# OPS 3·5cc Rear Exhaust CAR

THIS MONTH'S TEST is of the 1983 engine as used at the World Champs in Carnoux and in the view of many, is arguably the 'market-leader' in terms of power and reliability combined. It is the third *OPS* 3.5 car engine to be reviewed in this series, with detail improvements again being featured rather than any large scale design changes; once again the small subtle alterations have provided another higher 'bench-mark' of power output, whilst determinedly holding on to that highly regarded and hard-won reliability so much a feature of modern *OPS* engines.

## Mechanicals

Externally, little has changed from the 1982 R/E model — the sand-cast **crankcase** is still used, though, with the modification that the Rear Exhaust stack is now appreciably opened out downwards to remove flow restriction.

**Crankshaft;** now has improved shaping at start of induction bore (itself still at 9mm), whilst timing is altered to a large total period of 209° — this extra 26° being made up by 13° earlier opening and 13° later closing.

**Liner;** still in brass and chromed internally, this now has top and bottom edges of *all* ports angled: exhaust down 20°; transfer up 20°; and boost up 60° (was 50°). Bore size .002in. tight at TDC.

**Connecting rod;** now reduced slightly in weight by minor machining of non-load bearing areas. Still of high-duty alloy — bushed at big-end only, with one lube hole on non-thrust leading side.

**Cylinder-head;** heatsink is of improved design — rough cast heat-dissipating finish — ¼oz. heavier with fins more widely spaced (6mm instead of earlier 4mm) and taller, extending down below liner flange.

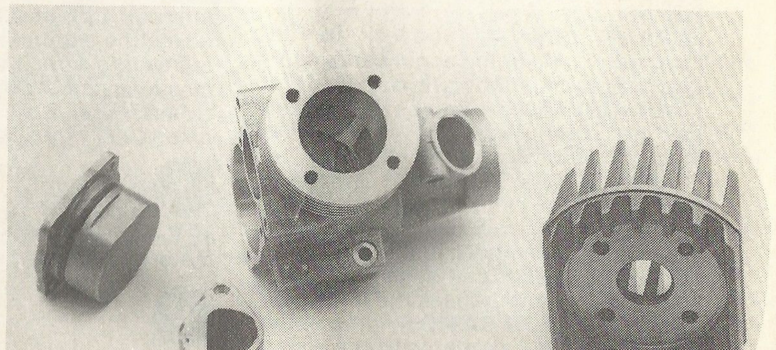
The combustion chamber separate insert undergoes an interesting change in view of the very tight squish clearances previously used by *OPS*. Instead of the usual flat squish band (horizontal or angled up) there is now a trumpet-style chamber — achieved by 'rounding-off' the previous sharp-cornered squish band. Clearance is now set at a much larger .022in. (3 × .008in. and 1 × .004in. gaskets were fitted to this test engine to this writer's initial consternation!) Previously squish has been cut right down to .005in. As trumpet heads have often been most effective at high compression ratios and tight clearances, this latest *OPS* set-up seems a clear move towards greater long-term reliability of both engine and glow-plug element. To a large extent therefore *OPS* have apparently sacrificed some of a certain power gain to increase general running reliability. *OPS* have further advised that engines for use in UK are set up with larger clearances (probably to offset the generally denser air due to lower average temperatures).

**Slide carburettor;** continues with the 9mm bore — but is now modified to incorporate the more conveniently placed vertical needle fuel valve.

**Backplate** — again uses 'O' ring sealing method, but interestingly this is now reinforced by addition of a normal paper gasket.

