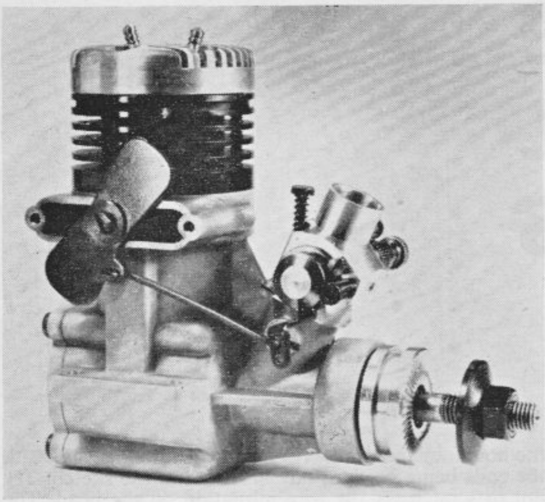


Peter Chinn's

Radio Motor Commentary

MERCO 61 SERIES III

Left: the new Merco 61 Series III is identified, externally, by new carburettor, integral cylinder fins and modified crankcase.

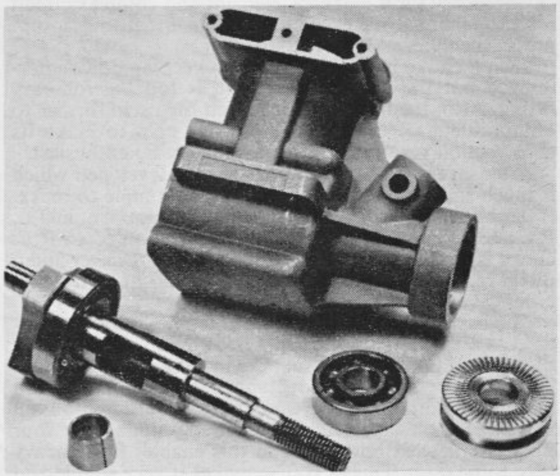
SOME eight months ago we published a photo of the front end of one of Merco manufacturer Dennis Allen's models showing a Merco 61 Mk. II equipped with an experimental carburettor of a new type. The original intention had been to market the Mk. II with a production version of this carburettor but towards the end of last season it became clear that, with the greater power liberated by this new carburettor, some modifications to the engine itself would be desirable. A development programme was therefore embarked upon and it was not until April 20, on the occasion of the Weybridge R/C Symposium, that the final result was shown to the public in the form of the new Merco 61 R/C Series III engine. At that time only a dozen motors had been built but production got well under way immediately afterwards and our test model was delivered on May 29.

We began a two-hour running-in period on the Series III immediately so that some test figures could be obtained for this article. The engine was first set-up with a 12 × 6 prop, connected to a tank of straight 3 to 1 fuel, primed and the battery lead applied to the rear glowplug. It started on the first flick of the prop.

This instant cold starting continued throughout the running-in and test periods. Hot restarting was not so positive at first, even though compression remained good, but improved as testing progressed. The Series III was just as easy to handle as the earlier 61. The compression ratio seems to be well chosen for a good balance between the requirements of docile handling and high power and at no time did the Series III show any inclination to take our fingers off.

Checks on various propeller loads revealed that it is at the top end of the r.p.m. scale that the new engine outpaces its predecessors. Comparing r.p.m. obtained with the Mk. I engine on the same props and on the same 5 per cent nitro fuel (both engines running without silencers) the Series III showed no advantage on a 14 × 6 Top-Flite but was 400 r.p.m. faster on a 12 × 6 Power-Prop, 600 r.p.m. faster on an 11 × 6 Top-Flite and 1,000 r.p.m. faster on an 11 × 5 Top-Flite. These, of course, are static r.p.m. figures. Obviously, an 11 × 5 would not be used on a model but the in-flight improvement on an 11 × 6, 11 × 6½ or 11 × 7 is likely to approach or even (in the case of an 11 × 6) equal the static improvement quoted for the 11 × 5.

