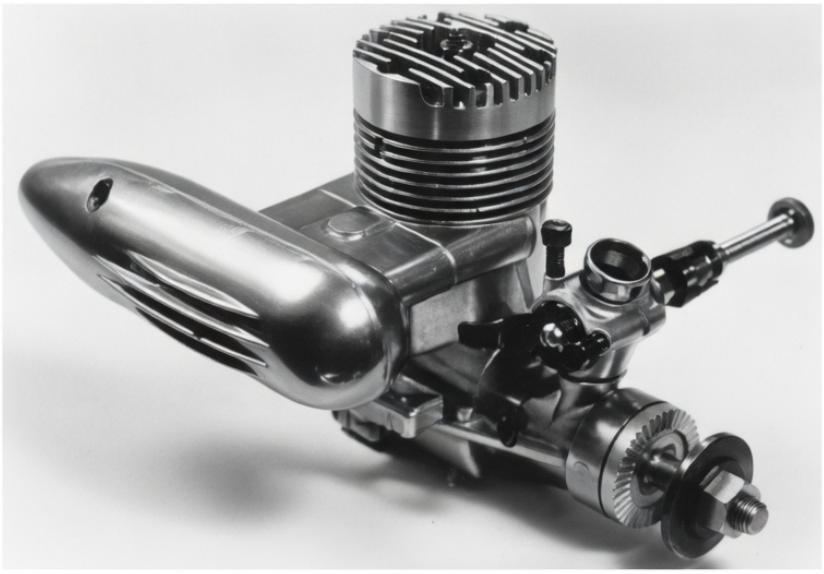
O.S Max-H 40 R/C



Second in a new series of regular monthly

ENGINE TESTS

by

Peter Chinn

Designed for U.S. Pylon Racing . . . "well constructed"

O.S. MAX-H 40-R/C

(tested with silencer fitted)

It has to be admitted that most radio-control engines A are hybrids. Very few were designed as R/C motors at the outset. The smaller jobs, as used for single-channel, arc nearly always stock general purpose diesels or glows to which a throttle has been added. Early "multi" engines were usually stunt .35's equipped with throttle type carburettors and, even with the more recent .45-.60 cu. in. R/C engines, the tendency among manufacturers, to make one basic design serve more than one purpose, has persisted.

This often works better than one might suppose. Even engines that were designed purely for control-line speed (e.g. McCoy 60) can sometimes make quite good R/C motors with the addition of a suitable carburettor (and by reducing compression ratio if necessary) provided that port timing is not too extreme. If a high power output is required as in a modern R/C acrobatic contest model certain of the characteristics of the typical hot contest engine may, in fact, be desirable.

These may include generous intake porting and transfer passages, a light piston and conrod assembly, plus the structural rigidity and good bearings that sustained high performance calls for in any engine. If the manufacturer then makes the necessary modifications to ensure efficient carburation at low, as well as high, speeds and under conditions of extensive variation in fuel head, the basis of a good powerful R/C engine may be established. Drastically reduced carburettor choke area will, of course, be required (especially if the original design was intended for pressure feed and speeds of 16,000 r.p.m. and up-wards) and this will automatically bring the b.h.p. peaking speed more into line with the prop requirements of R/C models. At the same time, it will usually be profitable to replace the cylinder with one providing modified port timing.

The O.S. Max-H 40-R/C, which is the subject of this month's report, undoubtedly benefits from the fact that it embodies basic design concepts contained in the other Max-H series high-performance engines (29R, 35C and 40-RR) without prejudice to the essential characteristics of a good R/C engine. In part, this is due to the fact that the Max-H series was conceived as a whole and not as a single type later modified to other uses.

