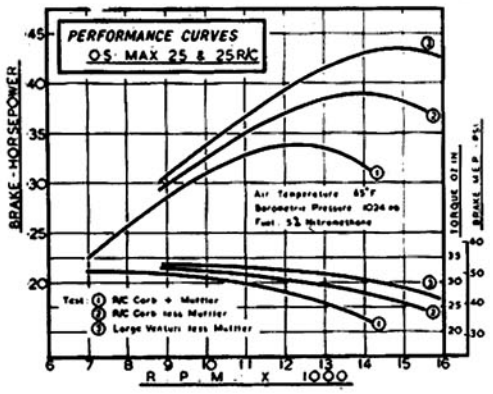
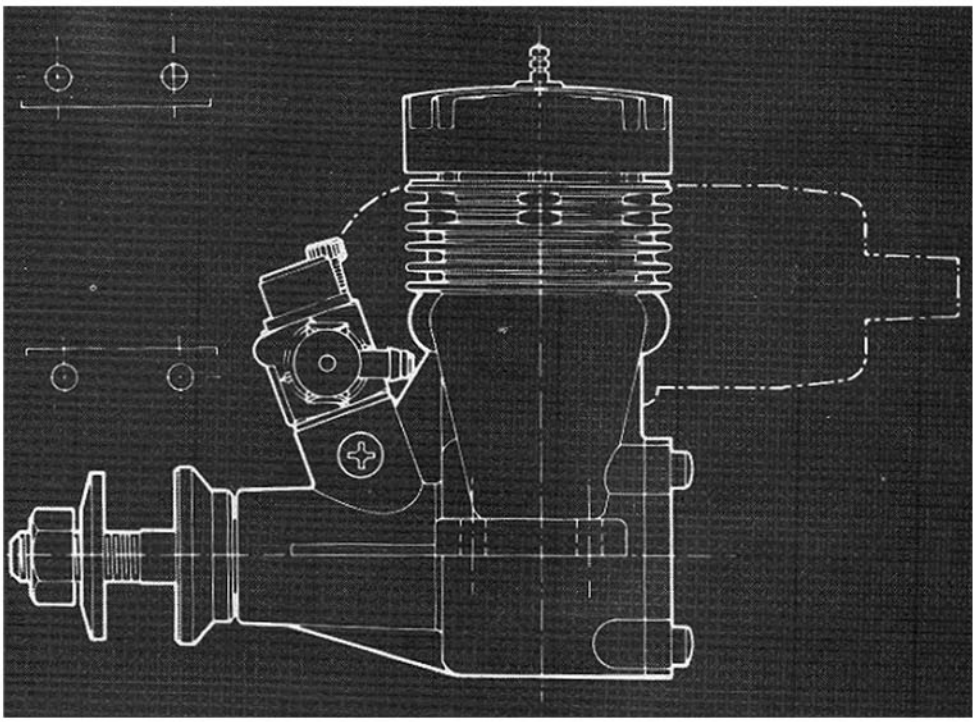




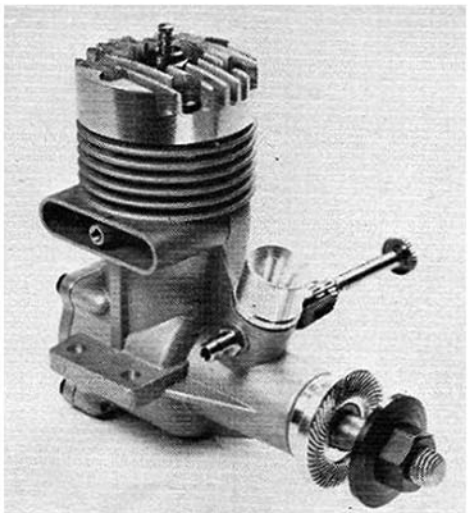
ENGINE REVIEW

O.S. MAX 25 and .25 R/C

BY PETER G. F. CHINN. . . for almost the same weight and external dimensions as the O.S. Max .20, the bored and stroked O.S. Max .25 offers a substantial bonus in increased power!

• One of the most widely used foreign engines in the .19-.20 cu.in. group at the present time, is the O.S. Max 20, first marketed late in 1971. In 1972, the O.S. company introduced the Max 25, which now rivals the 20 in popularity, not at all surprising as the 25 offers a worthwhile increment in performance for no increase in weight and only a very slightly greater overall height.

