ENGINE TEST

OS Engines' VF-R motor achieved second place at the 1985 World Championships against stiff Italian competition. Mike Billinton discovers how *OS* are 'keeping touch'

FIRSTLY, my apologies for the delay in this sequence of car engine tests — due mainly to a major re-siting of the dynamometer facility at Santa Pod. (I can now watch full-size drag-racing at a discreet distance whilst revving up the Rossi's and OPS's of the model world!). The forward Test schedule following this first 'new-siting' test of the top *OS* engine is hoped now to be: *NovaRossi* (Redhead), *OPS* (Greeno-tuned), *SG21*, new 5-port *Picco* or *Mantua*.

The *OS*21 VF-R is the motor which was placed 2nd and 10th at the World Champs. (Tokyo) July 1985, in the hands of J. Koma and K. Thukishi — driving for 'upright' needle control was very accurate new Japanese engine followed these good results — achieved against a veritable deluge of *OPS* placings at that meeting.

Not surpisingly both this new engine and that successful *OPS* 'Pro-Comp' model are, together with others, being persuaded along the same development route due to the advent of the now almost mandatory 4WD; i.e. that of increasing engine torque at the 16,000 rpm point onwards (roughly where clutch starts to bite), mainly in order to cope with the dramatically increased traction offered by 4WD. Failure to do so leads to a motor unable to get onto the rising power curve or more simply, 'bogging-down'.

The arrival of automatic two-speed gearboxes could mitigate this problem enough to see some engines reverting to earlier high rpm/high and narrow peak power points (plus the usual 'hole' in the torque curve at lower rpm).

However, the two-speeder does not strictly provide a wide enough gearing (witness some 12 speeders used in full-size motor-cycle piped two-stroke racing engines — albeit covering a much larger road speed envelope), therefore there will be a great deal of reluctance to abandon the higher torque at lower rpm engines currently finding favour. Particularly so as engine handling and reliability appear to have been enhanced in part by the slight relative lowering of rpm maximum HP points.

Comparison of the earlier *OS*21 VF-C (tested for 'Model Cars' Oct./Nov. 1983) with this latest VF-R shows this rpm shift, but more remarkable has been the large torque improvement. Clearly the *OS* engineers have been working on the problem of the relatively low-level response to tuned pipe use of that earlier engine — to such an effect that in torque terms at least the VF-R is now a very competitive engine.

This strong torque surge is not however maintained quite as far up the rpm band as has been found in some other competitors engines, and this results in a slightly restrained final HP maximum.

Mechanical pointers:

With considerable similarity between the VF-C and VF-R engines, it seems preferable to comment mainly on the differences:

1. Externally distinguishing features of the new model are the new 9mm slide carburettor, the more solid die-cast finish cylinder head with wider spaced and squarish plan-form finning and, on this test engine at least, a narrow turned 'cosmetic' groove on the front housing/front bearing section.

2. The cylinder head has a small 'ventilation' hole near the plug position to keep its temperature at reasonable levels by air replacement.

3. The plug thread is the more reliable brass insert, which paradoxically threatened problems during the test — from a source which has potentially affected other previous tests, though not as in this case, almost to a point of stoppage . . . The fine *OPS* 300 plugs are just that — fine. But they do have a detail fault in that *occasionally* the crimped coil ending intrudes out into the thread proper. Failure to file this down to below the thread height allows this hard coil material to damage the thread in the head. This should be noticeable when screwing the plug in. However, sometimes it is only manifest during removal, following which matters rapidly get fraught!

The brass insert of the *OS* head could almost be faulted for being too good in this context, for on one occasion a lengthy 'to and fro-ing' of plug spanner and oil application only just enabled the plug to be finally freed. Usually the much softer alloy head material gets moved aside by this protruding piece of element material — not so the brass insert. None of this is good practice — the plug needs preliminary trimming — using eye-glass if necessary; the head itself is beyond blame.

4. *OS* have continued with the same separate front housing — so it is worth Loctiting those front 4 bolts. There is now an oil channel in the housing just aft of the front bearing — and connects in the usual way to the base of carburettor via a small air slot.

5. The cylinder timing appears slightly reduced — though arguably only within measurement error. Certainly the exhaust port height is more shallow (.224in. against .230in.) and adds confirmation to the lower measured 164° against the earlier VF-C timing of 166°, which may lie behind the slight lowering of rpm points noted in this test both in open exhaust and tuned pipe formats.

