ENGINE REVIEW
O.S. MAX .49 R/C

ANOTHER EXCELLENT ENGINE FOR THE VERY LUCKY RADIO CONTROL FLIER-THE MULTI BUILDER HAS A WELL ROUNDED CHOICE TO SUIT ANY REQUIREMENT.

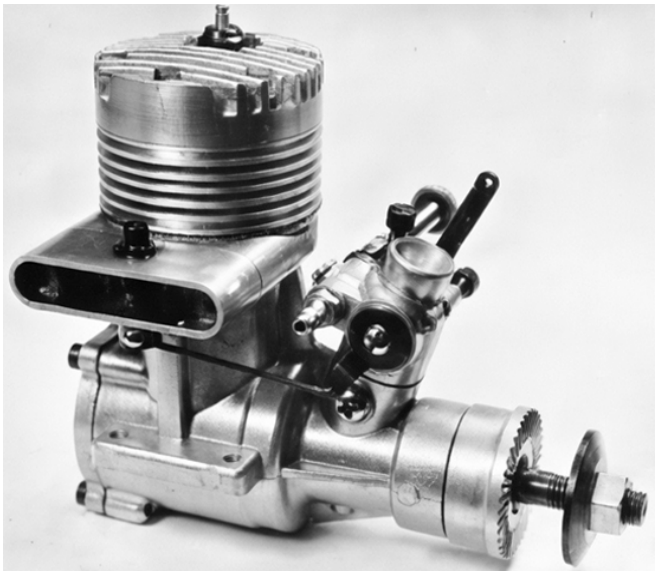
By P. G. F. CHINN

► A few years ago, a radio control engine was merely a stunt .35 with a simple throttle added. Today, in motors like the O.S. Max 49 R/C and the Veco 45 R/C described last month, we have radio-control motors which are de-signed as such.

This has come about only because the steadily advancing technique of multi-channel radio flying has shown such engines to be necessary. In many respects, top class multi-channel flying has been a couple of jumps ahead of engine development. Currently, it calls for an engine with wide- range and completely reliable throttling through varying flight attitudes, power that is a product of high torque rather than a high peaking speed, a tolerably low vibration level over the entire operational speed range and a reasonably long useful life for the wearing parts.

The actual peak horsepower of a 45 or .49 is not so much to increase potential output, as to compensate for the power loss that results from the modifications necessary to achieve a successful variable speed motor and the desirability of using a prop of somewhat larger diameter than the sizes on which most .35's are happiest. The actual peak horsepower of a .45 or 49 R/C engine may, in fact, be less than that of a hot combat .35 on the same fuel, but it will peak 3 to 5 thousand rpm less, developing higher torque at lower speed and therefore offer greater power in the up to 11.000 rpm speed range, corresponding to the 11 x 6 or 12 x 6 props commonly favored.

In the O.S. Max 49 R/C, the carburetor choke area and cylinder port timing combine to give the



Fine power and throttle response distinguish new O.S .49 R/C Holds current world R/C altitude record by Keith Hearn, Australia.

engine excellent low speed torque while restricting maximum rpm, as a result of which the engine should be better, in the air, on a 12 x 6 or 12 x 5 prop, rather than on an 11 x 6.
On a larger model of low wing loading, such as a scale biplane, a 13 x 5½ might even prove suitable and would still allow the engine to develop a reasonable high power output.

Briefly stated, the O.S. is a short stroke front induction motor with ball bearing shaft and coupled intake/exhaust speed control.
While bearing a superficial resemblance to the existing Max-Ill 35 R/C model, it has a number of refinements including an entirely redesigned throttle system.

The carburetor body is an aluminum pressure casting and plugs into the intake boss, the joint being sealed against air leaks by a rubber ring. It is retained by two short Phillips screws through the boss sides. A brass, barrel type throttle is used, the rotational limits of which are controlled by a spring loaded stop screw. Attached to the barrel, on the left hand side, is a blued steel actuating arm (adjustable) and, on the other side, a short cranked arm which couples to the exhaust valve.

O.S Max 49 R/C

Parts of O.S. Max .49 R/C. Engine is rugged and finely made, has shaft supported in one ball bearing supplemented by bronze bushing.

A feature not generally found on American R/C carburetors, but shared also by the British Merco R/C engines, is the air compensating control for adjusting the idling mixture. This consists of a small air bleed hole in the front of the carburetor body. Its purpose is similar to that of the notched choke on other barrel throttles (namely, to avoid over-choking the air admission while restricting the amount of gas admitted to the rotary-valve), but has the advantage of being adjustable by means of a screw which varies the amount of air admitted through the bleed hole.

An unorthodox feature of the O.S. 49 carburetor is the layout of the needle valve and jet assembly. Instead of the usual arrangement of a spray bar through, or below, the throttle barrel, the needle-valve is positioned to its rear. Fuel is metered from this to a separate screw-in brass jet which protrudes into a channel machined in the barrel and communicating with the barrel choke.

The exhaust throttle is of a new pattern. A neat extension is fixed, with two internal screws, to the exhaust stack and this carries a butterfly type throttle. It can be adjusted independently of the carburetor throttle.