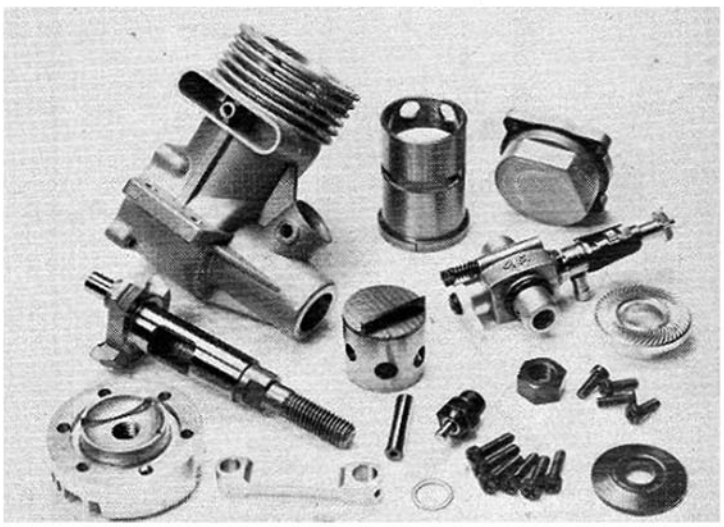
Like the 20, the 25 is obtainable in a standard version, for Free Flight and Control Line use, and in a throttle-equipped version for Radio Control—or for Scale C/L with third-line throttle control. Our present report deals with both versions of the 25, since conversion from standard to R/C type is merely a case of removing the venturi insert and needle-valve assembly and replacing it with the appropriate O.S. throttle type carburetor. A change made last year was the adoption of the newer O.S. Type 21 carburetor for the R/C engine. This is now used by the Max 20 R/C also. Both the 20 and the 25 accept the OS-702 muffler which, with the 25's introduction, had its tailpipe i.d. increased from 5 mm. to 6 mm. to cope with the 25's larger piston displacement.



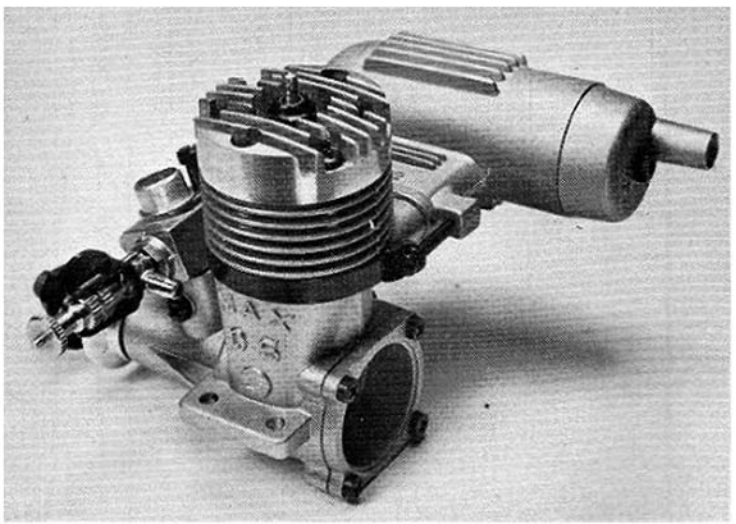
Outwardly almost identical to Max 20, Max 25 has a slightly deeper head and "S" type venturi.

Externally, the 25 looks almost identical to the 20—but for the "25" stamped on the crankcase casting, it would be difficult to tell them apart. A side-by-side comparison, however, reveals that the 25 has a slightly deeper cylinder head.

Internally, the differences are numerous and are mainly a consequence of the 25's increased bore and stroke. Cylinder bore is 18.0 mm. (0.7087 in.) instead of 16.8 mm. (0.6614 in.) and piston stroke is 16.0 mm. (0.6299 in.) instead of 14.6 mm. (0.5748 in.). The result is a 25.8 percent increase in displacement from 0.1975 cu.in. to 0.2486 cu.in., accompanied by a slightly higher stroke/bore ratio.



Well made parts of the Max 25 R/C. Although the engine looks much like the .20 model nearly all of the major components are new and different.



Stock muffler for both the Max 25 and .25 R/C engines is the OS-703 which offers a reasonable noise reduction without excessive power loss.

Components that are actually identical with those of the 20 and carry the same part numbers are limited to the connecting-rod, the crankcase-backplate, the prop-driver and washer and the carburetor parts.

