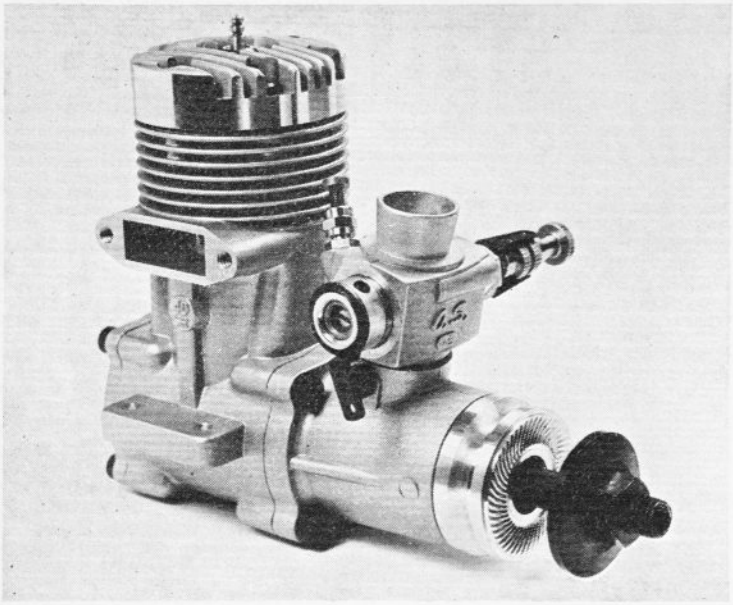


Peter Chinn tests the

O.S. MAX 40F —SR—

THIS latest R/C 40 from the O.S. company is a state-of-the-art design for those who are looking for the highest levels of all-round performance and refinement in the .40 cu.in. radio-control engine class. While the current standard Max 40 R/C model, introduced just over three years ago and featured in the October 1973 *Radio Modeller*, is likely to fully meet the needs of the majority of enthusiasts requiring a good quality .40 class twin ball-bearing R/C engine of lively performance, the newer 40F-SR incorporates just about every worthwhile refinement and offers 20-25 per cent more power at about 35 per cent greater cost.

The 40F-SR is not just a development of the 40 R/C. It is an entirely new model featuring Schnuerle scavenging, a massive "60 size" crankshaft journal and the new O.S. Type 4B automatic fuel metering carburettor. The shaft is, of course, supported in twin ball-bearings and the piston bosses are bronze bushed, as are both ends of the conrod in the interests of maximum bearing life.

At the time of writing, the 40F-SR retails at £35.72, but this includes the new OS-743 silencer which is more efficient than the OS-703 type and is well suited to the engine. Two Allen keys are also supplied: one for adjustment of the throttle arm and the other for the silencer attachment and engine assembly screws.

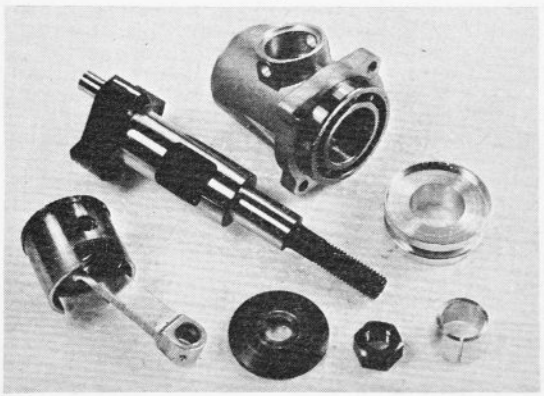
Design and construction summary

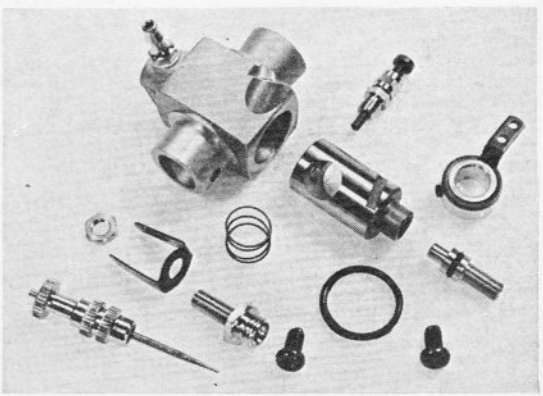
Main casting. This consists of the crankcase barrel and full-length finned cylinder casing in pressure diecast aluminium alloy with cast-in transfer channels, a short exhaust duct on the right side and substantial beam mounting lugs.

