

Merco 49 R/C



THE MERCO 49 is probably the finest British production engine which has appeared to date. Designed and developed to meet a specialised demand the price is high, but it offers real “value for money” engineering throughout as well as achieving a top world class rating for power output. This latter claim is emphasised by the fact that it has achieved substantial success and recognition as a “first choice” power unit for R/C in the United States or the virtual “home” of the glow motor, and where so many excellent designs have been produced over a period of nearly two decades.

The Merco, of course, “borrows” many of the design layout features originated on the other side of the Atlantic for large glow motor layout, but it is essentially an original development from the “29” and “35” series and “engineered” on British lines. The result is a very sturdy motor but one which, because of its exceptional workmanship and finish, is extremely attractive in appearance and a precision engineer’s delight internally. The benefit of sturdy construction should be a long and consistent life, particularly with a ball race mounted shaft. The only penalty paid is in the matter of weight. The bare engine weighs 13 ounces which, although not with an outstanding product at all unreasonable, could materially shift the c.g. forward on a radio control design originally intended for a lighter power unit e.g. a typical American “35” weighing 7-8 ounces. Conversely the modellers who always build tail-heavy in any case could find this a boon but the man who gets down to optimum structural weights

ENGINE ANALYSIS No. 100

MERCO 49 R/C

We celebrate a century of tests with an outstanding product.

by R. H. Warring

could find a shortening of the nose-length necessary to come out within the design c.g. range.

Despite being a large and extremely powerful engine the Merco “49” is extremely easy and safe to handle, with matching size propellers. Finger choking followed by a prime through the exhaust produces first or second flip starting from cold, with the needle at the running setting or opened up slightly. Re-starting when warm does not even require finger-choking, provided the fuel line has not drained empty. We found also that the Merco would start readily over a wide range of throttle settings, hot or cold.

Running adjustment is essentially non-critical and easy to establish. The actual setting depends on the fuel used. The Merco runs smoothly and well on straight fuel without marked deterioration of starting characteristics. For smoothest running and optimum performance, however, the addition of up to 5 per cent, nitromethane is recommended. This also appears to make adjustment of the throttle setting (barrel valve stop) and air bleed (idling mixture jet) less critical for maintaining minimum r.p.m. One can play about with the low speed settings, using various combinations of the barrel stop and air bleed adjustment. From a normal load-speed of 10-11.000 r.p.m., slow running can be held consistently at about 2.500. A slightly higher figure e.g. approaching 3.000 r.p.m. would probably be safer for flying, however.

The one important overriding adjustment is a slightly rich setting on the main needle. Extreme low running speeds are not necessary for flying and the few hundred r.p.m. which may make all

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the difference between a critical adjustment and one which is consistently reliable will not materially affect flight performance. Any propeller which normally revs at 10.000 r.p.m. and is slowed to 3.000 r.p.m. will have lost much of its thrust and will act as a pretty efficient brake in a dive.

The multi-speed performance of the Merco 49 is not so completely worked out that it could be classified as foolproof. It does need careful adjustment and the suction lift seems to become a little "marginal" at low speeds. Tank position, therefore, can be important and should be selected to suit low speed running. A pressurised tank seems to upset things completely, making adjustment very sensitive. On the other hand, we are satisfied that if trouble does occur in flight e.g. the engine stopping in the air the cause is not in the throttle design but (i) incorrect adjustment of the two low-speed controls (or too lean a main mixture setting), (ii) unsuitable tank positioning, or (iii) an unsuitable plug. The makers specifically recommend a shielded type glow plug for multi-speed use.

On test, the Merco "49" peaked at around 12.000 r.p.m., with a corresponding B.H.P. figure slightly in excess of .7. The power curve is extremely flat and an interesting characteristic for a glow motor, at least is the high and sustained torque developed at lower r.p.m. figures. Nylon propellers are a logical and safer choice for a motor of this potential, and confined virtually to one size 12 x 6. This size produces a static r.p.m. figure of 10.000 on 5 per cent, nitro fuel, which means that the "unloaded" figure in flight will be slightly lower than the peak. Most of the radio flyers appear to have adopted the 12 x 6 prop, as standard, although 11x 6 could equally well be used to develop true peak r.p.m. in the air, and may be preferred for control line. 12 x 5 and 12 x 6 are other possible sizes for free flight, pulling the operating r.p.m. down but still remaining on the flatfish part of the power curve. Larger diameter sizes do pull the r.p.m. down rather a lot. Any smaller propeller diameter than 11 inches makes one approach hand starting with exaggerated caution!