Crankcase. This uses the same casting as the Max 20 case. It comprises the crankcase proper, plus full length finned cylinder casing with bypass passage and exhaust stack and bronze bushed main bearing with intake boss.

Crankcase and Prop-driver Assembly. The case-hardened steel crankshaft has a 10.5 mm.dia. journal, and a 5.0 mm.dia. hollow crankpin. Counterbalancing is by means of cutaways each side of the crankpin, plus an integral crescent counterweight. The shaft has a 7.6 mm. bore gas passage which is fed from a large rectangular valve port with radiussed corners. Used in conjunction with a parallel sided intake aperature, this gives a rotary-valve timing (our measurements) of 30 deg. ABDC to 44 deg. ATDC. Immediately ahead of the journal, the shaft is stepped down to 9 mm. o.d. for the machined aluminum prop driver, keyed in position by a flat and the propshaft length is threaded for a standard ¼ UNF hexagon nut. Between the prop driver and machined face of the crankcase nose there is a blued steel shim washer 0.1 mm. thick, the purpose of which (by interposing a hard surface between two soft ones) is to provide a better thrust bearing surface if the engine should be run with a pusher prop installation, and/or to reduce wear when a starter is used. This is now a feature of all the smaller O.S. engines that do not have twin ball bearing mounted crankshafts.

Piston and Conrod Assembly. The piston, machined from Meehanite with a ground and lapped skirt, has a thin straight baffle and is fairly heavily relieved for a depth of 1 mm. immediately below the crown where thermal expansion is at its greatest. It has two 5 mm.dia. skirt ports on the bypass side which line up with similar ports in the cylinder sleeve. The piston weighs 7.5 grams. The full-floating 4 mm. o.d. hardened tubular wristpin is highly finished and has brass pads. The conrod is machined from aluminum alloy bar stock and has plain eyes with a lube hole at the lower end.

Cylinder Sleeve and Head. The cylinder sleeve has the same o.d. as the Max 20 sleeve and the larger bore of the 25 is therefore accommodated entirely by a reduction in the wall thickness of the sleeve. It is quite evident that the 20 case was, from the outset, intended to serve a dual displacement design, since even with a 1.2 mm. increase in cylinder bore, the 25 sleeve still has a wall thickness that is more than adequate at 1.2 mm. or .047 in.

The engine is, of course, of the conventional open-loop or crossflow scavenged type and uses unbridged rectangular bypass and exhaust ports timed to remain open, respectively, for 132 and 114 deg. (our measurements) of crank angle. To take care of the 25's greater stroke, the sleeve is slightly longer than that of the 20, the extra length appearing as a deeper top flange. This does not, however, result in an untidily excessive gap between the head and cylinder casing as the 25 head depth is greater, with the soft aluminum head gasket more deeply recessed.

Unlike the 20 head with its very large squish area and small diameter combustion chamber, the 25 head reverts to a shallow bowl-shaped chamber with only a vestigial squish band, barely 1 mm. wide, sourrounding it. As on all the smaller (under .40 cu.in.) O.S. engines, the head is machined from a pressure casting and has a cast-in brass thread insert for the glowplug. The head is deeply finned and is secured to the main casting with six Phillips screws.

The standard Max 25 is supplied with two interchangeable verturi inserts, held in place, in the usual way, by the spraybar, which is of plated brass and is fitted with the familiar type of O.S. needle with flexible extension. A rubber O-ring is recessed into the rim of the intake boss to ensure that no air leakage occurs, especially important when the R/C carburetor is fitted.

As received, the standard Max 25 was equipped with the smaller "S" type venturi insert suitable for C/L Stunt and general Sport flying. This has a minimum i.d. of 5.5 mm. just above the spraybar, opening out of 6.0 mm. at the spraybar and giving a moderate effective choke area of approximately 10 sq.mm. to ensure good fuel suction. The alternative "L" type venturi (supplied) has a larger throat (6.9 mm. i.d.) which, after allowing for the spraybar, gives an effective choke area of about 17 sq.mm. for added power where a reduction in fuel draw can be tolerated. Incidentally, in Japan, a third option is to fit the engine with a still larger venturi (throat bored out to 7.6 mm. for an effective choke area of about 23 sq.mm.) and to use this in conjunction with a crankcase pressurized fuel system for the C/L and R/C Combat classes flown in that country.