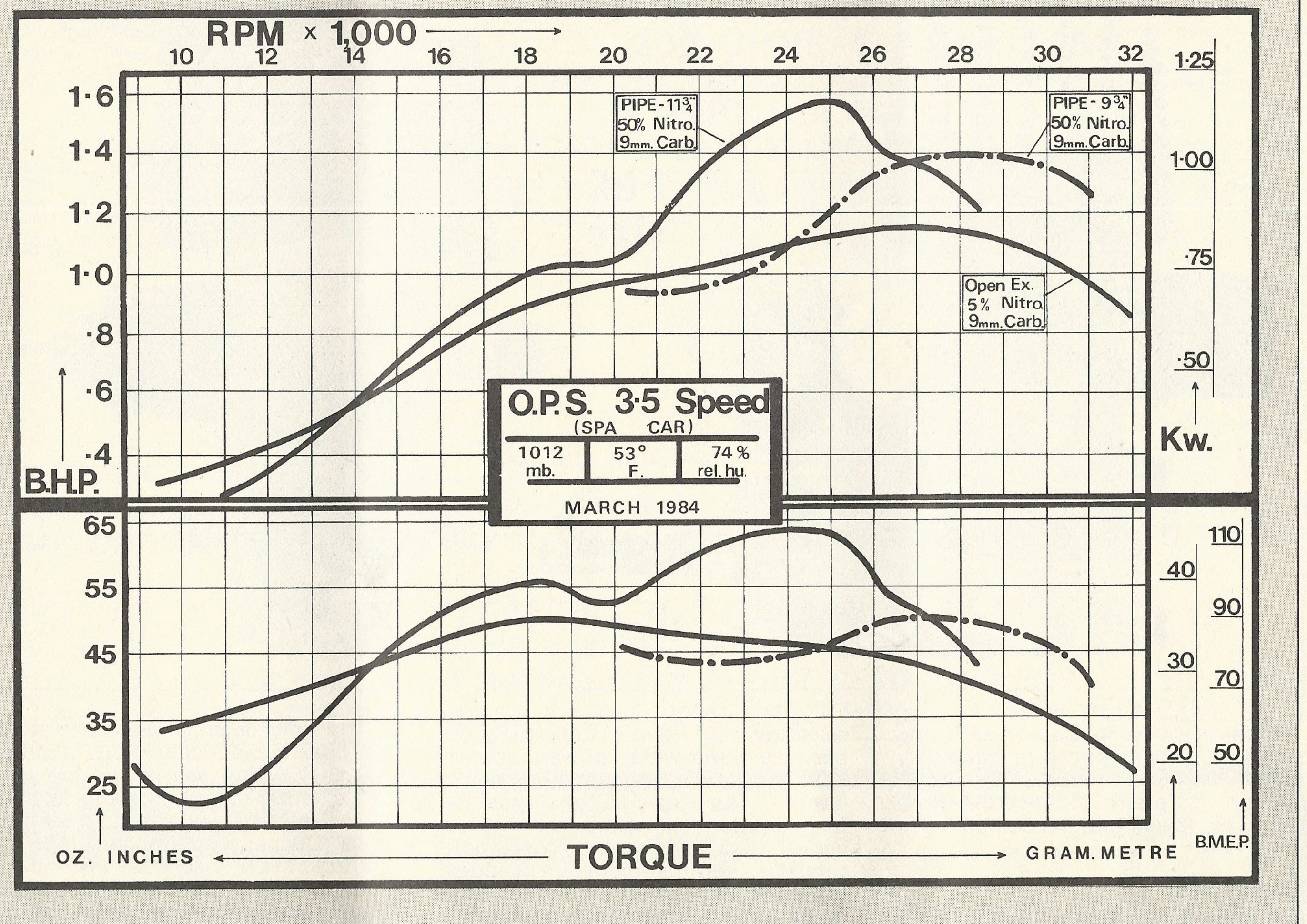
## Running-in and rpm checks

This manufacturer is now almost at the point of advising users *not* to run-in their (ABC) engines — so strong is their advice to operate at maximum bhp points and at temperatures of normally expected use. Their other related strong point is towards cleanliness of operation. The writer's experience is that both these 'principles' can result in consistently reliable performance at high power levels.



*Right: cast components of the OPS 3.5 showing O-ring sealed backplate sand cast crankcase and improved heat dissipation cylinder head.*






# OPS 3·5cc RE CAR

### Dimensions and weights

**Capacity** — .212cu. in. (3.48cc).
**Bore** — .655in. (16.6mm).
**Stroke** — .631in. (16mm nominal)
**Stroke/Bore ratio** — .96/1.
**Timing periods** — Exhaust 162°
— Transfer 126°
— Boost 124°
— Front induction opens 30° ABDC; closes 59° ATDC; total 209°.
**Exhaust port height** — .213in.
**Combustion chamber volume** — .36cc.
**Compression ratios** — Effective 7.4/1; geometric 10.6/1.
**Cylinder head squish/angle/width** — Continually flared trumpet shape — (min. clearance .022").
**Crankshaft dia.** — .4722in. (12mm).
**Crankpin dia.** — .1966in. (5mm).
**Crank bore dia.** — 9mm.
**Crank nose thread** — .244in. × 28tpi. (¼UNF).
**Gudgeon pin dia.** — .1572in. (4mm).
**Con-rod centres** — 30mm.
**Height** — 3.59in.
**Length** — 2.7in. (To front of prop. driver).
**Width** — 1.72in. (Across lugs).
**Width between bearers** — 1.18in.
**Mounting holes** — 16 × 36 mm × 3mm holes.
**Frontal area** — 4.94sq. in.
**Weight (with 9mm carb.)** — 10¼oz. (.29Kilo).