The combination of ringed piston and ball race mounted crankshaft results in an engine which appears to need very little running-in time. The maker's mention one hour, and not leaning out the mixture completely for the first 30 minutes. On the particular specimen we had (and which had experienced little or no previous running) only ten minutes running-in was more than adequate and there was no further detectable change in performance after this time, over a final total of two or more hours. There was no evidence of tightness of slowing up or overheating.

This seems to confirm running-in practice established by a leading American modeller for the Merco 15 minutes on the bench and then into the model. This same modeller also mentions that a comparable (American) glow motor takes so long to run in properly that the cost of fuel during running in exceeds that of the actual motor! The Merco appears entirely free from any criticism of this sort.

Design wise the Merco "49" employs orthodox large glow motor layout with opposed transfer and exhaust, and orthodox crankshaft rotary valve induction and timing. The crankcase casting consists of an exceptionally clean and well finished pressure die-casting in light alloy, incorporating lower cylinder housing, intake stub and ball race housings. A hardened steel 1 in. o/d liner with a flanged top plugs into the lower cylinder casing and is positioned vertically by a turned finned jacket. When the head is in position and tightened down with screws the liner is thus positioned by the depth of the jacket, tightened up against the bottom of the liner flange. Three long screws extend down into the crankcase unit, with three further screws attaching the head to the jacket. The bottom of the jacket itself seats on a thin paper gasket. The cylinder is slightly offset laterally (Desaxe), which is a design characteristic of all the Merco series; this arrangement giving certain theoretical advantages.

Ports cut in the liner walls consist of four equi-spaced square holes for the transfer and four similar sized square holes, spaced apart in pairs, for the exhaust. Transfer and exhaust have

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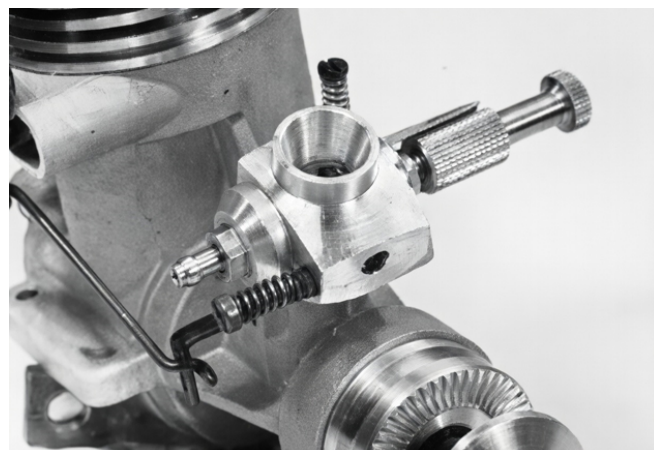
substantial overlap. Port areas are relatively small and the use of a series of separate port openings rather than a single port each side is dictated by the necessity of maintaining a satisfactory unbroken rubbing surface area to avoid trapping the piston rings. The transfer passage way itself is incorporated in the main casting and does not require an additional piston port to open.

The piston of light alloy, grooved to accommodate two cast iron rings and shaped with a filleted deflector on top. The $\frac{1}{4}$ in. diameter fully floating gudgeon pin is hollow and fitted with aluminum end pads. Piston walls are quite substantial and total weight of the piston plus rings is a little under $\frac{3}{8}$ ounce. The gudgeon pin is of hardened steel, ground and honed to finish. The connecting rod is a forging in light alloy with plain bearings and drilled with lubricating holes at each end.

The $\frac{1}{2}$ in. diameter crankshaft is turned from EN.1A steel, ease hardened, ground and fine-finished. The crank web is cut away for counterbalance and the solid crankpin is $\frac{1}{4}$ in. diameter. The $\frac{1}{2}$ in. diameter length is maintained up to the front bearing, where it steps down to .315 in. diameter (8 mm.) and thence (outside the bearing) to the $\frac{1}{4}$ in. diameter threaded propeller shaft. The dural prop, driver is secured by a split steel collet on the 8 mm. length of shaft protruding from the front bearing. Both races are S.K.F. high-speed type. Shaft port is rectangular, approximately $\frac{1}{2}$ in. x $\frac{3}{8}$ in., opening into a $\frac{3}{8}$ in. diameter central hole.