Cylinder-liner. Hardened steel cylinder-liner with 1.2mm. wall thickness, closely fitted to main casting and located by the usual top flange. Centrally bridged exhaust port on right side, timed to open and close at 72 deg. each side of BDC. Two main transfer ports flanking exhaust, angled to direct gas to left side of cylinder and timed to open and close at 59 deg. each side of BDC. Rectangular third port, diametrically opposite exhaust port, chamfered to sweep gas upward and timed to open and close at 58 deg. each side of BDC.

Crankshaft and prop drive assembly. Counterbalanced hardened steel crankshaft with extra large (15mm.) diameter main journal, $\frac{3}{8}$in. o.d. front journal and integral 5.5mm. crankpin on extra heavy (9.5mm. thick) crankweb. Rectangular valve port, 13mm. long, timed to open at 35 deg. ABDC and close at 50 deg. ATDC and admitting gas to 10.8 mm. i.d. gas passage, Machined aluminium alloy prop driver, recessed to protect front bearing and located on shaft by aluminium alloy split taper collet. $\frac{1}{4}$-28 UNF thread for prop nut.

Front housing and backplate. Substantial pressure die-cast aluminium alloy main bearing housing with 13mm. i.d. intake boss for carburettor and containing one NTN 15 × 28 mm. 11-ball steel-caged ball journal





bearing at inner end and one NMB ⅜ × ⅛in. 7-ball steel-caged shielded ball-bearing at outer end. Housing aligned with crankcase by o.d. of rear ball-bearing and secured with four Allen type chromium-molybdenum steel M3 × 0.5 cap screws.

Deeply recessed pressure diecast aluminium alloy crankcase-backplate secured with four Allen type chromium-molybdenum steel M3 × 0.5 cap screws.

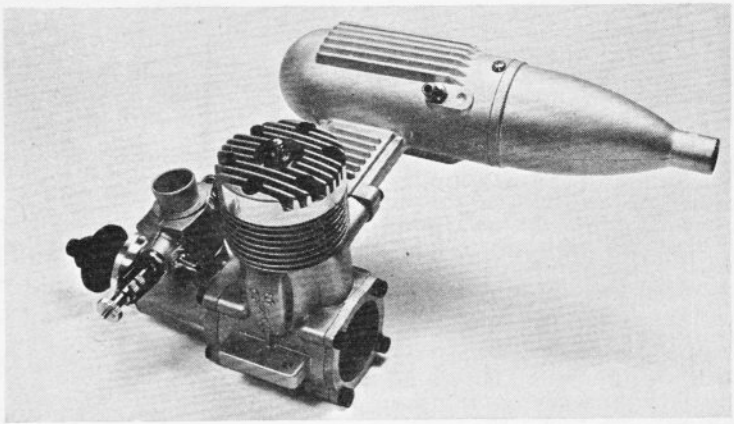
Piston and connecting-rod assembly. Piston machined from gravity casting in high grade piston alloy with bronze bushed bosses. Piston has flat crown, rectangular cutaways front and rear and the single compression ring is pinned to prevent rotation. The connecting-rod, 33 mm. between centres, is machined from high duty aluminium alloy bar stock and is phosphor-bronze bushed at both ends. Conrod has a single oil hole at the big end and a slit type hole at the small end. The hardened tubular gudgeon-pin, highly finished and a close floating fit in both piston and conrod, has an o.d. of 4.5mm. and is retained by wire circlips.

Cylinder-head. Pressure diecast aluminium alloy finned cylinder-head with cast-in brass thread insert for glowplug. Bowl-shaped combustion chamber surrounded by sloped 3.7mm. wide squishband. Recessed 0.4mm. soft aluminium gasket. Head secured to main casting with six Allen type chromium-molybdenum steel M3 × 0.5 cap screws.