### Performance:

**Max. BHP** — 1.57 at 24,930rpm (OPS pipe/50% nitro./9mm carb.); 1.16 at 26,510rpm (open ex./5% nitro./9mm carb.).
**Max torque** — 63oz. in. at 24,210rpm (OPS pipe/50% nitro.); 50oz. in. at 17,640rpm (Open ex./5% nitro.).

### RPM standard propellers

8 × 6 Zinger — 16,410 (Open Ex./5% nitro.).
7 × 6 Taipan — 19,210 (Open Ex./5% nitro.).
7 × 4 Taipan — 24,900 (Open Ex./5% nitro.).

### Performance equivalents

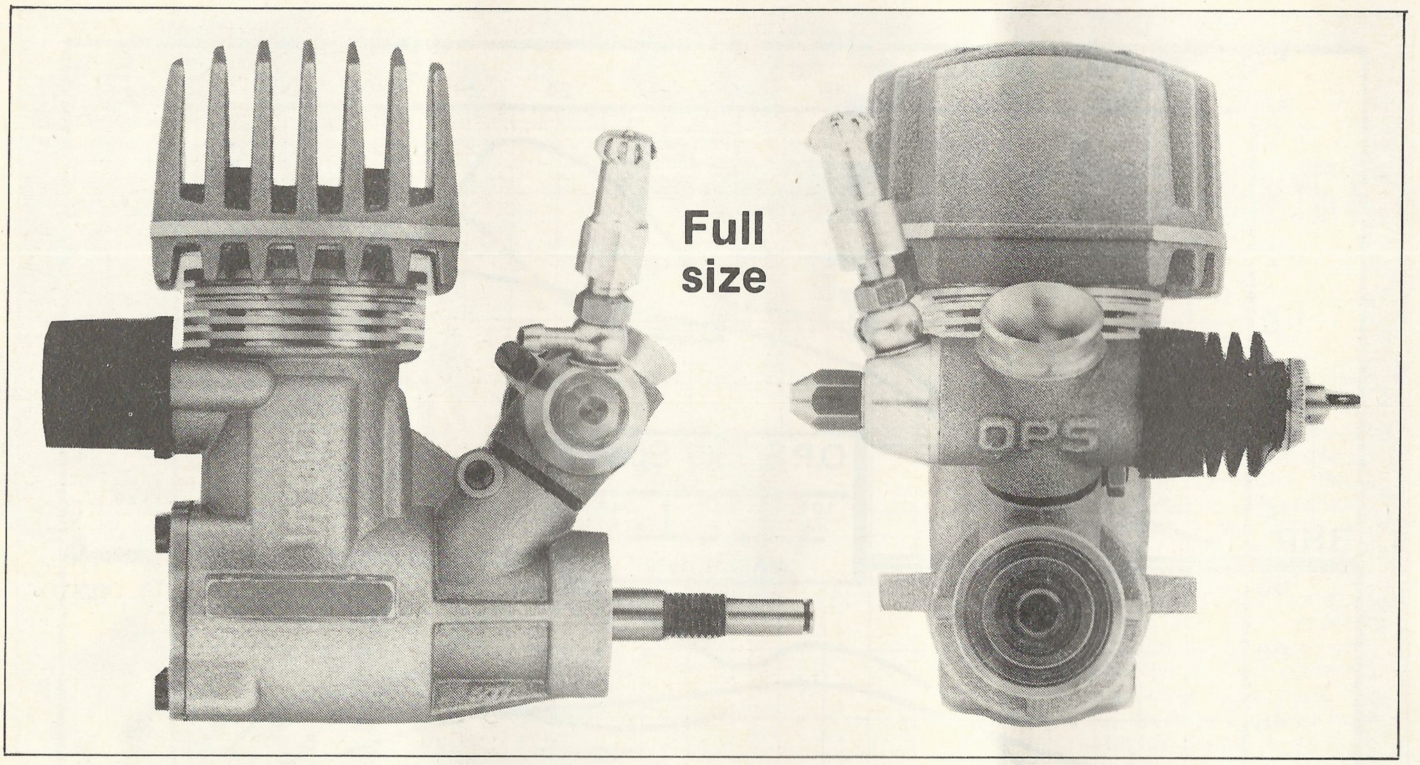
| | |
|---|---|
| BHP/cu. in. | 7.4 |
| **BHP/cc** | .45 |
| **Oz. in./cu. in.** | 297.1 |
| **Oz. in./cc** | 18.1 |
| **Gm metre/cc** | 12.93 |
| **BHP/lb.** | 2.45 |
| **BHP/Kilo** | 5.41 |
| **BHP/sq. in. frontal area** | .32 |