The carburettor unit is fabricated in dural and consists of a body unit plugging into the stub intake in the crankcase casting, where it is located and secured with a screw on each side. The brass spray bar is assembled through the body and encircled by a barrel throttle linked to an external lever. This lever is coupled to a centrally pivoted exhaust flap to close the exhaust opening progressively with barrel rotation.

Two adjusting screws are fitted to the carburettor body. One acts as a stop for the barrel movement for location of the degree of slow speed opening. The other controls the opening of the air bleed hole leading directly into the throat of the intake.



Close up of production type carburettor with forward facing air bleed for slow speed setting.

This opening is masked off by rotation of the barrel at "open" throttle setting and thus is effective as an air bleed only at low speed settings when the barrel opening uncovers the hole. The whole carburettor unit and its linkage is very well made and positive in action and adjustment. The needle valve is locked by a spring and serrated thimble "ratchet" action, is light to adjust but holds exact settings. The throttle arm is on the right hand side (the same side as the exhaust) and the needle on the left.

Summarising, an engine of the highest quality through-out which should establish a lead in "multi" R/C work throughout the world. Whilst the specific output of .09 B.H.P. per c.c. is not as high as that achieved by many racing glow motors, it must be remembered that this is produced at a comparatively modest r.p.m. figure and a figure, incidentally, which is about the ideal for radio control or large stunt control line work. It is certainly the most powerful engine of its type we have received to date and a real pleasure to handle.

PROPELLER	R.P.M. FIGURES
12 x 6 Tornado nylon	10.200
12 x 5 Tornado nylon	11.000
12 x 4 Tornado nylon	11.750
11 x 6 Tornado nylon	11.500
11 x 4 Top Flite nylon	12.300
10 x 6 Top Flite nylon	12.500
10 x 6 Frog nylon	12.700

Fuel: Mercury No. 5.

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Recommended propellers: R/C 12 x 6 or 11 x 6.

Free Flight 12 x 4 or 13 x 4.

Control Line 12 x 5 or 11 x 6.

Price £11 19s. 8d. including Purchase Tax

Specification:

Displacement: 8.2 c.c. (.49 cu. in.)

Bore: .880 in.

Stroke: .805 in.

Bore/stroke ratio: 1.09

Bare weight: 13 ounces

Max. Power: .72 B.H.P. at 12,000 r.p.m.

Max. Torque: 72 ounce-inches at 8,000 r.p.m.

Power rating: .088 B.H.P. per c.c.

Power/weight ratio: .0555 B.H.P. per ounce

Manufacturers:

D. J. Allen Engineering Ltd. 30

Angel Factory Colony, Edmonton N.18

Material Specification:

Crankcase: pressure die-casting in L.33 light alloy, sand blast finish.

Crankshaft: EN 1A steel, case hardened.

Liner: EN.1A Steel, case-hardened ground and honed to finish.

Piston: low expansion light alloy; two cast iron rings.

Connecting rod: RR.56 light alloy forging.

Cylinder jacket: turned dural

Head: turned dural

Crankcase back cover: pressure die casting in L.33 light alloy, sand blast finish

