car engine differs internally from the standard 'Car Competition' engine in 'reliability improvements' only . . .

The **crankpin** is now hard chromed (to inhibit bearing 'pick-up'). The aluminium alloy **connecting rod** is now fine shot blasted to increase resistance to fatigue. The **crankshaft bore** is now flared out towards the web's outer diameter — which probably helps to maintain a more consistent oil mist in the orbit of big-end bearing travel. I have no definitive information on this point though it might be said that it does not appear to be a performance improver if these test results are any guide.

The **liner/piston** combination is geometrically identical to the standard 'Car Competition' set-up and has port timings no different either from those of the 1983 rear-exhaust engine. The combination is however specially drawn off the production line for fitment to this 'Professional' engine on the basis of quality and a slightly tighter piston fit than standard. Consequently they require (as does the harder crankpin) a longer running-in period than is customary for *OPS* engines. The liner is now pinned to prevent misalignment on reassembly. The exhaust timing as standard remains conservatively low at 162° and this rises to only 166° even if the steel under-flange liner shims are fitted. (These come as part of the 'Pro' package).



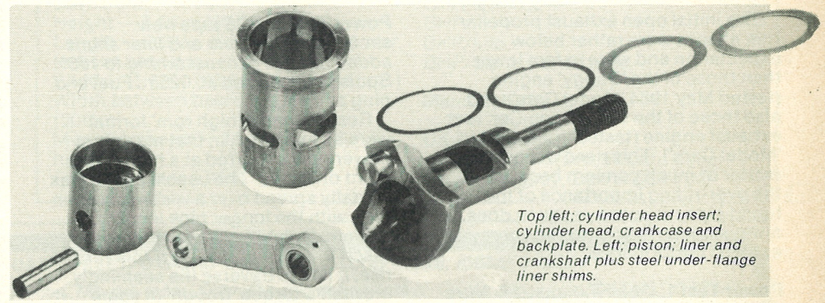
In general this points to a restriction on higher power levels, and it appears that *OPS* car engines respond favourably to the raising of the exhaust port timing only. It is hoped to test such a modified engine shortly (courtesy of Phil Greeno).

The **cylinder head insert** reverts to a standard hemi-bowl with a flat, narrow squish band. The **squish clearance** is fixed at the now proven, 'reliable' figure of .025in. (.6mm), though it is recognised that this results in a slight power loss.

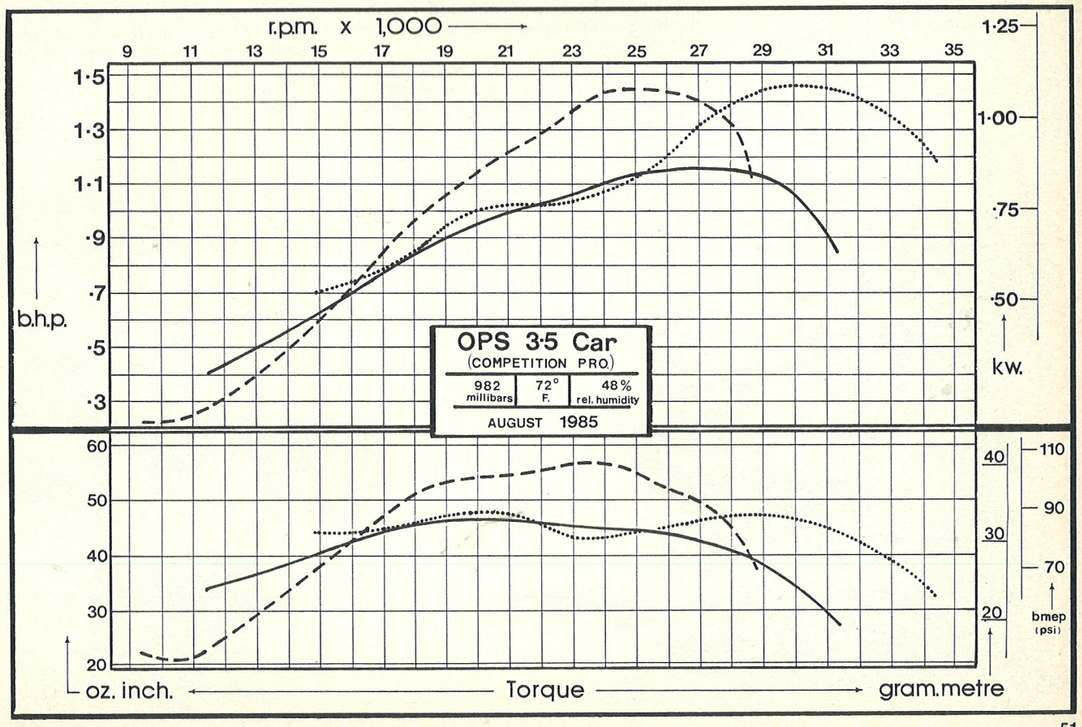
The **slide carburettor** is now fitted with a brass barrel as standard, which though much heavier resists wear more effectively than the earlier aluminium type. The **choke diameter** is enlarged to a full 10mm.