6. In conjunction with squish clearance increase (from .014in. to .016in.) the combustion chamber volume now results in a distinct lowering of effective compression ratio to 7.35/1 from the earlier 8.8/1.

In spite of these 'ameleorations' the VF-R did not improve on the *OPS*300 plug-crunching ability at maximum pipe resonance and 50% nitro — if anything it was more hungry than the earlier VF-C engine.

7. The new *OS* 2S slide carburettor has an enlarged 9mm bore, and features the *OS* anodised aluminium barrel found in several of their other engines. The resultant light weight/low friction ratio of this barrel style appears to restrict wear, and at the finish of the test, very little play or wear was to be seen.

The well positioned and knurled 'up tight' needle control was very accurate in use, though it too suffered from 'O' ring swelling when using high nitro fuels — to the point almost of immovability. Nice on the track? Nasty on the dyno!

The adjustable main jet gave firm control over acceleration, and throttle response was as good as can be reasonably assessed away from the track and on a test bench (this aspect of 'accelerating performance' is still under scrutiny and will form part of a future test). Idling performance itself was equally acceptable and trouble-free.

Power Tests

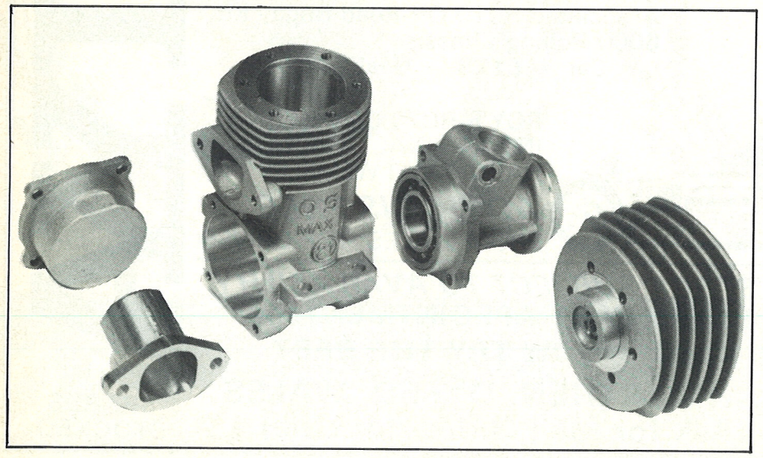
Test 1.

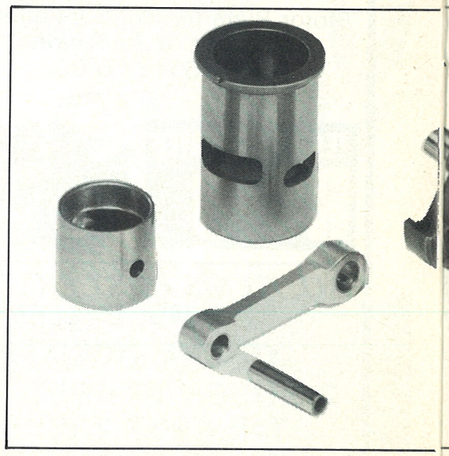
Open Exhaust. 5% Nitro/20% Castor. OS No. 8 plug.

These torque tests covered rpm points from 9,800 to 33,500, and immediately revealed the shift in performance emphasis. At 16,000 rpm maximum torque was up from 40 to 49oz.in. compared with the earlier VF-C engine, whilst at 24,000 rpm it was up 4oz.in. to 44oz.in.