Gudgeon pin: EN.1A steel, hardened and ground; fitted aluminum end pads

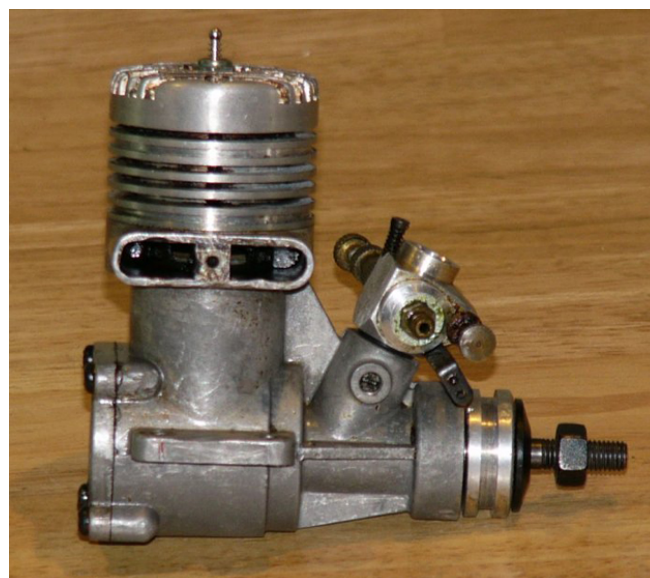
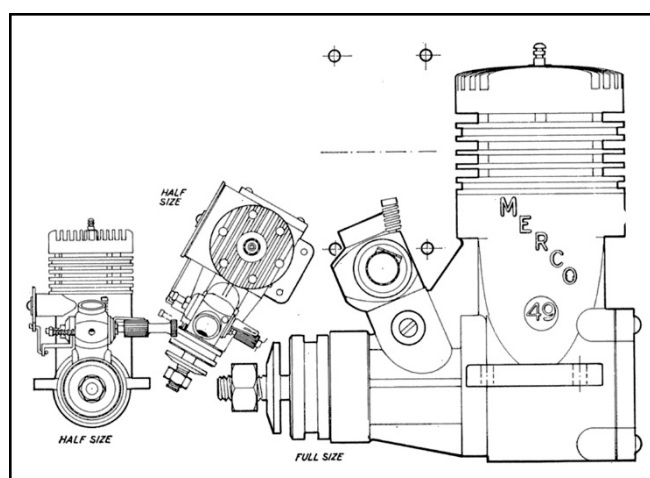
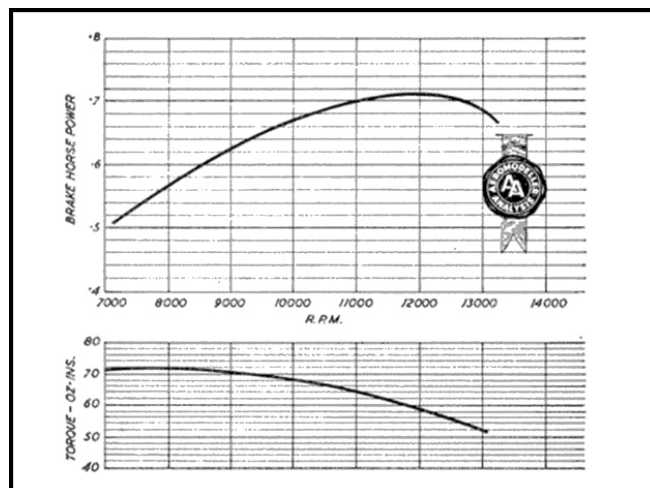
Main bearings: ½ in. ball race (rear) and 8 mm. ball race (front)

Cylinder head: dural turning, central plug position, contoured combustion chamber

Carburettor unit: turned dural body and barrel valve; brass spray bar and thimble

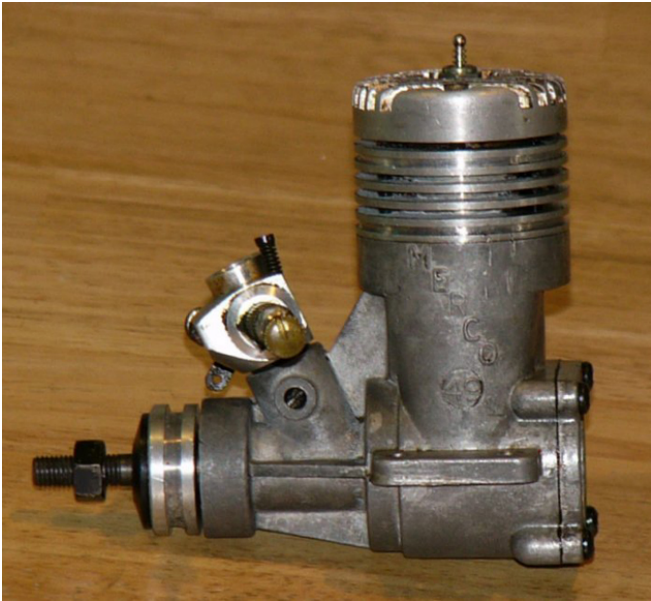
Propeller driver: turned dural, split steel collet fitting

Exhaust battle, throttle arm, linkage: black-finished steel



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