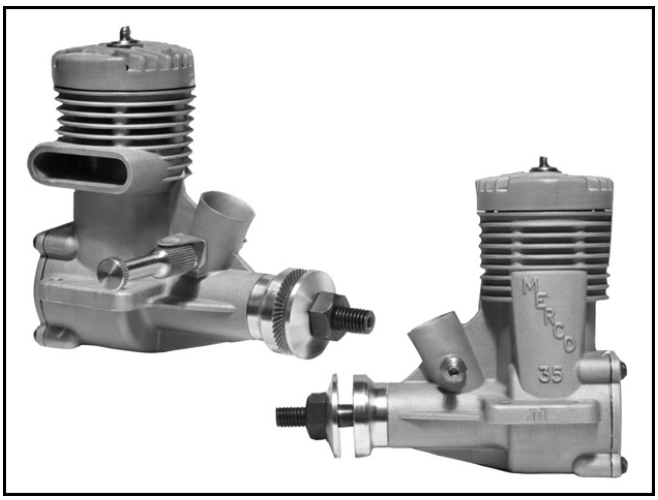
1960 Model

Merco 35

Engine Analysis No. 68
by R. H. Warring



BRITISH engine development over the past ten years or more has been concentrated on the smaller sizes of motors with the notable exception of the Eta series and the Frog “500”, plus a strictly limited number of large capacity diesels. As a result the aeromodeller who wants to fly big models and the radio enthusiast, for whom a 5 c.c. plus glow motor is a logical choice of power plant has cast envious eyes on overseas production models, and gone to considerable length and often paid fancy prices to acquire one.

Good as these foreign motors may be, they have perhaps enjoyed a reputation of being better than they really are because of lack of “home" competition in this field. The Merco should do much to bring the picture into proper perspective by showing that a large British glow motor can be just as good as any in performance, and probably beat them all as regards standard of workmanship.

Of course the Merco borrows design features from the top American glow motors. Some twenty years of development work in the States has resulted in a more or less standardised layout which every new engine has to follow, more or less, to stay in the top class. Trying something else just for the sake of being different must almost invariably carry a performance penalty. But even following an established layout still leaves plenty of bugs to be ironed out and many a headache on the way before the design can be finalised for production.

The Merco team have come up with their own answers to these individual problems, and a fine job they appear to have done throughout, still without having reached finality. A number of modifications have been introduced since the first production model, aimed to lower running in time and reducing the vibration level to please the radio control boys, and specifically for the latter field there is a version coming with a highly developed speed control, combining a barrel throttle and exhaust slide with an airbleed setting for very slow idling.

Main differences between the 1959 Merco and the 1960 model are that the new model incorporates a leaded steel liner, the piston is very much lighter and slightly relieved around the top edge, and the crankshaft web has been increased in thickness to provide a heavier counterbalance. The Allen Mercury Type “C” glow plug is also recommended as standard, as giving a slightly superior performance.

The 1959 Merco did, undoubtedly, need a lot of running-in time to free up properly and develop maximum performance. The 1960 model should be easier in this respect. Initial stiffness of the test engine was removed in ½ hour's preliminary running followed by a series of diminishing propeller size runs ranging from 13 x 5 down to 10 x 5 and involved the eventual consumption of 30 fluid ounces of fuel. When ready for test report, the engine was quite free and would hold 16.000 plus r.p.m. consistently with the bearing remaining cool.

Starting characteristics are first class. The Merco does not like being too wet and, in fact, if generously primed it was found best to flick over two or three times before connecting the plug. Then starting was more or less instantaneous.

Merco 35 Stunt

High standard of machining is evident in this view of Merco working parts. Note rectangular shaft valve.

It should never give any troubles unless there is something definitely wrong, like a burnt out plug. Although it has a healthy “kick”, too, it was never a vicious engine to hand start, even on small diameter propellers. A beginner could quickly learn to handle the “Merco” with confidence if not complacency!

The needle valve control is non-critical over a turn or so but has a definite characteristic of requiring a specific setting for maximum performance with any propeller size. If the mixture is leaned right out, running still remains consistent but there is a definite loss of power. Opening the needle from minimum lean selling progressively increases the r.p.m. up to about half a turn. From this optimum setting, further opening of the needle causes a fall in r.p.m. again as the mixture becomes too rich. The difference in performance between “minimum lean” and “optimum” needle settings is quite appreciable about 1.000 r.p.m. al a load-speed circa 11.000 r.p.m. or the static r.p.m. at which the Merco would most probably be operated in a model.