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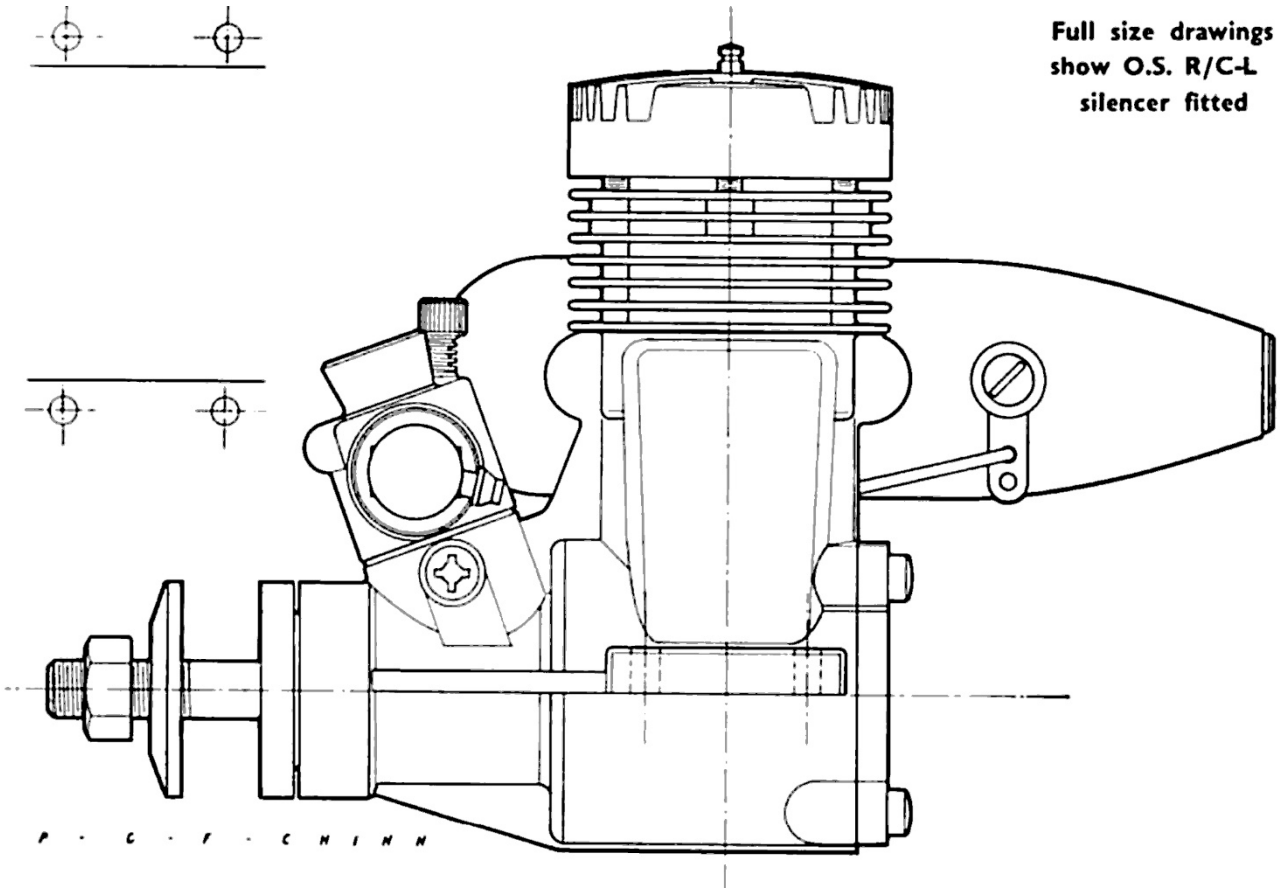

Actually, the only components of the Max-H series that are exactly the same in all four models, are the connecting-rod and back-plate. Many other parts look similar but have subtle modifications. So far as the 40-RR and 40-R/C are concerned, the latter has(quite apart from the obvious addition of the throttle system) a different cylinder with slightly smaller port areas, shorter transfer and exhaust periods, a hemispherical, instead of a wedge, combustion chamber and a slightly lower compression ratio.

Suitable Model Types

With a displacement of 6.5 cc. or .40 cu. in., the Max-II 40-R/C will probably be regarded in the U.K. as something of an “in-between”. It is true, of course, that most current “full house” aerobatic models use .45-.60 cu. in. (7.5-10 cc.) engines and that, for models equipped with fewer controls, notably trainers and intermediate types, motors in the 19-.30 cu. in. (3-5 cc.) group are the generally accepted wear. However, it is worth pointing out that the Max-H 40-R/C would not be entirely out of place in a light multi since it actually equals (or in some cases exceeds) the power of most current 45-49 cu. in. R /C engines.

Where the 40-R/C has an obvious application, as American modellers have already discovered, is in “Goodyear” pylon racing. It meets, exactly, the rules laid down by the National Miniature Pylon Racing Association concerning power units for this type of event and its performance must obviously make it a serious contender. It remains to be seen whether this type of event will become popular in the U.K.

Examination of the parts of the Max-II 40-R/C discloses both intelligent design and notably good workmanship. The combined crankcase/front- housing/cylinder unit is an excellent diecasting, well-braced and extensively machined and the drop-in hardened steel cylinder liner is highly finished with cleanly cut ports. The crankshaft has an exceptionally large bore gas passage (bigger than on the O.S. 50 and 58 in fact) is finely ground on all working surfaces and avoids points of possible local weakness by the extensive use of radii.

