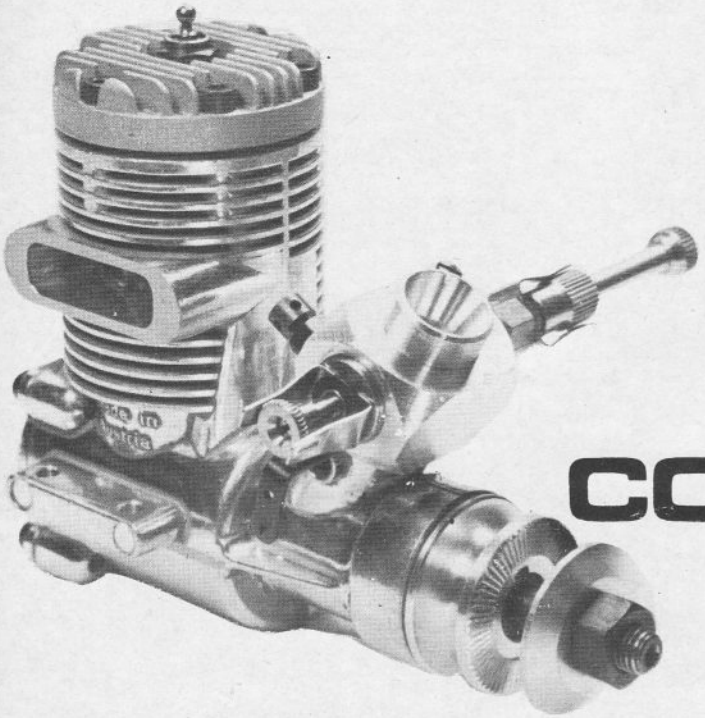


## Peter Chinn's

# RADIO MOTOR COMMENTARY

**Left: in the same class as the O.S. Max 40-FSR, the new Austrian built Webra Speed 40 R/C. Both engines are intended to set the highest standards of performance in the 40 R/C class.**

### New Generation R/C 40s

The two most widely used engines in the recent World R/C Aerobatics Championships in Switzerland were the Austro-Webra Speed 61 and the O.S. Max 60-FSR. The former, which has been steadily gaining popularity during the past three seasons, powered about half the entry, while the latter, still in its first year, seems to have made quite a good start with three models (two American and one Japanese), so powered, in the first six.

With these two engines currently enjoying such international acceptance, it is interesting to speculate on the fact that both manufacturers appear to have similar ideas about the sort of engines that the market needs. For example, while the Speed 61 and Max 60-FSR are ultra high-performance Schnuerle scavenged engines aimed primarily at the contest enthusiast, both O.S. and Webra have continued to offer the less expensive crossflow-scavenged basic designs with which they entered the 10 c.c. R/C engine lists, eight or nine years ago, in the shape of the current O.S. Max H.60F-GR and Webra-Blackhead 61. Again, both makers have crossflow scavenged, twin ball-bearing .40 cu. in. radio-control motors: the O.S. Max 40-RC which, in 1972, replaced the earlier 40-P and 40-SP models, and the Berlin-built Webra 40 first made in 1971.

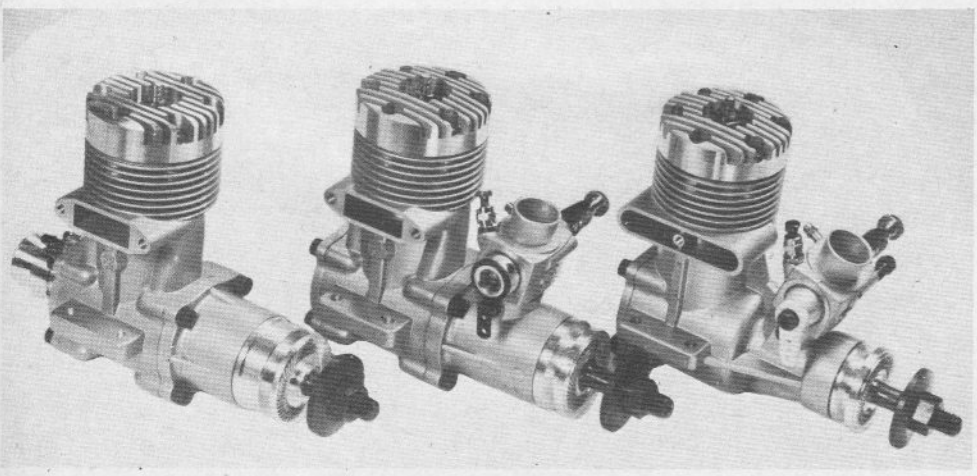
Now, both firms are taking the same line in the 40 group that they have successfully exploited in the 60 class, by producing Schnuerle-scavenged motors for those willing to pay a little extra for the highest available levels of performance in the .40 cu. in. front rotary-valve aerobatic R/C engine class.