The **cylinder head heatsink, crankcase and backplate** from the 1983 engine are still retained in this latest 'Pro' version, and a high-speed Tufnol caged main bearing is fitted as standard.

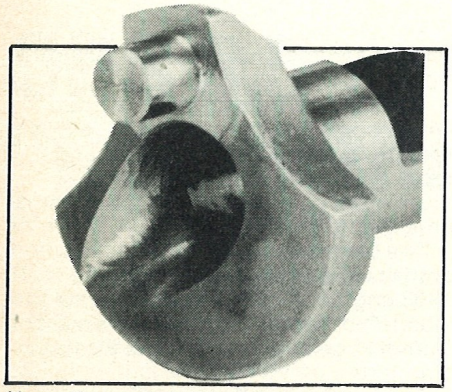
As can be seen, the total 'Pro' package is essentially a continued building onto a known, race-proven layout, and as such, follows successful engineering practice elsewhere. It is interesting to speculate whether competitive pressures will though finally persuade *OPS* to make a radical ▷



Top left; cylinder head insert; cylinder head, crankcase and backplate. Left; piston; liner and crankshaft plus steel under-flange liner shims.



Engine Test No. 20



Above; the crankshaft bore has now been flared out, possibly to increase the lubrication area for the big end bearing.

change to what is now a quite familiar design in order to reach the 2HP mark more precisely.

Performance

The initial open exhaust propeller rpm checks were rather below expectation and were in fact lower than those of the 'Buggy' engine (tested May 1984 'Model Cars') and also those of the 1983 'Open Car' rear exhaust engine (tested June 1984 'Model Cars'). This need not be a matter of much concern because of the over-riding importance of the tuned pipe response — which does not always relate directly to the open exhaust performance.

Power Test 1. *Open Exhaust/5% Nitro & 15% Castor oil/SG0303 plug*

Torque readings confirmed the picture as presented by the standard prop rpm checks — that values were slightly below those of the 1983 rear exhaust engine. As customary though the *OPS* was rock-steady and quite pleasingly predictable in carburettor response. Peak power was reached at very similar point in the rpm scale to that of the 1983 engine, seeming to conform the geometric similarities of both engines.

Power Test 2. *OPS tuned pipe (300mm plug to end of rubber can)/50% Nitro & 4% Castor with 11% ML70 synthetic oil/SG plug*

Torque readings during this test revealed the usual pattern though 'dips and peaks' in the curve were slightly less sharp than is often the case. The net result was, in tuned pipe terms, a power band of some smoothness but which, almost as a consequence, lacked the very high peak torque values previously seen.

Power Test 3. *OPS pipe now shortened to 250mm and liner shims added to raise exhaust timing to 166°.* Squish maintained at .025in. Fuel and plug as Test 2