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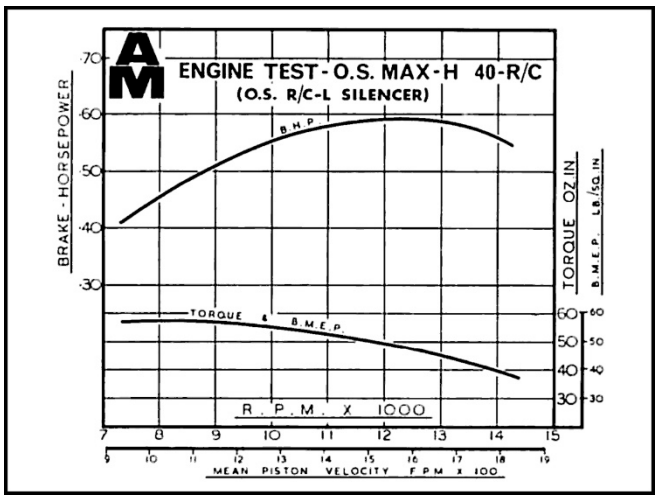

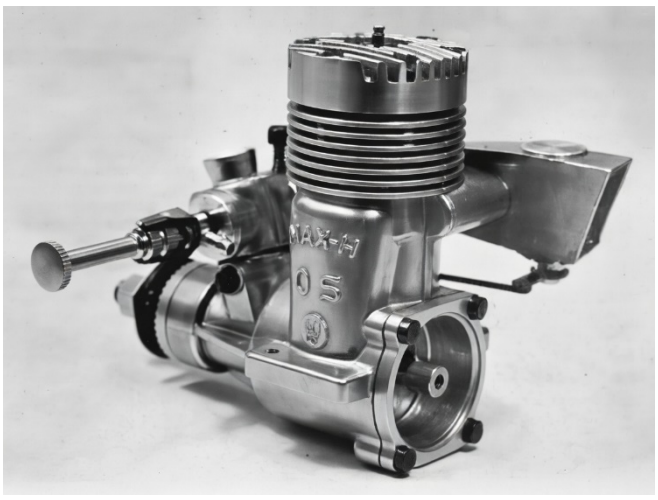

It runs in a high quality ball-bearing at the rear and a cast-in bronze bush at the front.

Throttles and Silencers

The carburettor is the same as that fitted to the O.S. Max-50 R/C and 58 R/C except for a slightly smaller (6.3 instead of 6.7 mm.) choke diameter. It has a ground brass throttle barrel smoothly rotating in a honed bearing surface and has the usual throttle stop and air-bleed adjusting screws. The complete needle-valve assembly with tee fitting fuel inlet is mounted on the left hand side, the jet protruding into the centre of the throttle barrel which rotates around it.

No less than three types of coupled exhaust restrictor units are produced for the 40 R/C, the standard fitting, as seen in the U.K., being a right-angled, funnel-shaped diecast extension, with a vertically- pivoted butterfly valve coupled to the carburettor throttle. However, these various units are now of little concern in view of the obligation to use silencers. O.S., who were one of the first manufacturers to offer silencers for their engines, make two suitable for the 40 R/C, namely, the standard Jetstream type “L” (large) silencer, and the “R/C-L" type which has the addition of a laterally pivoted valve, in the aft section, for coupling to the carburettor throttle. Either type can be used with or without an extension duct supplied. They are made in diecast aluminium alloy half shells with machined dural nozzle rings and neat internal two-screw fixing.

Diecast funnel extension exhaust throttle fitted to O.S. Max-H 40-R/C is not a silencer as might be first supposed. This is in fact just an extension exnaust duct with a vertically pivoted butterfly valve located at its rear end linked to the carburettor throttle. This cannot be used with a silencer and thus the type R/C-L silencer was introduced with an internal butterfly valve.

Performance

One big disadvantage of many medium and large size lapped piston engines has been the irksome and lengthy running-in period they require. Happily, this does not seem to be the case with the Max-H 40. During the first hour or two of running on our test engines, there was a slight loss of revs (2-3 per cent) in reaching running temperature from cold if the mixture was leaned out to the optimum, but there was never any question of hardening to a stop and, with the needle set a trifle rich there seems to be no reason why the 40 should not be run-in in the air. It was noticeable, however, that both hot re-starting and throttling improved after about two hours running.