Running was very consistent at all low speeds and particularly sweet al the higher speeds. The vibration level was inclined to be excessive at speeds of over 14.000 r.p.m. This, however, is well above what would be the normal operating speed in practice, and above the peak r.p.m. Apart from this there was nothing that could be faulted in the running characteristics.

Performance was checked at a number of different load speeds using the A-M Type “C” plug and the old- type KLG glow plug, with no measurable difference. The manufacturers state, however, that on some engines there is a noticeable increase in performance with the A-M plug amounting to as much as 500 r.p.m. with the same size of propeller. The A-M plug on the test engine was finally burnt out after a prolonged run at 17.000 r.p.m. and on the basis of its time in use should provide a long, useful life under all reasonable operating conditions.

Maximum power, as measured with the test engine, was -55 B.H.P. at 13.400 r.p.m. using a standard methanol castor mixture with 15 per cent, nitromethane. This can be regarded as an extremely good figure for a plain bearing engine of this size, with peak power developed at a very usable r.p.m. A 12 x 3 or 11 x 4 propeller would appear the best size for free flight, Merco recommend a 10 x 5 propeller with wide blades for stunt and a 8 x 8 or 9 x 6 for general control line.

The Merco is assembled around a very clean, beautifully produced die-cast crankcase unit of substantial proportions and strength. The transfer passage is cast in on the left hand side of the cylinder with exhaust stack diametrically opposed. The unhardened steel liner is of substantial wall thickness (.9062 in. o/d for a bore of .8 in.), ground all over, except the ends. Rectangular transfer and exhaust ports, diametrically opposed, are cut through the liner walls. The transfer overlaps the exhaust some 75 per cent, of its depth.

The liner is an extremely good plug fit in the casting, held by the head fastening with six Phillips head screws. A groove recessed in the head carries a gasket for scaling against the top of the liner. Locating the gasket in this manner mini mises the chances of it "blowing” although this can still occur should the head screws work loose. The head is completely formed as a casting and external surfaces stove enamelled bright orange.

Merco 35 Stunt

New accessory packs for Merco spares provide quick replacement service.

The piston is of cast iron, machined away to a minimum wall thickness, and the lower ¼ in. of the piston (in a length of .72 in.) is relieved .002 in., whilst the top edge is also slightly relieved. The 3/16 in. diameter floating gudgeon pin is hollow and fitted with brass end pads, while the connecting rod is a light alloy forging with plain big and little bearings.

The crankshaft is of substantial diameter (.437 in.) but with a large hole through the centre (5/16 in. dia.) connecting to the rectangular intake port. The shaft steps down abruptly to a nominal ¼ in. diameter immediately in front of the bearing and the front end is tapped ¼ in. BSF for the propeller nut. A dural propeller driver is drilled with a plain hole and merely forced over the splined length of the shaft to butt against the shoulder of the "step".

Crank web thickness is 3/16 in. and the top of the web cut away to provide counterbalance. The degree of balance provided, incidentally, roughly counters the weight of the connecting rod, leaving the piston weight (g ounce) theoretically unbalanced at T.D.C. Crank pin diameter is 7/32 in. The shaft is hardened and ground over the journal surfaces and the crankpin. It runs in a drawn bronze bush, cast integral with the crankcase, drilled, reamed and honed to size. The bearing fit and bearing surface were very fine indeed.

Both the spray bar and the needle thimble are of brass, the latter large in size and convenient to handle. As supplied, the needle is mounted on the right hand of the choke tube the "hot" side of the engine since the exhaust stack faces this way. It is more convenient and certainly more comfortable to reassemble the spray bar with the needle on the left, unless the model layout makes this too awkward.

Summarising, the Merco "35" looks a good engine (with its cleanly finished, vapour blasted crankcase), and it is a good engine; powerful, consistent and easy to handle. It is also remarkably good value for money for the workmanship throughout is really first class in the best British tradition. Perhaps, as it proves its worth on the flying field, we shall hear less enthusiasm for the "superiority" of big foreign glow motors. This is a British engine with the potential to show otherwise!