The Webra Speed 40-RC and the O.S. Max 40-FSR may not look much alike externally, but they do have certain features in common, one or two of which set them both apart from previous 40 class R/C engines and probably point the way for rivals to follow.

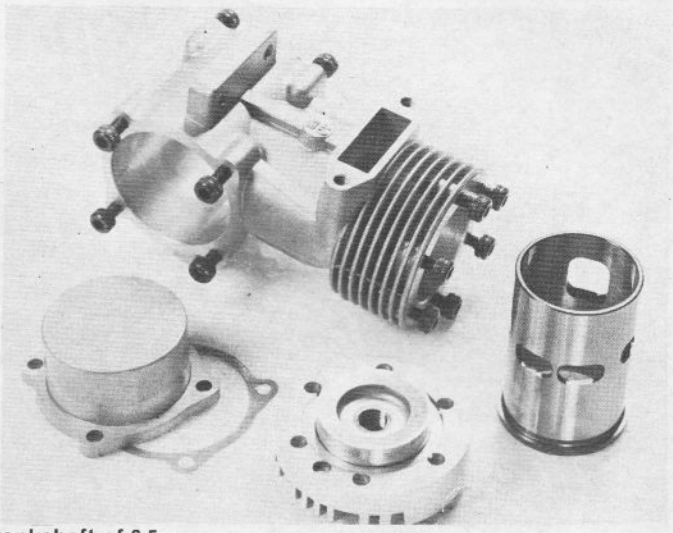
One of these is the adoption of "60" size crankshaft journals. In contrast to the 12mm main journal diameter of the German Webra 40-RC (a size shared by many other shaft valve 40s) and the 13mm journal of the Max 40-RC, both new models have 15mm shafts. (The only other 40 to use this size is the new Enya 40 which, however, is not a Schnuerle port motor). This very large o.d. has obviously been adopted mainly for the large bore gas passage it permits and, in the Max 40-FSR, this is taken to 10.8mm, in the interests of free breathing. On the other hand, the Webra Speed 40 has a 9mm i.d. main journal, the shaft's ability to accommodate a larger bore being used only in the pylon racing version of this engine, in which it is opened out to 10.5mm.

Here it is appropriate to mention the lineage of the motors under discussion. The O.S. is based on the main casting (comprising unit crankcase barrel and cylinder casing) of the Max 40-SR rear rotary drum-valve racing engine, but with modified cylinder porting, a different piston and head and, of course, totally different front and back ends, so that the general design resembles a scaled down 60-FSR. The Webra also has a 'racing' companion model (known as the Speed-40 Pylon) but here the shaft valve layout is shared by both models, the difference being confined to a few internal modifications and the replacement of the Pylon's plain venturi intake by a Webra TN carburettor. Its parentage is very much a case of "by HP 40 out of Webra Speed 61F", the same designer, Peter Billes, having been responsible for all three engines. This is very evident in the general styling of the engine, with its prominent cylinder finning extending down below the level of the exhaust duct and its tumble polished casting finish.