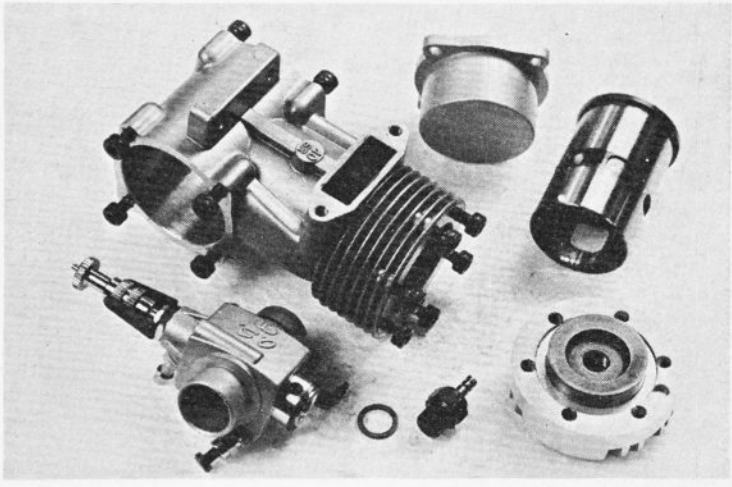
Carburettor. O.S. Type 4B automatic fuel metering type. Pressure diecast aluminium alloy body. Ground steel throttle barrel. Brass mixture control valve installed in throttle barrel with O-ring seal and equipped with screwdriver slot enabling low-speed mixture to be adjusted while engine is idling. Idle-stop screw mounted in separate screw-in body with gland-nut. Main needle valve mounted in left hand side of carburettor body in screw-in needle carrier with ratchet device. Separate spraybar and valve set pressed into carburettor body. Fuel inlet nipple fitted at rear left-hand side. Throttle arm on separate aluminium collar mounted on right hand end of throttle barrel and adjustable by means of Allen grub screw.

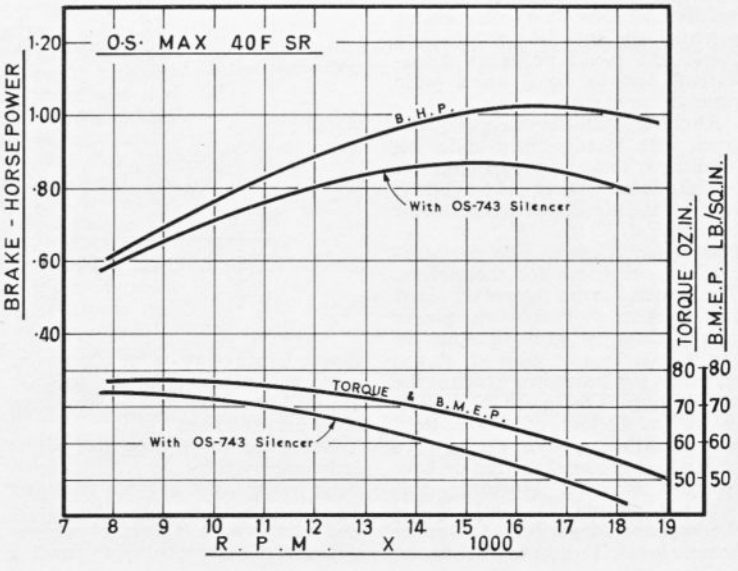
The Type 4B carburettor has a choke bore of 7.5mm. and an effective choke area of approximately 25 sq.mm.

Silencer. The silencer supplied with the Max 40F-SR is the OS-743 type which was designed specifically for this engine. It is a conventional expansion chamber type but has



Heading (opposite page) shows the 40F without its silencer, which would have hidden much of the motor from that angle. It is seen above, however, with the new O.S.743, with which these tests were carried out. *Below:* main castings, cylinder liner and new type 4B automatic carburettor.





larger volume, heavier construction and a bigger outlet area than the OS-703 type supplied with the standard Max 40 R/C. The silencer is equipped with a brass priming nozzle and a screw-in brass outlet nipple for pressurising the fuel tank. The nipple is optional and a blanking screw is provided. The silencer attaches directly to the tapped holes in the engine's exhaust duct with two M3.5 × 0.6 chrome-moly steel Allen cap screws.