### Manufacturer

*OPS, Monza, Italy.*

### UK Distributor

*OPS Distribution Ltd., 512 Berridge Road West, Hyson Green, Nottingham.*




RPM levels reached early on, using standard propellers were markedly higher than previous best figures — though different carburettor bore sizing made some of the comparisons uncertain.

## Power test 1

**Equipment** - *Open Exhaust/5% nitro./15% Castor/9mm carb./OPS 300 plug.*

Consequent on the high rpms just seen, it was no surprise that torque readings were soon up to the 50oz. in. mark, (a figure not long ago deemed respectable whilst using tuned-pipe and 50% nitromethane!) Also, good torque was maintained even in the post-30,000rpm area.

## Power test 2

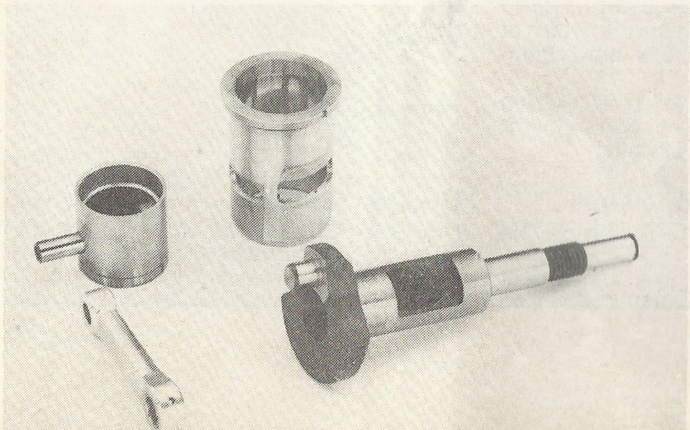
**Equipment** - *OPS tuned quiet pipe (rubber silencing can style) at 11¾*in. plug to end can./50% nitro./10% ML70 and 5% Castor/9mm carb./OPS 300 plug.

Using the *OPS* recommended length for this pipe proved that the factory have done much work on pipe selection and length determination, because band-width proved acceptably wide plus being at high power level — the final 1.57bhp was the highest figure yet recorded in this test series for 3.5cc engines in standard trim. It is likely that reduction of squish to around .010in. would increase power up to 1.7bhp using above equipment. This appears to tie in with an *OPS* figure of 1.57bhp on tuned pipe and 25% nitro. (Probably on tight squish). The officially quoted 1.3bhp at 27,000 for the car engine refers to straight fuel and pipe.

## Power test 3

**Equipment** - *OPS pipe now at 9¾*in. plug to end can. Other spec. as test 2.

In pursuit of further information, this higher rpm curve revealed the usual sideways shift up the rpm scale when pipe is somewhat shortened. As noted before, handling became more critical at 'correct' pipe resonance and beyond, with general performance being more ragged and inspiring less confidence than when using the recommended length of 11¾in.



*Left: internal OPS components, piston and con-rod liner and crankshaft. The latter is already finished for use with the SG 'Columbia' clutch system. Other types are available.*

The only negative aspect to report has been subject of previous comment — the 'O' ring seal to needle valve movement became progressively stiffer to operate when using high-nitro fuels. Deeper 'knurling' was filed into control knob because the normal shallow knurling provided inadequate finger grip following onset of this problem. As mentioned before — in actual car use, such stiffness could be a boon — preventing unwanted movement of precise settings — but on the dynamometer where continual variability of settings is required, it's a problem. Strangely, from some enquiries made, the writer appears to be alone in having this problem . . . could be an interesting separate subject for a full test!

## Summary

With each succeeding test in this series, the subtle confidence generating qualities of *OPS* engines have become more manifest to this writer. Amongst the more positive aspects is a truly clean, wide-band, and storming performance on tuned pipe (when at recommended length) such as has rarely been the case with most of the competitive motors in this class. This must indicate considerable work has been undertaken by the manufacturer in this one area alone, quite apart from the necessarily related mechanical reliability features continually being incorporated in order to withstand the strong power outputs likely with correct pipe performance. The way of the racing-engine manufacturer is hard indeed.