Porting is in accordance with what one might expect of a study of R/C engine requirements. Rotary valve timing is a fairly conventional 50 deg ABDC 45 deg ATDC but the bypass period is a conservative 102 deg, with the exhaust opening leading by 10 degrees for a total period of 122 degrees (our measurements). The bypass system continues familiar O.S. practice in that two circular piston skirt ports are used, registering with similar ports in the lower part of the cylinder sleeve.

The main casting of the Max 49 is a well produced pressure casting comprising crankcase and bearing housing, the latter containing a single ball-journal bearing at the inner end, augmented by a heavy bronze full-length outer bush.
The crankshaft is of nickel-chrome steel with a ½ in. dia. journal, a 17/64 in. dia. tubular crankpin and a 9 mm. bore gas passage, fed from a rectangular valve port. The shaft is heavily counterbalanced by a machined-in crescent counterweight supplemented by cutaway web flanks.

The piston is of lightweight design, machined from Meehanite, scaling just over 0.5 oz. and has an internal annular stiffening rib above the wrist-pin bosses. Immediately below the crown, for a depth of 2 mm. the piston diameter is relieved approximately .001 in. The baffle is a straight fence pattern, mildly radiussed at its base.
The full-floating, hardened wrist-pin is tubular with aluminum end pads and has a diameter of 7/32 in. A machined 24ST aluminum alloy conrod is used, having an oil hole at its lower end.

Unlike other O.S. Max engines which have integrally finned cylinders, the 49 uses a separate, machined, dural finned cooling jacket and a hardened steel sleeve. The sleeve has a wall thickness of .068 in. and is flanged at the top where it makes the joint with the cylinder head.
The head is of die cast and machined aluminum alloy, has a recessed blowout-proof soft aluminum gasket and is generously finned.
The internal head contour is basically a shallow, hemispherical pattern modified to clear the piston baffle, with the plug located over the baffle. Six Phillips screws secure the head, three of which pass through the fins into the main casting to attach the complete cylinder assembly. In accordance with normal O.S. practice, no plug is supplied with the engine. Our tests were carried out on the O.S. No. 6 bar type plug but the makers state that the Veco and K&B R/C plugs

O.S Max 49 R/C

makers state that the Veco and K&B R/C plugs are eminently suitable for this engine.

Aimed at improving smoothness of running, the .49 is fitted with a special counterbalanced prop driver. This is located on the shaft by a flat and is a die casting hollowed out from the rear, except for a 110 degree segment which is left solid to augment the crankshaft counterbalance. We formed the impression that this might be a source of weakness in the event of a nose-over engine-on landing but it is only fair to remark that no such failures have apparently been reported. Nevertheless, the manufacturers have assured us that this point is being investigated and will be speedily dealt with if found necessary.

The earlier type Max .29's and .35's, like many other engines of similar design, were apt to require rather prolonged breaking-in but this has been greatly improved of late. Of two Max .49's received, neither required more than one hour of rich mixture break-in before sustained full throttle running could be safely held. After approximately 2 hours and using a mild, 5 percent nitro fuel, we were getting up to 8.500 on Top Flite 13 x 5 ½ and 12 x 8 props, 9.300 on a 12 x 6 Tornado, 10.400 on a 12 x 5 Power Prop and 10.500 on an 11 x 6 Top Flite. There would appear to be no point in propping the engine for a higher speed than this as, in the air, it would then be operating beyond its peaking speed. At 13.000 rpm, for example, the output dropped to .55 bhp from .65 at 11.300 rpm. This compares with a drop from .63 at 11.700 to .59 at 13.000 for another (.45) R/C engine recently tested.

Starting from cold was best accomplished with the throttle open and an exhaust prime. Hot restarts were usually obtained by choking the air intake for a couple of preliminary turns of the prop and could also be made with the throttle closed. As with all throttle equipped engines, some extra practice with starting under varied conditions and on different throttle settings is desirable in order to achieve complete familiarization with the engine's handling characteristics.

The relatively complex throttle design of the O.S. appears to have paid off, the power range obtainable with it being at least as good as anything yet achieved in an R/C engine and a great deal better than most. Depending on weather, fuel and prop used, the minimum idle obtainable can be anything from 1.600 rpm up, On 5 percent nitro fuel and in an air temperature of 50 deg. F, we found that the throttle stop and air control could be quite safely set for 2.200 rpm on a 12 x 5 or 12 x 6 prop without risk of the engine cutting out on opening up after a long period of idling.