The Type 21 carburetor now fitted to the R/C version of the Max 25 is similar in principle to the earlier O.S. carb used for this engine but is of improved construction. The newer carb still uses a ground brass throttle barrel in a pressure cast aluminum body with adjustable airbleed and the usual throttle stop, but the needle-valve assembly now screws directly into the body casting. In the earlier type carburetor the needle valve assembly screwed into a pressed in aluminum plug and this had a tendency to pull out if the engine took a hard knock in the wrong place.

Another change to the R/C carb is the adoption of a "noiseless" nylon type throttle arm with an alloy distance piece instead of a cranked metal arm. The location of the jet tube in the throttle barrel remains adjustable, allowing the effective choke area to be varied. As supplied, the jet tube projects approximately midway across the choke, giving an effective choke area of just over 11 sq.mm.

Performance

The manufacturer rates the Max 25 R/C at a nominal 0.40 bhp at between 13,000 and 14,000 rpm when run on a straight 3-to-1 mixture of methanol and castor oil and without the muffler. Helped slightly by our stock test fuel (5 percent nitro), our 25 R/C came close to this claim, the test readings giving a power curve that peaked at 0.39 bhp at 14,000 rpm.

The OS-702 muffler is of the expansion chamber type and, with a 6 mm. i.d. tailpipe (28 sq.mm. outlet area), strikes a reasonable balance between the conflicting demands of effective muffling and minimum power loss. Retested with the muffler, the 25 R/C was reduced to 0.34 bhp at between 12,000 and 12,500 rpm. This is still pretty good for a motor that has much the same overall dimensions and weight as the average .19. In fact, the power output at the peak of the bhp curve *with* muffler, is much the same as that of the Max 20 R/C *without* muffler so, comparing the two motors, the only penalty one has to pay for using the 25 with muffler, rather than the 20 without muffler, is the weight of the muffler itself—a mere 1.3 oz. Actually, though, this does not tell the whole story because the 25 develops considerably higher torque than the 20, so that, for a given prop size (particularly on props that hold rpm below 13,000) the muffled 25 R/C has markedly more pulling power than the unmuffled 20 R/C. For example, on an 8x5 Power Prop the unmuffled 20 and muffled 25 were roughly equal with just a hundred revs or so in the 25's favor at 13,600 rpm. On an 8x6, the muffled 25 was 400 revs faster than the unmuffled 20 (the unmuffled 25 being some 700 rpm faster still) while, on a 9x5 Top Flite, the muffled 25 was 600 rpm up on the unmuffled 20.

Replacing the R/C carb with the "S" venturi insert and standard spraybar assembly, we then ran a further series of tests on the 25 with muffler installed. Power output did not vary significantly from the level recorded with the R/C carb and muffler, and our next step, therefore, was to substitute the "L" venturi. Here the power over most of the rpm range was fractionally lower than the levels reached with the R/C version less muffler. Typical prop revs recorded included 10,300 on a 9x6 Taipan fiberglass-nylon, 11,600 on a 10x3½ Top Flite wood, 12,700 on a 9x4 Top Flite nylon, 13,400 on an 8x6 Power Prop wood and 14,200 on an 8x5 Power Prop wood.

Finally, in order to check the gross output of the 25 with the large venturi, but still on 5 percent nitro, the previous test was repeated with the muffler removed. This added 300-800 rpm to the above prop speeds and peak horsepower was raised to just on 0.44 bhp at 15,000 rpm. This leaves little doubt that, with the aid of competition type fuels containing upwards of 25 percent pure nitromethane, power could be pushed up to around the ½ horsepower mark should the user require this and be prepared to accept the reduced life of working parts that this must inevitably bring.

General operational qualities of the Max 25 were good. Our two test sample engines were fairly free running right from new. First starts from cold were always obtained immediately and hot restarts were only a little less prompt. Having regard for the fact that the 25 has a heavier piston and is more powerful than the 20 for the same overall engine mass, one might expect it to run a little less smoothly but no very marked increase in vibration level was evident on test.

The R/C throttle worked well. Safe idling speeds ranged from 2,200 when running on a 10x5 nylon prop to 2600 rpm on a 9x4 wood, with good recovery and a useful mid-range. Response to the needle-valve was positive provided that the right glowplug was used. On some plugs the engine lost power and became quite critical to needle adjustment unless extra nitro was added to the fuel. We used the O.S. No. 7 bar type plug which seemed to