Structurally, the new Webra 40 is distinguished by a one-piece body casting. This contrasts with the Speed 61 and HP 40, as well as with the O.S. 40-FSR, all of which have separate front ends. Both new 40s use pressure castings with cored transfer passages. Cylinder liner porting follows the orthodox Schnuerle 3-port system, with a centrally bridged exhaust, flanked by angled transfer ports to direct the incoming charge to the left side of the cylinder, where it is then swept upward by the inclined third port. Exhaust ports are somewhat bigger in area on the Webra and are open longer: the exhaust period of the example examined was some 150 degrees of crank angle, compared with 144 degrees for the O.S., but it is possible that this may have been slightly more than standard as a check on a Webra Speed 40 Pylon yielded only 146 degrees of crank angle. The Webra transfer ports are slightly smaller than those of the O.S. but are open a couple of degrees longer. The third port, on



**Left: O.S. now offer a choice of three .40 cu. in. engines. Left is the latest version of the Max 40-SR pylon-racing motor (for which a marine conversion is also available). Centre is the new high performance Max 40-FSR discussed in this article. Right is the popular Max 40 R/C.**



**Above left: massive crankshaft of 6.5 c.c. O.S. 40-FSR uses same main journal o.d. as most modern 10 c.c. engines. Piston bosses and both ends of conrod are bronze bushed. Above right: O.S. 40-FSR is based on main casting of 40-SR pylon-racing engine but all other parts are different, including cylinder porting and cylinder head.**

the other hand, is bigger but is open for a 4 degree shorter period. The Webra has a thicker walled cylinder liner than the O.S. (1.75mm instead of 1.2mm).

Both engines use flat-crowned aluminium pistons with single, pinned rings. The Webra ring is of the Dykes type, but, whereas the Max 40-SR also uses a Dykes ring, the FSR is fitted with a conventional compression ring and one must therefore assume that the O.S company subscribes to the view that a conventional ring, less delicate and less prone to give trouble, may be better for more general R/C flying. Piston weight of the Webra is slightly less at 8.6 grammes (including ring and gudgeon pin) as against 9.0g for the O.S.

Connecting-rods, machined from bar stock for the O.S. and drop-forged in the case of the Webra, are respectively 33mm and 35mm between centres. The short length of the O.S. rod means less dead volume below the piston and higher primary compression for better pumping efficiency, but the Webra's longer length offers the advantage of reduced piston side-thrust. Both conrods are bronze bushed at each end and the O.S. also has bronzed bushed piston bosses. Both gudgeon-pins are finely finished and closely fitted for minimum wear and are retained by wire circlips.

Cylinder heads are pressure diecast with bowl shaped combustion chambers and large squish areas. The O.S. has a 13.7mm diameter bowl surrounded by a 3.7mm wide squish band. The Webra has a smaller diameter, slightly deeper, bowl and a 4.3mm squish band. As with other O.S. engines having diecast heads, the 40-FSR has a cast-in brass thread insert for the glowplug. Gaskets of soft aluminium, 0.2mm thick for the Webra and 0.4mm thick for the O.S., are fitted. Measured nominal compression-ratio for the O.S. was 11:1 and, for the Webra, figures of approximately 12.1 and 12.7 were measured on two samples, giving an average of 12.4:1.

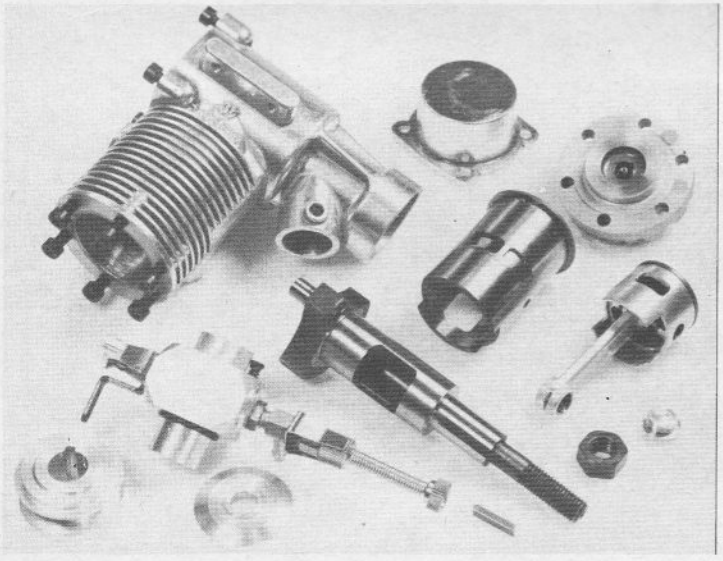
Both engines use one-piece, hardened crankshafts and in addition to sharing a 15mm main journal o.d., they both have 5.5mm o.d. crankpins, $\frac{3}{8}$ in. dia. front journals and a $\frac{1}{4}$-UNF thread for the prop nut. The Webra has a slightly longer valve port (14mm instead of 13mm) and the O.S. has a particularly massively proportioned crankweb.