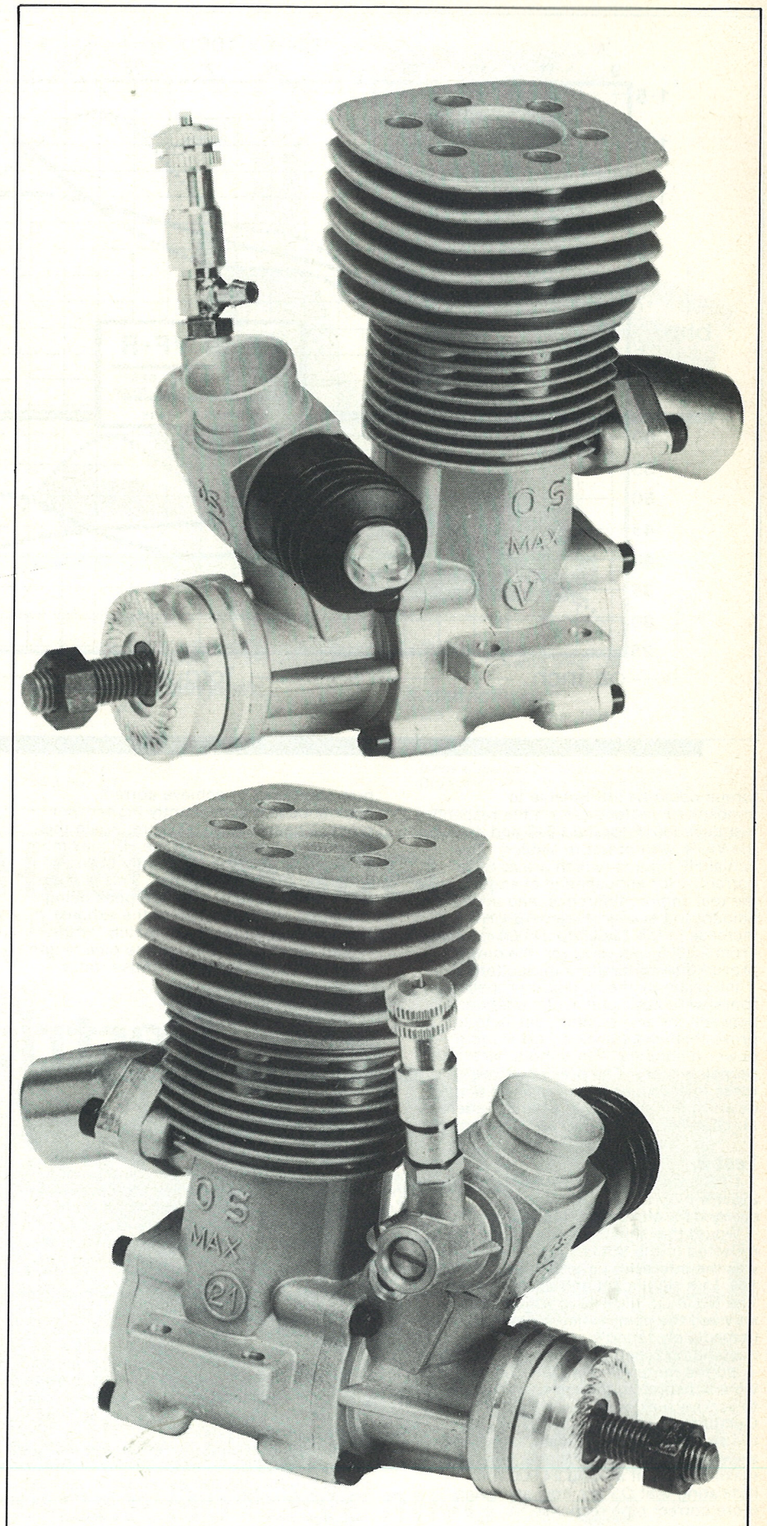
Around a third of this actual uplift in

Right: two sides of the VF-R showing typical clean lines and stylish appearance. Don't be deceived, this OS engine is a durable as well as pretty performer.