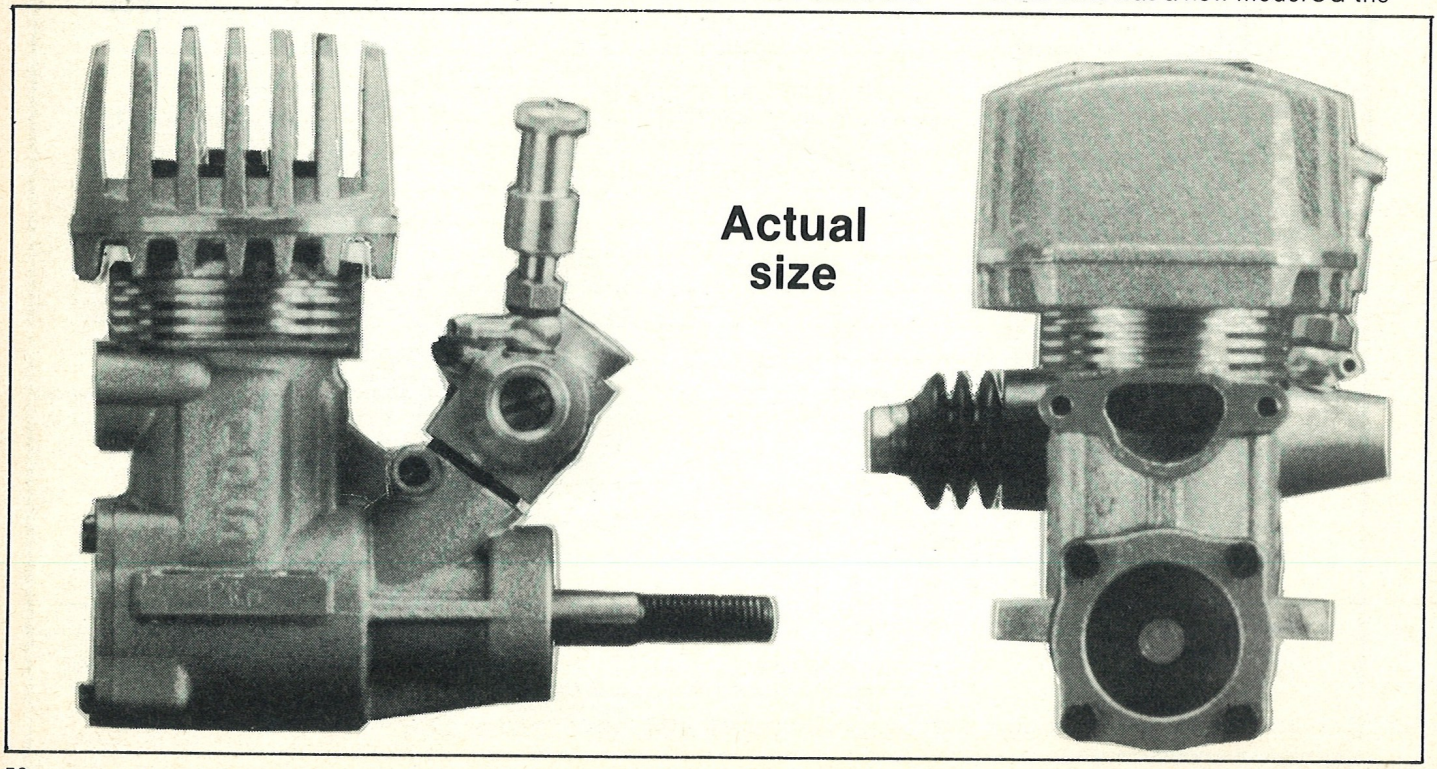
Results in this 'high rpm' format were as expected, in that maximum power now occurred at a higher rpm point of 30,100. The usable power was actually spread over a *wider* rpm span than with the longer pipe length of 300mm. But, before the engine can reach the start of that high rpm torque rise, it has to traverse the seemingly inevitable torque 'trough' of some severity in the 23,000 rpm area. Again the longer pipe length looks the better bet all round.

Following the relatively restrained power levels during these three tests, dynamometer checks were made and zero's re-established . . . but all looked in good order. A few brief torque readings were undertaken with the squish band clearance narrowed to .012in. whilst on both 300mm and 250mm pipe lengths. This had a meaningful effect at one point only, when, on the long pipe, 60oz in. was reached for the first and only time during this test (at the 24,000rpm area) — which still left the engine just short of the 1.5HP mark. At lower and higher rpm points on both pipe lengths the torque readings relapsed to the values gained with the .025in. squish clearance.