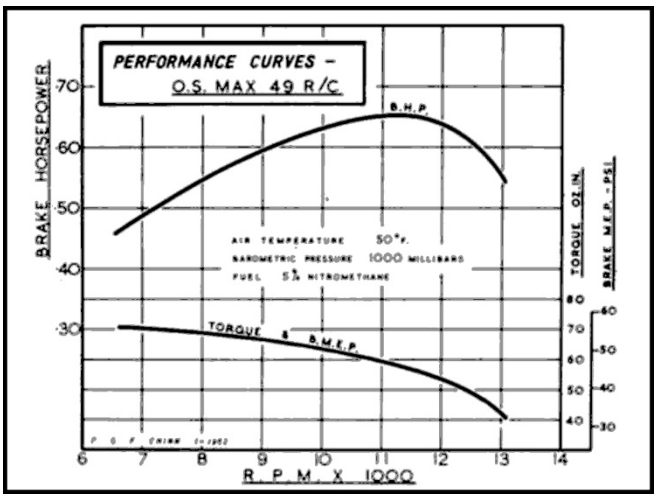
Our bench tests do not necessarily prove that such an idling speed is equally safe under the varying conditions experienced in flight (e.g. fuel pressure differential caused by a gradually emptying tank, changes in flight attitude, etc.). However, since a slightly higher idling speed of, say, 2.500 rpm, from a full throttle 10.000, still represents an idling output of less than 2 percent and since prototype test flights have apparently indicated that the engine's small venturi provides fully adequate fuel draw under critical conditions, we have no reason for supposing that the engine's excellent idling on the bench is not reflected in a reliably effective throttle range in the air.

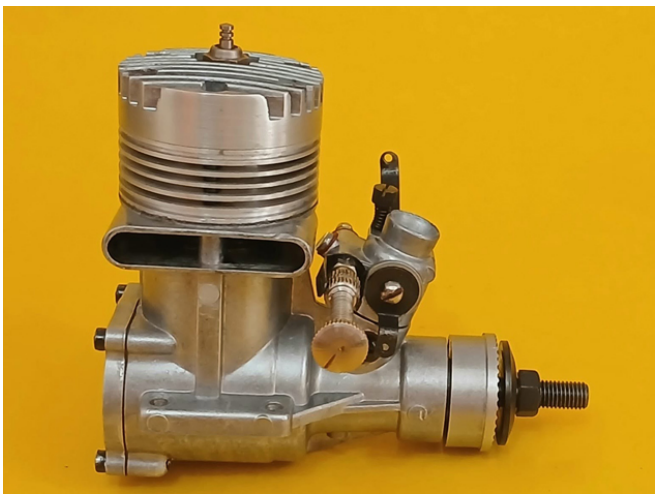
In all, the O.S. Max 49 R/C would appear to be a very welcome addition to the rather limited range of large radio control engines at present available.

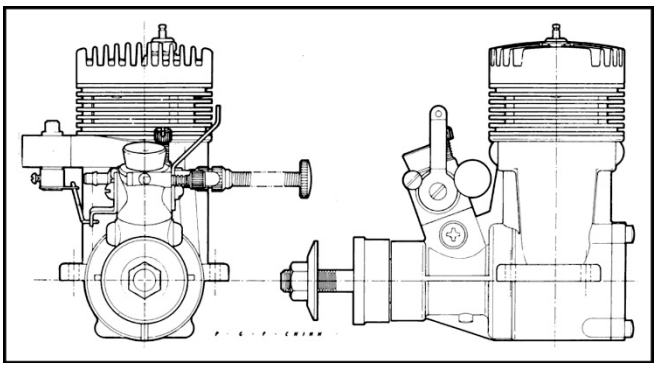
Summary of Data

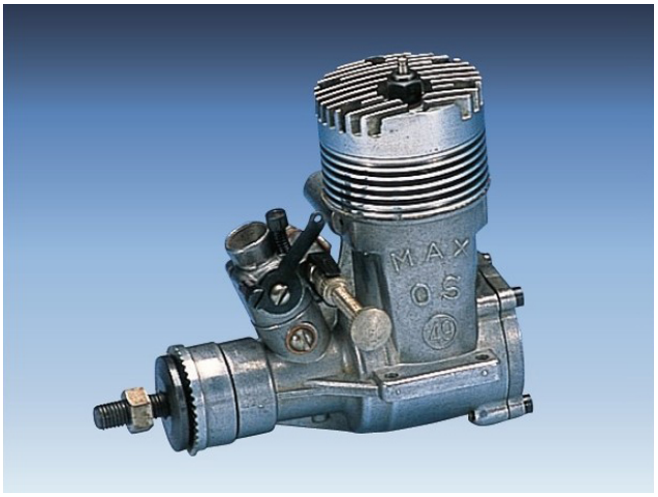
Type: Loop-scavenged, two-stroke cycle with shaft rotary valve induction. Coupled intake and exhaust throttle valves.
Weight: 11 oz.
Displacement: 0.4978 cu. in. or 8.158 c.c.
Bore: 0.8976 in. (22.8 mm.)
Stroke: 0.7874 in. (20 mm).
Stroke/Bore Ratio: 0.885:1
Compression Ratio: 9.5:1
Specific Output (as tested): 1.31 bhp/cu. in.
Power/Weight Ratio (as tested): 0.945 bhp/lb.
Manufacturer: Ogawa Model Manufacturing Co. Ltd., Hiranobaba, Higashisumiyoshi, Osaka, Japan.
U.S. Distributor: World Engines Inc., 8206 Blue Ash Road, Cincinnati 36, Ohio. **Price:** $24.95.

O.S Max 49 R/C









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