Most of our tests were carried out with the R/C-L type silencer fitted. This chopped 300 to 1,000 r.p.m. off the revs depending on prop size, but the power output of the engine is so good that this can easily be afforded. On a 12 X 5 Power-Prop, for example, r.p.m. was reduced from 10,100 to 9,700. Matching the prop size closer to the engine’s peaking speed, 10 x 6 and 10 x 5 Top Flites (wood) were turned al 11.900

O.S Max-H 40 R/C

(11,300 with silencer) and 12,500 (11,900 with silencer). With the silencer, the engine pulled a wide range of other prop sizes quite happily, e.g. 8.100 on a 13 x 5 ½ Top Flite wood, 8.700 on a 12 x 6 Power, 9.900 on an II x 6 Power, 10,800 on an 11x5 Top-Flite wood, 12,000 on an 11x4 Top-Flite wood and 13,500 on a 10 x 3 ½ Top Flite wood.

Throttling was generally good and safe (bench) idling speeds on typical props ranged from 2.300 on an II x 6 to 2,900 on a 10 x 5. These required the air-bleed almost fully open, but the engine remained somewhat critical to the throttle stop adjustment and we would suggest that when the throttle is coupled to a servo, any backlash in the linkage would need to be taken up.

As suggested by the r.p.m. figures on big props, the Max-H 40 R/C delivered notably good torque, and this reached nearly 58 oz. in. at 8,000 r.p.m. with the silencer fitted. As is usual with orthodox silencer systems, torque dropped off a little faster, as load was reduced, than it did without the silencer but the decline of the torque curse was by no means steep and. as a result, a very good maximum output of 0.59 b.h.p. at approximately 12,400 r.p.m. was recorded. Without the silencer, the engine reached .70 b.h.p. at 13,700 r.p.m.

The outstanding feature of the Max-H 40-R/C is, undoubtedly, its high power output and we think it is sufficiently well designed and constructed to stand up to this sort of performance, without deterioration, for long periods. Incidentally, the OS. No, 7 bar-type glow plug survived all running and testing.

Power/Weight Ratio (as tested complete with silencer): 0.89 b.h.p./lb.

Specific Output (as tested complete with silencer): 9| b.h.p./litre.

SPECIFICATION

Type: Single-cylinder, air-cooled, loop-scavenged, two-stroke cycle glow-plug ignition with ball-bearing crankshaft. Shaft type rotary-valve induction. Coupled throttle system.

Bore: 20.6 mm (0.8110 in.)
Stroke: 19.5 mm. (0.7677 in.)
Stroke/Bore Ratio: 0.947:1
Weight: 9.9 oz. (with standard exhaust valve)
10.6 oz. (with Jetstream R/C-L silencer)

General Structural Data

Pressure die-cast aluminium alloy crankcase/cylinder block/ front housing unit with detachable rear cover secured with four Phillips screws. Case-hardened steel crankshaft, with 13 mm. dia. journal, 9.8 mm. bore gas passage and 6.35 mm. dia. hollow crankpin and counterbalanced by machined-in crescent counter weight supplemented by cutaway web flanks. 13 x 28 mm. 8-ball heavy duty ball-bearing main, supplemented by bronze outer bearing. Hardened steel cylinder liner located in cylinder block by flange at top and secured by cylinder head. Meehanite piston with flat crown and straight baffle filleted at base and with internal annular stiffening web above gudgeon-pin bosses. Fully-floating case-hardened 5 mm. dia. tubular steel gudgeon pin with brass pads. Machined 24ST3 duralumin connecting-rod with two lubrication holes at big end. Pressure die-cast and machined aluminium alloy cylinder head with cast-in brass thread insert for glow-plug, recessed soft aluminium blowout proof gasket and secured to cylinder block with six Phillips screws. Pressure die-cast aluminium alloy carburettor body seating on rubber grommet in intake boss and secured with two screws. Ground brass throttle barrel rotating in honed bearing surface in carburettor body. Plated brass spraybar assembly with flexible needle-valve extension. Pressure die-cast aluminium alloy right-angled exhaust duct with machined dural butterfly throttle unit and optional extension adaptor and interchangeable with Jetstream "L" or "R/C-L" silencers.

TEST CONDITIONS

Running time prior to test: 2 hours
Fuel used: 5 per cent nitromethane, 25 per cent Duckhams Racing Castor-Oil, 70 per cent. I.C.I. methanol.

O.S Max-H 40 R/C

Glow-plug used: O.S. No.7 bar type, platinum filament, 1.5 volt.
Air temperature: 62 deg.F (17 deg. C)
Barometer: 29.8 in. Hg.
Silencer type: O.S. Jetstream R/C-L.

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