Valve timings are almost identical. Checked timing of the O.S. was 34° ABDC to 49° ATDC. Checked timing of the Webra was 35° ABDC to 52° ATDC, but as a check on the Pylon version revealed somewhat *earlier* closure (48° ATDC), it seems probable that a nominal period of 195 degrees, timed 35-50°, is common to both Webra models. (One would normally expect, if valve timing were to differ at all, to have later, rather than earlier, valve closure, in line with the higher peaking speed of the racing model.)

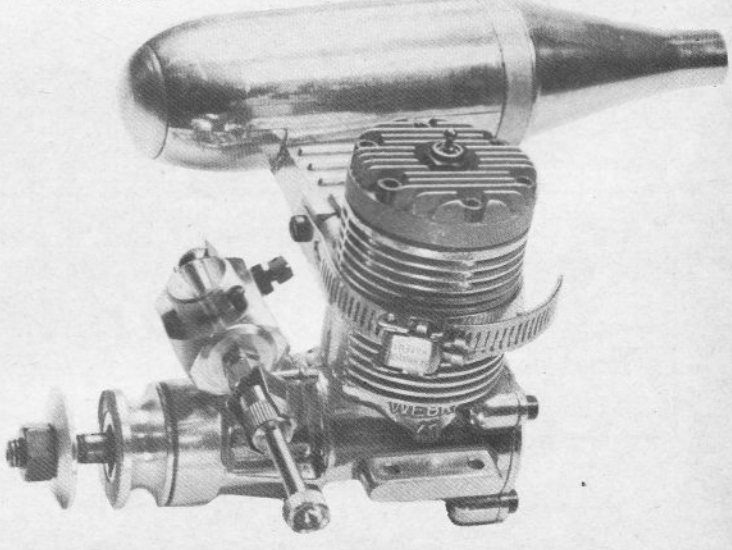
Both engines use barrel throttle carburettors with adjustable automatic mixture control. The Webra has the well-known Webra TN carburettor first used on the original Webra 61 in 1967 and, in the example received from the U.K. distributor, this had a 7.5mm choke, giving an effective choke area of 28 sq. mm, although an engine submitted for test by the factory had an 8mm choke which increases effective area to about 33 sq. mm. The O.S. has the new O.S. Type 4B carburettor with a 7.5mm choke and an effective choke area of approximately 25 sq. mm.

Heavier than previous O.S. 40 engines, the Max 40-FSR scales a checked 320 grammes or 11.3 oz. The new OS-743 silencer adds nearly 3 oz. to this figure. The 743 has a larger volume and a bigger outlet area than the OS-703 used by the crossflow-scavenged Max 40 engine and should not cause such a severe power loss. The Webra Speed-40 scales 12.4 oz. bare, two ounces heavier than the standard Webra 40. The silencer supplied for the Speed 40 is exactly the same as that now marketed for the Speed 61 except for a minor modification to the inlet duct. It pushes the weight of the Speed 40 R/C close to '60' levels at a checked 473 g. or 16.7 oz. The OS-743 is included in the price of the engine and is boxed with it. The Webra silencer is an optional extra.

Power outputs of these two new motors are expected to be at least 20 per cent higher than the levels reached by the crossflow O.S. and Webra 40 models. We shall be checking on this in due course, after which the results will be published in RCM&E.



**Left: parts of the Webra Speed 40 R/C. Despite outward differences, it has a number of features in common with the O.S. 40-FSR. Below: Webra Speed 40 R/C with new Webra 1100/E-G4 silencer. Rather a heavy combination at 16.7 oz.**



## Question Time

*QUESTION. I am thinking of entering Club 20 pylon racing and wonder which of the possible engines would be the best choice. I wonder if you would be good enough to venture an opinion. Obviously, to make the wrong choice from lack of information would be very frustrating and expensive.*

*The engines available appear to be Fox, O.S., Enya 19 and 19BB, HB and Veco.*

P.S., Surrey.