The actual gross b.h.p. of the Series III shows an improvement of almost 30 per cent on that of the original Mk. I. This is without silencers being fitted. The net

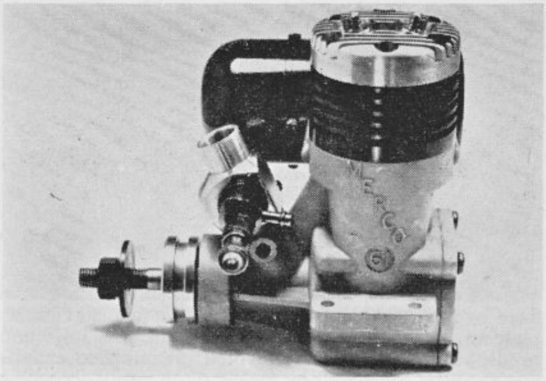


gain after allowing for power loss through a standard Merco muffler is very much less, but D. J. Allen Engineering have managed to recover some of this loss by designing an entirely new silencer for the Series III, known as the 'Peak-Power' muffler. Using this silencer, the following prop r.p.m. were recorded:

8,700 r.p.m.	on	13 × 6	PAW Trucut wood
9,700 ,,	,,	13 × 5½	Top-Flite wood
10,500 ,,	,,	12 × 6	Power-Prop wood
9,800 ,,	,,	11 × 8	Top-Flite wood
11,000 ,,	,,	11 × 8	Power-Prop wood
10,100 ,,	,,	11 × 7¾	Bartels glass-fibre
11,150 ,,	,,	11 × 6	Top-Flite wood
11,300 ,,	,,	11 × 6	Power-Prop wood
12,400 ,,	,,	11 × 5	Top-Flite wood
13,200 ,,	,,	11 × 5	Power-Prop wood

Removing the Peak-Power silencer and replacing it with a standard Merco silencer resulted in an r.p.m. loss ranging from just under 100 revs on the 13 × 6, to 600 revs on the 11 × 5 Power-Prop. Moreover, the old type silencer was noticeably noisier despite the fact that it was quite unmodified and was complete with outlet nozzle.

Where does the Series III's extra power come from? Undoubtedly, the major part of the improvement can be attributed to the new 'Micro-Flo' carburettor. This has a choke area more than double that of the previous



Right: the lack of rear overhang on the new Merco 'Peak-Power' silencer will please those who prefer radial mounting. Silencer outlet is on the side at the front end.

model – much larger, in fact, than that of any other 10 cc' R/C engine (HP 61 R/C included) offered to date. The throat diameter is not increased, but the larger-diameter spraybar, which formerly cut the effective area by 60 per cent, has been discarded and is replaced by a small diameter jet protruding into the centre of the throttle barrel.

Hitherto, it has generally been accepted that a small carburettor choke area is essential for good throttle control. It is, of course, true that a large venturi throat does not create so much suction at the fuel jet as a small one. If such suction is insufficient, a slight variation in fuel delivery pressure (such as occurs through various manoeuvres and between full and nearly empty tank levels) may cause the engine to starve or to run excessively rich to the extent that it may cut out. However, most R/C carburettor chokes are a good deal smaller than they need be to ensure adequate *full-throttle* suction. They are deliberately kept small to ensure more effective operation at part throttle settings.

It is not a question of insufficient fuel suction at idling speed. Here, the engine does not depend on the speed of the airflow through the venturi to pull the fuel through the jet: with the air supply almost cut off, the strong suction created by crankcase depression takes over and it is usually necessary to provide some means of preventing the fuel mixture from becoming too rich – i.e. a notched barrel or an airbleed hole. The main problem is one of ensuring that the mixture strength range is kept within certain limits at part throttle openings. This can best be done by keeping the choke on the small side and this is what is done with most R/C engines. But it costs power.

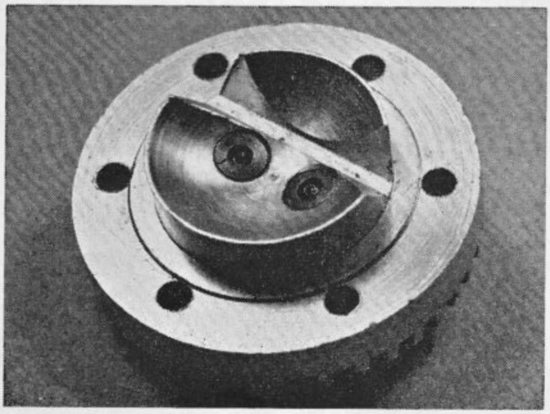
What is required to permit larger venturis is a means of regulating the amount of fuel delivered by the carburettor jet so that it is reasonably well matched to the amount of air admitted at all throttle openings. The 'rising needle' throttle is an old idea, first used with petrol engines, in which the needle-valve is gradually withdrawn from the fuel jet as the throttle is opened, thereby allowing more fuel to reach the engine. The Johnson Automix carburettor contained the first commercial application to model R/C engines of a similar idea. Here, the needle rotated with the throttle barrel which moved sideways as it opened, thereby opening the needle-valve as well. Neither of these systems effect a perfectly balanced mixture over the entire speed range, however.