As a result of this slightly unexpected total result, a further sample of the 'Pro' engine was tested at a later date, and with more extensive running-in it was hoped to achieve a result somewhat nearer the manufacturers' claim of 1.93HP at 29,500rpm. In the event, this '2nd try' absolutely confirmed the high consistency of recent *OPS* products, for, even following a longer running-in period, the power results in open exhaust, tuned pipe, and the standard propeller rpm figures all were, within measurement error, identical to engine 1 — ranging in rpm from 9,000 to 35,000!

Of some interest during the 70 separate runs covering the two engines was the fact that at no time did the monitored pipe pressure exceed 1.2 psi whereas with HP levels in the 1.7 area pressure readings of 1.5 psi plus are the norm when the engine reaches the maximum pipe resonance points.

The glowplug used throughout most of the tests was a new model *SG* the



SG '0303', which is of similar heat value and robustness to the well-proven *OPS* 300. Comparative checks during early runs indicated similar response.

Whether the *SG* plug would actually have survived a 2HP run was however not ascertained but it appears there is now a promising new source of strong glowplugs for competition use.

Summary

This test of the *OPS* 'Pro/Comp' engine proved a difficult matter in some ways. Its sheer reliability and soundness of performance remain a hallmark, and which was again undeniably present on this occasion.

The 1985 competition results — at the highest level — seem to mock the possibility that the engine may be operating so successfully from a power base actually lower than that of earlier *OPS* models, or that of some current competitor engines. In addition the manufacturers' power claim rests as a sort of mute challenge which I, at least, have not been able to meet.

In practice of course, there are many reasons for competitive success in the model car world, as elsewhere . . . vehicle preparation, driver skills, organisational back-up, etc., and the addition to these of a ready supply of really consistent engines 'out of the box' must be a definite advantage.

In the meantime one can only wonder how this fascinatingly 'private' Italian battle will develop.

Dimensions and weights:

Capacity — .2115cu.in. (3.465cc)
Bore — .6543in. (16.6mm)
Stroke — .629in. (16mm nominal)
Stroke/bore ratio — .96/1
Timing periods —
- Exhaust — 162°
- Transfer — 132°
- Boost — 129°
- Front induction —
- Opens — 31° ABDC
- Closes — 58° ATDC
- Total — 207°

Combustion chamber volume — .36cc
Compression ratios —
- Effective — 7.4/1
- Geometric — 10.6/1

Cylinder head squish clearance — .025in.
Squish angle — 0°
Squish band width — 2.2mm
Crankshaft dia. — .4723in. (12mm)
Crankpin dia. — .1972in. (5mm nominal)
Crank bore — 9mm
Crank nose thread — .2445in. × 28 TPI (¼ UNF)
Gudgeon pin dia. — .1572in. (4mm)
Connecting rod centres — 30mm
Carb bore — 10mm
Height — 3.59in. (91mm)
Length — 2.34in. (59.5mm) (rear cover to front bearing)
Width — 1.72in. (43.5mm) (across lugs)
Width between bearers — 1.18in. (30mm)
Mounting holes — 16 × 36mm × 3mm holes
Frontal area — 4.94sq.in.
Weight — 10.3oz (.292 kilo)
Piston weight — 4 gm

Performance

Max BHP
1.44 at 30,100rpm (pipe at 250mm/50% nitro)
1.13 at 26,500 rpm. (Open exhaust/5% nitro

MaxTorque
57oz in. at 23,750rpm (pipe at 300mm/50% nitro)
47oz in. at 19,630rpm (Open exhaust/5% nitro)

RPM on standard propellers
8 × 6 Zinger — 15,350 (Open Ex/5% nitro)
7× 6 Taipan — 18,600 (Open Ex/5% nitro)
7 × 4 Taipan — 23,400 (Open Ex/5% nitro)
7 × 4 Taipan — 25,320 (Pipe at 300mm/50% nitro)

Performance equivalents:

BHP/cu in. —	6.80
BHP/cc —	.415
Oz in./cu.in. —	269
Oz in./cc —	16.45
Gm metre/cc —	11.86
BHP/lb —	2.23
BHP/kilo —	4.93
BHP/sq.in. frontal area —	.29

Manufacturer:
OPS, Monza, Italy.
UK Distributor:
MacGregor Industries Ltd., Canal Estate, Langley, Berks. SL3 6EQ.