PROPELLER - R.P.M. FIGURES

Propeller dia.	pitch	r.p.m.
10 x 6	Frog nylon	11.200
9 x 6	Frog nylon	13.800
8 x 4	Frog nylon	16.000
9 x 4	Frog nylon	13.500
12 x 4	Trucut	9.000
11 x 4	Trucut	11.000
11 x 6	Trucut	9.400
10 x 6	Trucut	11.000
10 x 4	Trucut	11.500
9 x 6	Trucut	12.000
9 x 4	Trucut	14.200
9 x 5	Slant	13.200
9 x 4	Slant	14.000
8 x 4	Slant	16.000
10 x 4	Slant	13.200

Fuel used: 32 ½ per cent. Castor/52 ½ per cent. Methanol/15 percent. Nitromethane

Data

Displacement: 5.794 c.c. (.353 cu. in.)
Bore: .800 in.
Stroke: .703 in.
Bore/Stroke ratio: 1.14
Bare Weight: 7 ½ oz.

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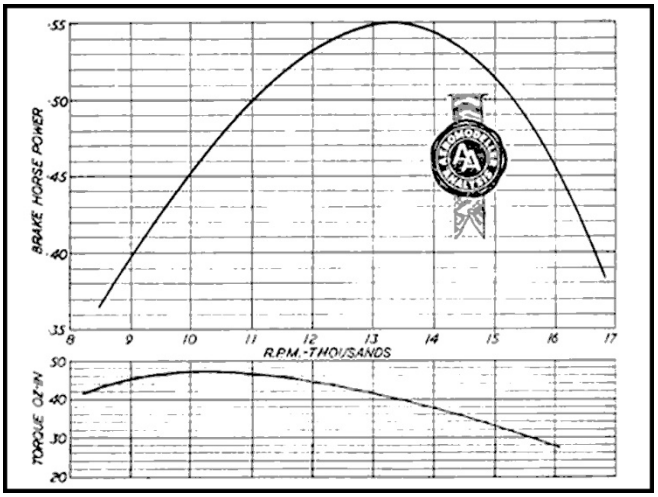
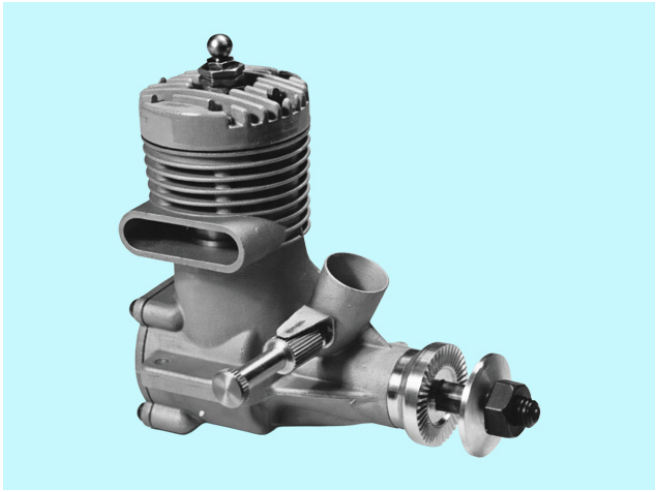
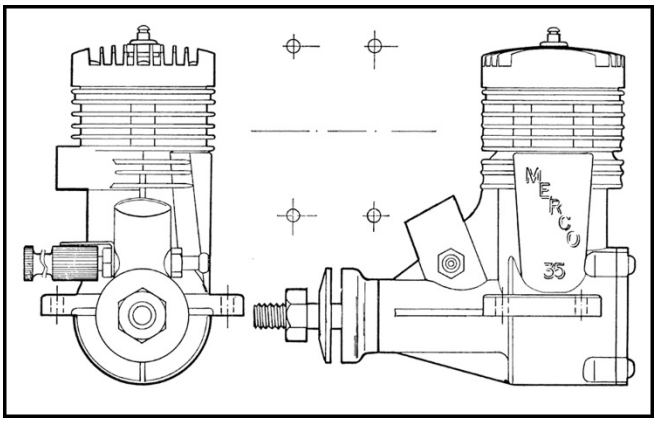
Max. Power: .55 B.H.P. at 13.400 r.p.m.
Max. Torque: 47 ounce-inches at 10.400 r.p.m.
Power rating: .095 B.H.P. per c.c.
Power/Weight ratio: .073 B.H.P. per oz.