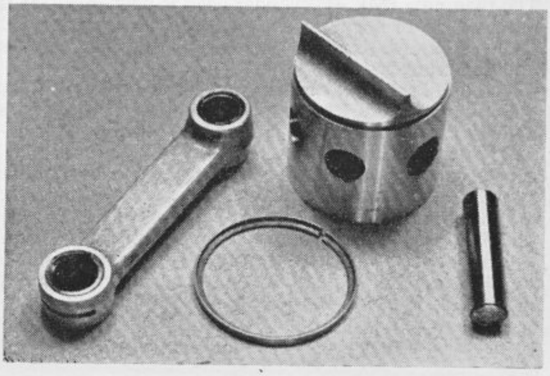
A step nearer is the Lee carburettor which was designed for the Veco 61 and combines the basic idea of the Johnson throttle (in a better mechanical form) to cope with the middle range of throttle openings, plus an adjustable airbleed for setting the idling mixture.

In both the Johnson and the Lee carburettors, the amount that the barrel moves sideways (and thus the degree to which the needle-valve is automatically opened and closed) is fixed by the angle of a slot in the throttle barrel. In some circumstances the mixture may be weakened too much as the throttle is closed. Or it may remain too rich. On the Johnson an attempt was made to overcome this failing by offering an accessory set of three needles having different tapers. On the Veco carburettor, two barrel slots are provided so as to give a choice of rich or weak settings.

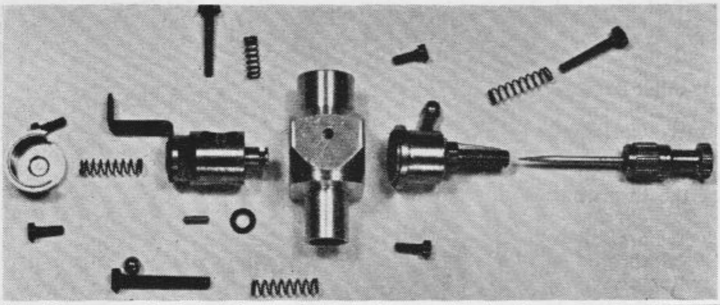
On the new Merco Micro-Flo carburettor with its large choke area, it was (or so we suspect) vital that a means of adjusting the mixture strength range more precisely should be found. Ideally, it should be possible, by means of a simple adjustment, preferably carried out while the engine is actually running, to control the degree to which fuel flow to the jet is reduced as the throttle is moved towards the low-speed position. It should be possible to adjust this to within very fine limits and, for simplicity, without interfering with the main needle-valve setting.

This is exactly what the Micro-Flo carburettor provides. As on the Johnson and Veco throttles, the barrel moves sideways as it rotates, but this movement is not

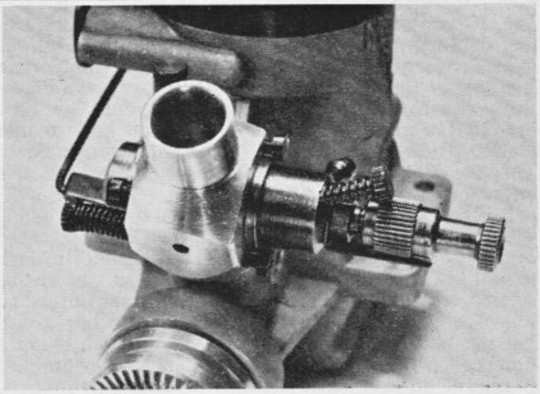




Centre left: Series III main casting has more 'square' crankcase, bigger mounting lugs and a wide strenthening rib on exhaust side. Shaft and bearings are unaltered. Above: cylinder-head, employing hemispherical combustion chamber with two inclined standard plugs, is unchanged. Right: Dykes type piston ring is now used. Piston bosses and both ends of connecting-rod are bronze bushed.