Test performance

The 40F-SR was run-in on straight 75/25 methanol/castor oil fuel. From the beginning, the engine was very free-running and showed no tendency to tighten-up but we nevertheless followed our standard running-in procedure of a series of short rich runs for the first half-hour, followed by a further accumulation of runs totalling another half-hour with the last 10-15 minutes operation at the peak setting.

For the performance tests, our standard R/C test fuel containing 20 percent castor-oil and 5 percent nitromethane was used. The engine was fitted with an O.S. No.9 glow-plug. Atmospheric temperature at the time of testing was 9 deg.C (48 deg.F) and barometric pressure was 1016 mb (30.00 in.Hg).

Starting and running. Even when the 40F-SR was brand-new, before run-in, piston-seal was excellent and the resulting good compression gave instantaneous hand starting. The very first attempt to start the engine was, in fact, rewarded with a "first flick" start and these easy starting qualities remained throughout the tests. Despite its considerable potential, the 40F-SR was also very docile and could be safely hand-started, hot or cold, on a wide variety of prop sizes.

Running qualities were equally good, with steady firing under all conditions including operation on straight fuel in fairly cold weather. Nor was the needle-valve adjustment at all critical.

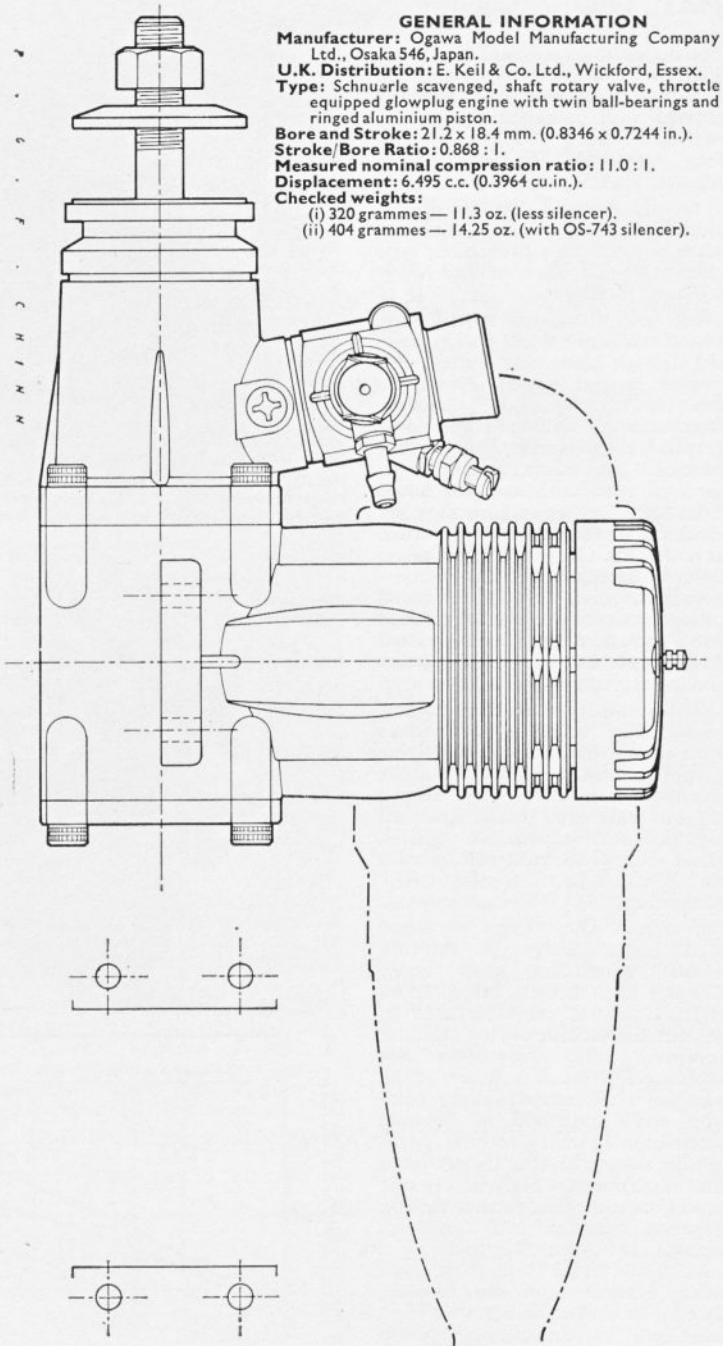
Power—less silencer. The performance figures speak for themselves. The torque v. rpm figures obtained on test, when plotted for the power curve, show a gross output of approximately 1.02 bhp at 16,500 rpm on 5 per cent nitro which is the highest output for a .40 cu.in. R/C engine (as distinct, of course, from non-throttling pylon racing 40s with wide open intakes) that we have recorded to date. Moreover, this high peak output is not achieved at the expense of performance under heavier loads. Thanks to a maximum torque figure of 77 oz.in. at between 9,000 and 10,000 rpm, the 40F-SR has well above average performance on larger prop sizes.