ANSWER. In order to give a straight answer to your question, it would be necessary to test representative examples of all the eligible Club 20 engines, in *Club 20 trim*, i.e. on straight fuel, with standard silencer and where options are available, the largest *legal* carburettor choke area.

We have not carried out such a detailed test programme and are not, therefore, in a position to offer firm advice on this subject.

However, we have, at various times, tested all the engines you mention and after referring to the results of these tests and also examining notes made at the time, it would seem that the one engine which Club 20 enthusiasts might do well to take a little more seriously is the Fox 19. This has the added attraction of also being one of the cheapest in its standard non-throttle version.

On test, using 5 per cent nitromethane fuel, the standard (non throttle equipped) Fox 19 indicated a gross output of approximately 0.39 b.h.p. at 17,000 r.p.m. It revelled in high r.p.m. and the recommended Fox silencer absorbed very little power. Glowplug consumption was a little on the high side when the engine was propped for over 16,000 r.p.m. but this might be less serious with other examples.

A full test report on this motor appeared in the April 1974 issue of *Aeromodeller*.

*QUESTION. In a recent report in R.C.M. &E you mentioned the single-cylinder 25 c.c. Moki M6 engine. I wonder if you could please tell me the price of this engine, also the address of Harry Brooks whom you also mentioned. I would like to take this opportunity to say how very much I enjoy your engine test reports in both* R.C.M.& E *and* Radio Modeller *and I would be very interested to see how the Moki M6 compared, power-wise, with some of the multi-cylinder engines of similar capacity . . . Have you ever tested the other big singles, the Fox 78 and O.S. 80? If you have, can you please tell me in which issues of what magazines? I expect you get a lot of letters from other readers, so I sincerely hope that my questions do not put you to too much trouble. Many thanks for you good work in our favourite magazines.* R.A.H., Kent.

ANSWER. The normal retail price of the Moki M6 at the time we examined it was understood to be about £75, but you can check on this with Harry Brooks, the U.K. importer, whose address is: 15 Victoria Road, Portslade, Sussex.

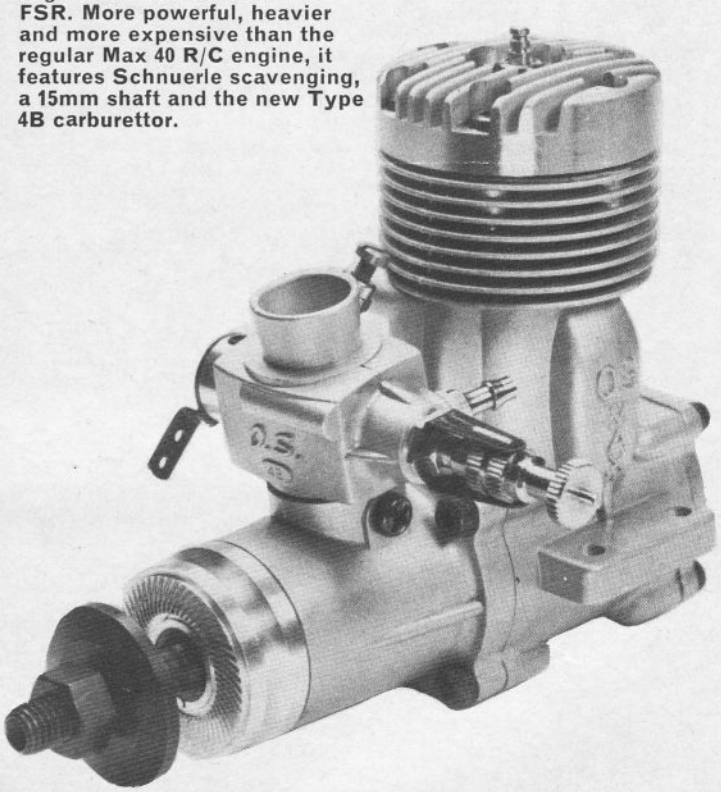
It is difficult to compare the Moki with other model engines of similar capacity as these are practically non-existent. In regard to multi-cylinder engines, the four-cylinder and six-cylinder Ross engines are 20 c.c. and 30 c.c. respectively and are the only current production model engines having total displacements in this group. We have tested only the four-cylinder model. This produced approximately 1.6 b.h.p. at 10,500 r.p.m. on standard 5 per cent nitromethane fuel.