Left: the Micro-Flo carburettor contains 25 parts in all. Swivel plate which controls mixture strength is fixed in needle-valve housing on right.



Below: close-up of the Micro-Flo carburettor. Small angled screw above needle-valve stem is the 'middle-range screw' for adjusting mixture strength at intermediate throttle openings.

fixed by an angled slot. Instead, there is a small circular plate in the housing which contains the fuel inlet and needle-valve. This plate is pivoted on one side and its angle can be controlled by means of an easily accessible screw (called the 'middle-range screw') above the needle-valve. The end of the throttle barrel contains a pin which bears against this plate. The barrel is constrained to remain (via its pin) firmly against the plate by a compression spring. Thus the amount that the barrel moves sideways in its travel from the open to the closed positions is infinitely variable by means of the screw adjustment, so providing an extremely precise control over the mixture in the all-important intermediate throttle range. An adjustable airbleed – and, of course, the usual throttle stop screw – are provided for setting the idle.

On the bench, we found that this worked well. With the middle range screw correctly adjusted, a mixture strength within the acceptable limits over the entire throttle range was maintained, resulting in very progressive throttle control. That this works in the air, too, has been borne out by the extensive flight testing that has been carried out by the manufacturer.

As we have said, it is the new carburettor that gives the Series III most of its extra power. However, a number of improvements have been made in the construction of the engine to give it the durability necessary to cope with such extra power.

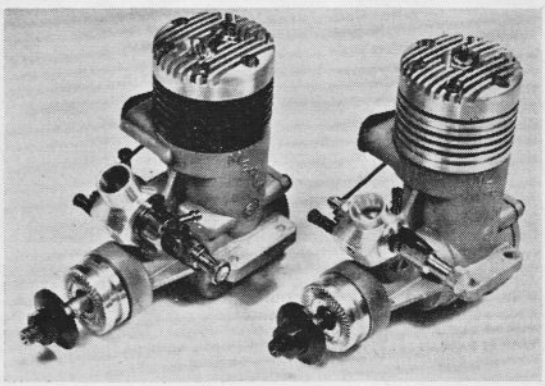
The crankcase has been strengthened by the addition of extra metal. This includes squaring off the front end, using wider, thicker and longer mounting lugs (bolt hole spacing is now different from the Mk. I and Mk. II) and adding a substantial vertical rib on the right hand side between the exhaust duct and mounting lug. The exhaust duct also has the addition of two drilled and tapped lugs for direct attachment of either type Merco silencer.

In place of the separate finned aluminium cylinder jacket and steel liner of all previous Merco 49's and 61's, the Series III now has a heavy one-piece steel cylinder with integral fins and an extremely thick base flange. The twin plug (Mk. II) cylinder-head is unchanged, as is the method of securing the cylinder components, i.e. six head screws, three of which pass through the fins into the crankcase.

The crankshaft and bearing set-up is unchanged. By present shaft-valve 10 cc. engine standards, the Merco's 12.7 mm. shaft is small and, should it be thought necessary in the future, it is here, probably, that the next development in the pursuit of still more power could be made. Porting, too, is virtually unchanged – in fact, the cylinder ports are the same size as those of the original Mk. I 49. New, however, is the adoption of a single Dykes pattern low-pressure piston ring giving excellent compression seal with minimum ring friction. Already successfully used on the K & B 40 and O.S.40P pylon-racing R/C engines, the Dykes ring appears for the first time in a 10 cc. R/C engine in the Merco and may well be adopted for other engines in this class. We understand that the latest version of the Veco 61 will, in fact, have a Dykes type ring.

Powerful engines always generate a lot of heat and the Series III is no exception. The Mk. I and Mk. II ran fairly hot and the Series III runs even hotter but the extra metal in the crankcase and cylinder can doubtless take care of this. Both ends of the conrod are bronze bushed, as are the piston bosses and, to further reduce the risk of small-end wear, skirt transfer ports are used to scavenge hot gas from beneath the piston crown. These are features carried over from the later model Mk. II's.

At just over 15 oz., the Series III is about $2\frac{1}{2}$ oz. heavier than the original 61 but is still a good deal lighter than engines like the Super-Tigre G.60 and Rossi 60. It could prove to be the most successful Merco yet. Here's wishing it the best of British luck.



Right: side by side comparison of the Series III with the original Mk. I engine. New model will fit same bearer spacing but needs wider bolt spacing.