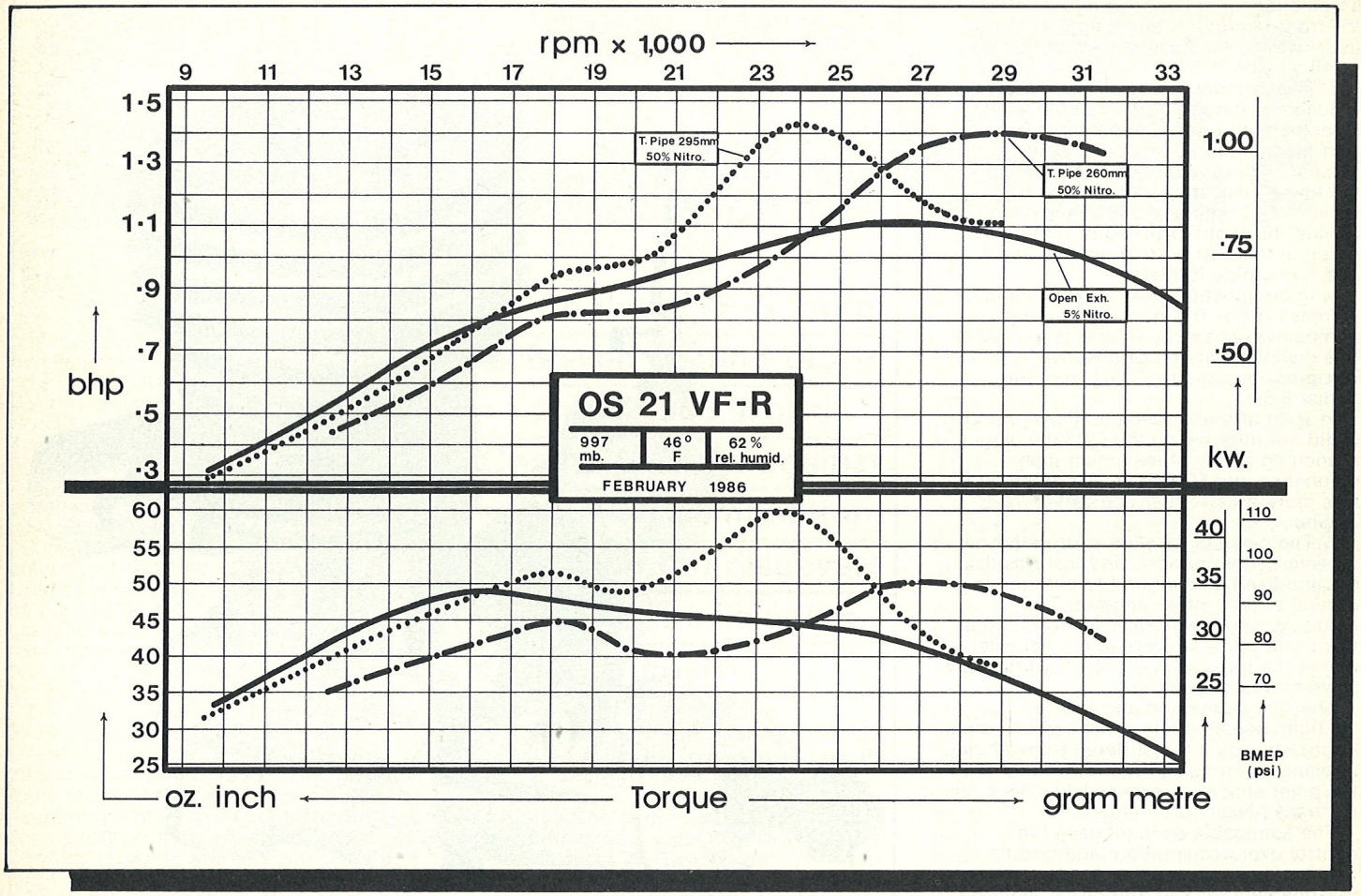




Below left: external components of the VF-R showing typical OS craftsmanship and finish. The crankcase features a separate front housing which carries both high speed crankshaft bearings. Below right: the internal components. Interestingly (and annoyingly for many) OS still persist with their double flatted crankshaft which necessitates special clutch mounting.



OS Max – 21v F-R Glowplug two-stroke single cylinder



torque could be attributable to atmospheric differences on the respective test days (80° F for the VF-C and 45° F for the VF-R: with pressure similar). The actual HP figures (which are as usual corrected for atmospheric changes), show the real *engine* difference, and appears to amount to between 12 and 16% HP increase in the 12,000 to 24,000 rpm area. From 26,000 rpm however, the new VF-R proved little different in torque terms.

Interestingly the standard propeller rpm's were not significantly changed between the two engines, seeming to prove that whilst thick air gives more power it happens also to hold back final propeller rpm's. The precise values of these interactions have yet to be pinned down in the absence of a variable density air chamber in which to test the engines!

Test 2.

OPS tuned pipe (rubber can end) set at 295mm plug to end. 50% Nitro/4% castor/11% ML70 synthetic oil.

Would the 'shift' in performance be reflected in the tuned-pipe layout? That was the interesting question. Answer — yes, to a significant and useable degree. The No. 8 *OS* glow-plug which had survived the open exhaust runs was immediately found wanting on these demanding tuned pipe and 50% nitro runs — so the more reliable *OPS* 300 plugs were substituted, though even these failed to survive maximum resonance HP. Compared with the earlier VF-C test using the same *OPS* tuned pipe, combustion appeared crisper and cleaner when at that maximum point around 24,000 rpm indicating that *OS* are now achieving more correct pipe response.

Test 3.

OPS pipe now at 260mm. Fuel and plug as test 2.