Material Specification

Crankcase: L.M.6 light alloy die casting Cylinder
Liner: Leaded mild steel, unhardened
Piston: Meehanite
Con rod: R.R.56 light alloy forging
Crankshaft: Hardened steel
Main Bearing: Phosphor bronze bush
Spray bar assembly: Brass
Head: Light alloy die casting (stove enamelled)
Propeller driver: Dural
Propeller nut: ½ in. B.S.F.







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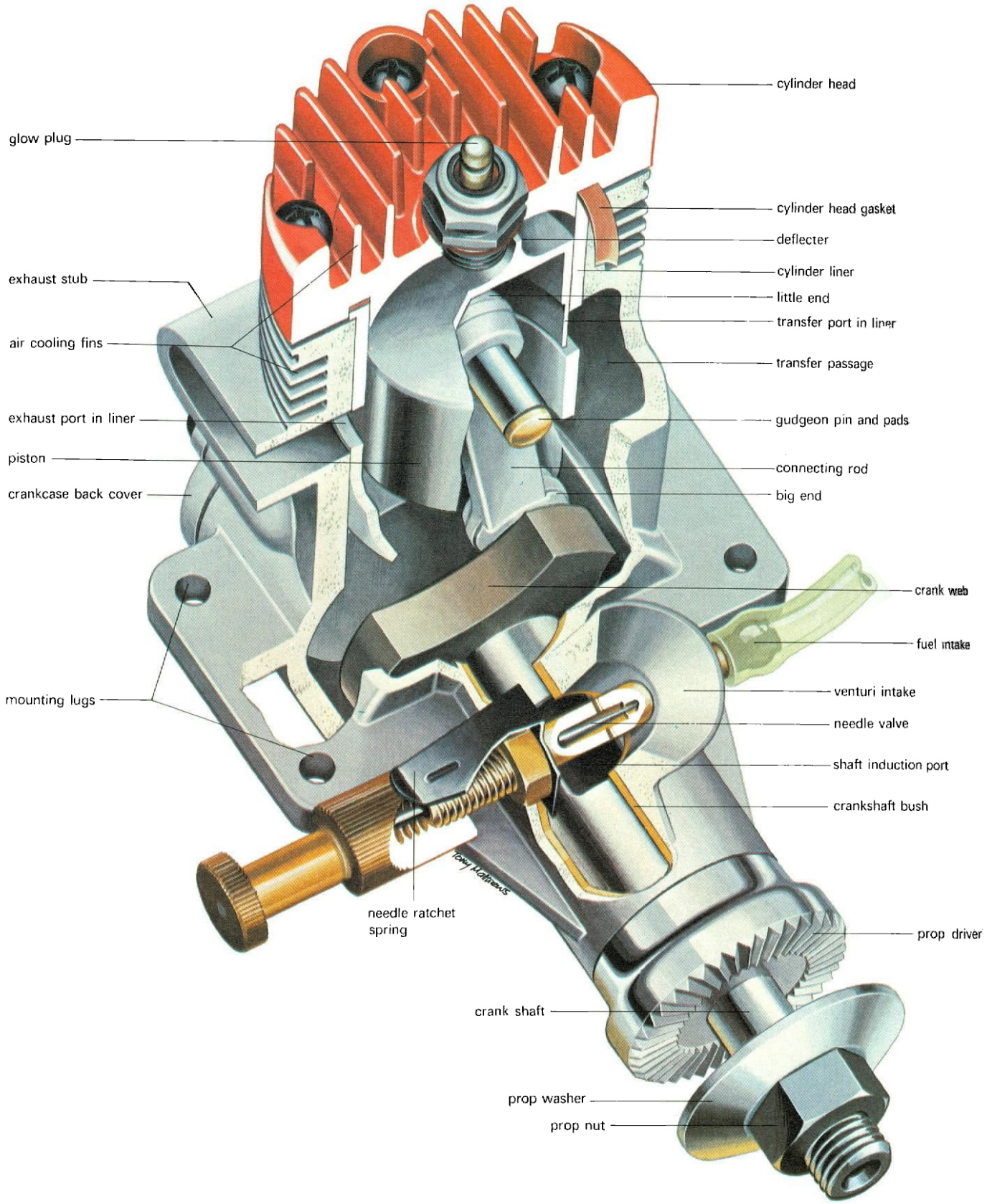
Engines

A TYPICAL GLOW-PLUG ENGINE



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