Using the 10 × 6 prop size popularly employed for .40 engined aerobatic models, the 40F-SR recorded 13,500 rpm on a Top Flite maple and 14,100 on a Taipan glassfibre-nylon. This is probably as small a prop as would normally be practical without going over the peak of the power curve in the air. For example, a 9 × 6 Top Flite maple was turned

—Continued on page 42

GENERAL INFORMATION

Manufacturer: Ogawa Model Manufacturing Company Ltd., Osaka 546, Japan.
U.K. Distribution: E. Keil & Co. Ltd., Wickford, Essex.
Type: Schnuarle scavenged, shaft rotary valve, throttle equipped glowplug engine with twin ball-bearings and ringed aluminium piston.
Bore and Stroke: 21.2 x 18.4 mm. (0.8346 x 0.7244 in.).
Stroke/Bore Ratio: 0.868 : 1.
Measured nominal compression ratio: 11.0 : 1.
Displacement: 6.495 c.c. (0.3964 cu.in.).
Checked weights:
(i) 320 grammes — 11.3 oz. (less silencer).
(ii) 404 grammes — 14.25 oz. (with OS-743 silencer).



ENGINE TEST

—*continued from page 40*

at 15,100 and a 9×6 Taipan glass-fibre-nylon at 15,800. At the other end of the scale, an 11×6 Power-Prop maple was turned at an impressive 12,400, a 12×5 Power-Prop at 11,000 and a 12×6 Top Flite at 9,700 rpm.

Power—with silencer. The new OS-743 silencer struck a good balance between noise suppression and power loss. Peak power output was reduced to approximately 0.87 bhp at 15,000 rpm and prop speeds over the 9,500-16,000 rpm range were reduced by between 2 and 5 per cent approx. For example, a 12×6 Top Flite maple was turned at 9,500, a 12×5 Power Prop standard at 10,800, an 11×6 Power Prop maple at 11,900, a 10×6 Top Flite maple at 12,900, a 10×6 Taipan at 13,450, a 9×6 Top Flite maple at 14,400 and a 9×6 Taipan at 15,100.

The OS-743 silencer had no adverse effects on the handling or running qualities of the 40F-SR.

Throttling. Response to the new Type 4B automatic carburettor was highly satisfactory. Safe continous idling was achieved down to 2,200 rpm. Control was very linear and the transition from 2-stroking to 4-stroking, as the throttle was closed, took place smoothly at between 7,000 and 6,500 rpm.

Comment

Easy to handle, very powerful, good throttle, smooth running. Runs well on straight methanol/castor as well as nitro blends. Easy on plugs (one O.S. No. 9 survived all tests including rpm up to 19,000). High standards of quality control maintained in the construction of these engines should ensure similar levels of performance in all production models.