As previous tests, the pipe length was now shortened to achieve correct resonance at a significantly higher rpm point — nearer to 30,000 rpm. Again this resulted in a lowering of the HP maximum — together with the frequently observed widening of the HP plateau. This is felt to be in part a case of the high peak being 'chopped off' as a result of the exhaust timing being an incorrect match for the higher rpm's, even though the pipe length itself is of right length for those rpm's.

Summary

In spite of a relatively delicate and refined structure (compared with say a *Picco* or *NovaRossi*), the *OS* VF-R proved almost unexpectedly reliable and survived the whole test regime quite unscathed. Quality of construction remains unsurpassed and at present is probably a major factor in keeping these engines 'in touch' with the Italian HP producers.

Restrictions

Time prevented any sensible look at the effects and/or problems resulting from the proposed new rulings designed to reduce noise. From a personal point it always seems odd to see the development of fine engines being stifled (at both ends!). Admittedly they are already heavily restricted if one accepts that the maximum carburettor bore could be the same as the engine bore size!

Also one must appreciate the problems posed by noise nuisance to National bodies and organisers. Provided the motives are open and unclouded by considerations of any *HP* control 'per se', for commercial or other reasons, then the socially responsible would see the sense of such moves where locally sensitive noise situations exist.

Equally it would be nice to see a degree of tolerance being extended by those who seem to be affected by 'noise nuisance' only when it is generated by 'toys' or units performing no visible useful economic function. Apparently even a model glider was once the subject of 'noise' complaint.

This is not to belittle the subject — the problem is real — the various freedoms involved are also real. Before I forget this is an Engine Test report (!), the effect of fitting an exhaust restrictor of 5½mm and at the same time an Inlet one of 6mm (possible EFRA dimensions), was to reduce HP at the one load point measured — giving the following set of figures:

	Unrestricted	Restricted
RPM	23,550	21,000
Torque	60oz.ins.	50oz.ins.
HP	1.42	1.05

Too much importance should not be placed on this 'loss' because it will be necessary to undertake as normal a wide-ranging rpm set of torque figures to arrive at the real picture. What can be said though is that on a given load the effect of those restrictors clearly prevented the engine from reaching correct resonance as before and load would need to be reduced in order to get back to that resonance rpm point. I intend to pursue this matter also in a future test, though it may be that EFRA developments in the meantime may make them of little interest.

OS Max – 21 VF-R Glow-plug 2-stroke single cylinder

Dimensions & Weights:

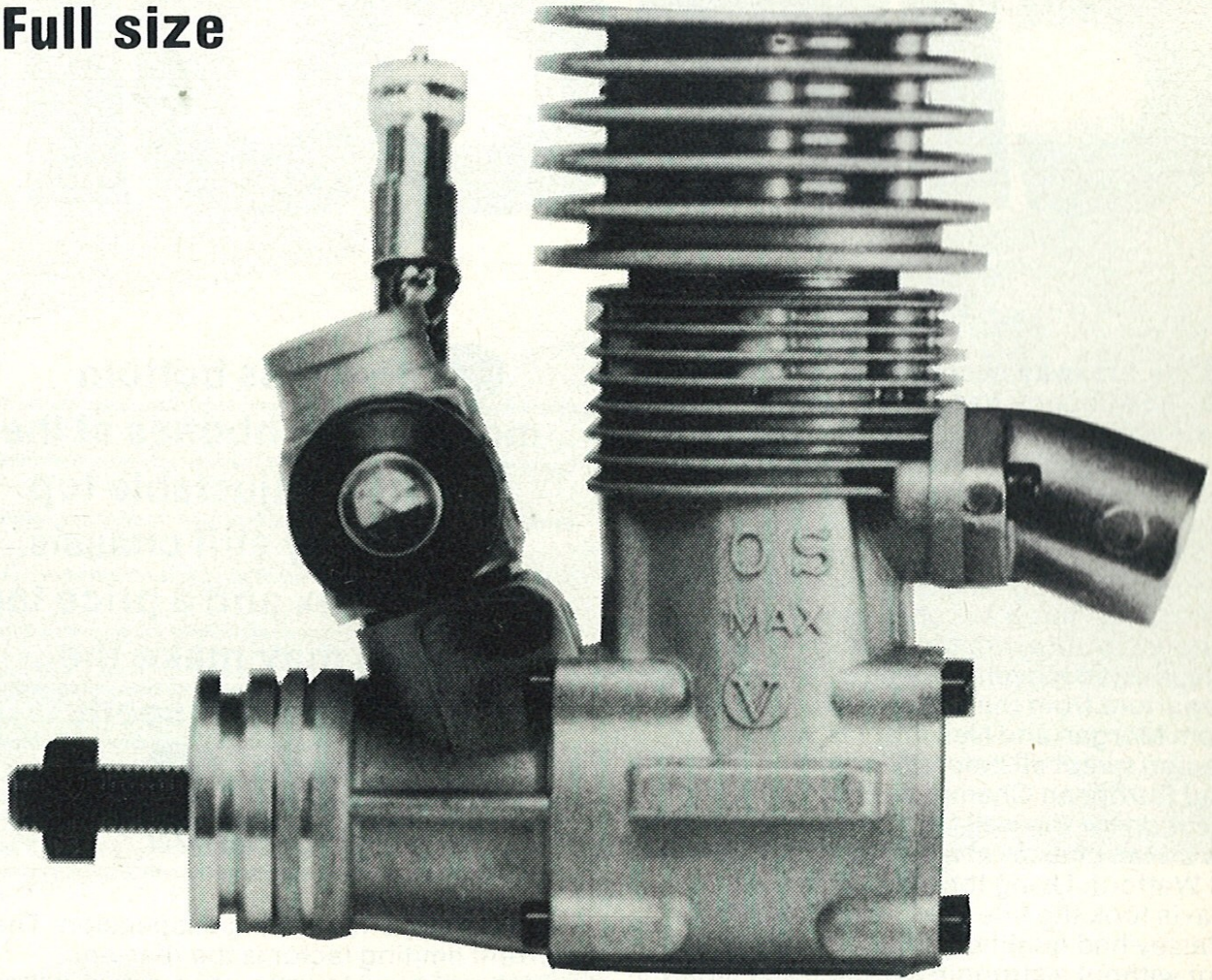
Capacity: .2109cu.in. (3.456cc)
Bore: .6532in. (16.59mm)
Stroke: .6294in. (15.986mm)
Stroke/Bore ratio: .963/1
Timing periods: Exhaust — 164°
Transfer — 128°
Boost — 122°
Front Induction—opens 36° ABDC
— closes 63° ATDC — Total 207°
Exhaust port height — .224in.
Combustion chamber volume: .35cc
Compression ratios: Geometric — 10.87/1
Effective — 7.35/1
Cylinder head squish: .016in. (.4mm)
Squish band width: .124in. (3.15mm)
Squish band angle: 2½°
Crankshaft dia.: .4723in. (12mm nominal)
Crankpin dia.: .1954in. (4.96mm)
Crankshaft bore: .342in. (8.68mm)
Crank nose thread: .2463in. x 28 tpi (¼ UNF)
Gudgeon pin dia.: .1574in. (4mm nominal)
Connecting rod centres: 29mm
Weight overall: 10.45ozs. (296gms)
Mounting holes: 15 x 38mm with 3mm holes
Width between bearers: 1.21in. (30.7mm)
Height: 3.52in. (89.4mm)
Width: 1.78in. (45.2mm)
Length: 2.75in. (69.85mm)
Frontal area: 4.76sq.in. (30.7sq.cms.)

Performance:

Max. BHP: 1.42 at 23,900 rpm. (OPS pipe/50% nitro)
1.11 at 25,870 rpm (Open Ex./5% nitro)
Max. Torque: 60oz.ins. at 23,550 rpm
(OPS pipe/50% nitro)
49oz.ins. at 16,100 rpm
(Open Ex./5% nitro)

RPM on standard propellers:
8 x 6 Zinger — 16,085 (Open Ex./5% nitro)
7 x 6 Taipan — 18,670 (Open Ex./5% nitro)
7 x 4 Taipan — 23,820 (Open Ex./5% nitro)

Full size



7 x 6 Taipan — 19,210 (Pipe at 300mm/50% nitro)
7 x 4 Taipan — 25,480 (Pipe at 300mm/50% nitro)

Performance Equivalents:

BHP/cu.in.: 6.73
BHP/cc: .41
Oz.in./cu.in.: 284.5
Oz.in./cc: 17.36
Gm. metre/cc: 12.3
BHP/lb.: 2.17
BHP/kilo: 4.79
BHP/sq.in. frontal area: .298

Manufacturer:

O.S. Engines, Osaka, Japan.

U.K. Distributor:

Irvine Engines Ltd., Unit 2, Brunswick Ind. Park, Brunswick Way, New Southgate, London N11.