Both the Fox 78 and the O.S.80 have been featured in past articles and test reports. For the Fox 78, the appropriate issues are: *R.C.M.& E* November 1974, *Model Airplane News* (USA) October 1975 and *Radio Modeller* June 1975. For the O.S. 80 the issues are: *R.C.M.& E* January 1973, *Model Airplane News* January 1973 and *Radio Modeller* March 1973. Thank you for your kind remarks.

**NEW HIGH PERFORMANCE 40 R/C ENGINES**

| | | O.S. Max 40-FSR | Webra Speed 40 R/C |
|---|---|---|---|
| *Induction System* | | Crankshaft rotary valve | Crankshaft rotary valve |
| *Scavenging System* | | Schnuerle 3-port | Schnuerle 3-port |
| *Bore x Stroke* | mm | 21.2 x 18.4 | 21.0 x 18.6 |
| | in. | 0.8346 x 0.7244 | 0.8268 x 0.7323 |
| *Swept Volume* | c.c. | 6.495 | 6.442 |
| | cu. in. | 0.3964 | 0.3931 |
| *Stroke/Bore Ratio* | | 0.868 : 1 | 0.886 : 1 |
| *Weight:* less silencer | g | 320 | 352 |
| | oz. | 11.3 | 12.4 |
| *Weight,* with maker's recommended silencer | g | 404 | 473 |
| | oz. | 14.3 | 16.7 |
| *External Dimensions:* | | | |
| Length, from prop driver face | | 85mm | 87mm |
| Height, c/shaft axis to head, less plug: | | 66mm | 66mm |
| Crankcase width | | 33mm | 34mm |
| Width across mounting lugs | | 50mm | 50mm |
| *Bearings* Main | | Ball journal, front and rear | Ball journal, front and rear |
| Big end | | Bronze bushed | Bronze bushed |
| Small end | | Bronze bushed | Bronze bushed |
| Piston bosses | | Bronze bushed | Plain |
| *Crankshaft* Main journal | | 15mm o.d. | 15mm o.d. |
| Gas passage | | 10.8mm bore | 9.0mm bore |
| Front journal | | ⅜ in. o.d. | ⅜ in. o.d. |
| Crankpin | | 5.5mm o.d. | 5.5mm o.d. |
| *Piston* | | Aluminium alloy with flat crown and single, pinned compression-ring | Aluminium alloy with flat crown and single, pinned Dykes ring |
| *Combustion Chamber* | | Bowl and squish band | Bowl and squish band |
| *Measured Nominal Compression Ratio* | | 11.0 : 1 | 12.4 : 1* |
| *Port timing* (observed) | | | |
| Exhaust period | | 144 deg. | 150 deg.* |
| Transfer period | | 118 deg. | 120 deg. |
| 3rd port period | | 116 deg. | 112 deg. |
| Rotary valve opens | | 34 deg. ABDC | 35 deg. ABDC |
| closes | | 49 deg. ATDC | 52 deg. ATDC* |
| *Carburettor type* | | Barrel throttle with adjustable automatic mixture control | Barrel throttle with adjustable automatic mixture control |
| *Choke Bore* | | 7.5mm | 7.5mm* |
| *Effective choke area* (approx.) | | 25 sq. mm | 28 sq. mm* |
| *Estimated gross output* (5 per cent nitromethane) | | 1.0 b.h.p. plus | 1.0 b.h.p. plus |

*See text



**Right: the new O.S. Max 40-FSR. More powerful, heavier and more expensive than the regular Max 40 R/C engine, it features Schnuerle scavenging, a 15mm shaft and the new Type 4B carburettor.**

## Make it Legal . . . get your R/C licence!

Just in case some newcomers to the hobby are not aware, operation of radio control equipment requires a licence. This costs £2.40, but it covers a five-year period, so at 48p per year, the licensing fee can't be described as expensive. Licence application forms are obtainable from: *The Home Office, Radio Regulatory Dept., Waterloo Bridge House, Waterloo Road, London, S.E.1.*