dia. x pitch	Propeller—R.P.M. Figures	r.p.m.
9 x 6	Frog nylon	10,600
8 x 4	Frog nylon	13,800
8 x 6	Frog nylon	11,500
11 x 4	Top Flite	8,800
10 x 6	Top Flite	8,800
10 x 3½	Top Flite	10,100
9 x 7	Top Flite	9,000
9 x 6	Top Flite	9,800
9 x 4	Top Flite	12,000
8 x 4	Top Flite	14,800
9 x 7	K-K nylon	9,000
9 x 6	K-K nylon	9,300
9 x 4	K-K nylon	12,700
8 x 6	K-K nylon	11,900
8 x 4	K-K nylon	14,400
9 x 4	Trucut	11,500
8 x 6	Trucut	11,300
7 x 9	Trucut	11,500
8 x 4	Trucut	14,600
7 x 6	Trucut	11,500
7 x 4	Trucut	17,000
6 x 9	Trucut	14,600

Fuel used: D-C "Quickstart" diesel fuel.

Displacement: 2·443 c.c. (·149 cu. in.)
Bore: ·589 in.
Stroke: ·547 in.
Bore/Stroke ratio:
Bare weight: 6¼ oz.
Max. power: ·332 B.H.P. at 15,000 r.p.m.
Max. torque: 27 ounce-inches at 9,000 r.p.m.
Power rating: ·135 B.H.P. per c.c.
Power/weight ratio: ·053 B.H.P. per oz.
Material specification:
Crankcase unit: Pressure die-cast light alloy
Cylinder: Mild steel
Crankshaft: Hardened steel
Piston: Cast iron
Contra piston: Cast iron
Connecting rod: Light alloy casting with bronze bushings
Cylinder jacket: Turned dural
Spraybar: Brass; nickel plated
Bearing: One 11·5 mm. ballrace at rear; bronze bush (front)
Manufacturers:
Enya Metal Products Ltd.,
Tokyo, Japan

ENYA 15D

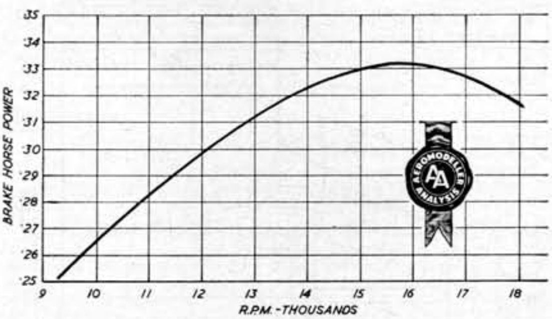
Mark II

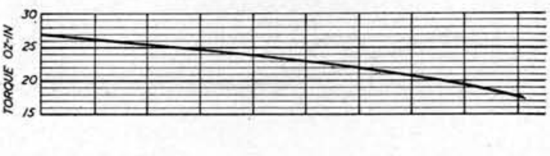
ENGINE ANALYSIS No. 80

by R. H. Warring

CONTINUING TO DEVELOP their loop-scavenged 2·5c.c. diesel, Enya have beefed up their design somewhat in the Mark II version, improved the performance and offer a throttle unit as an extra to give a power plant which should be equally at home for racing or contest work, or general-purpose "sport" application (particularly radio control). Performance is way up in the top class — a measured B.H.P. on test of ·332 at 15,500 r.p.m. — and the Enya Mk. II is extremely robust, although this has been achieved at the expense of producing a somewhat heavy 2·5 c.c. engine (over 6 ounces). Handling characteristics are generally excellent; alternative venturis are provided for "stunt" and "speed" work and the barrel-type throttle control is both cleverly designed and about the most efficient of its type we have encountered on an engine of this size.

The loop-scavenged diesel is essentially a post-war Japanese development and is no longer a novelty, as such. The system offers certain advantages for high speed running — which is why it is generally favoured for the racing-type glow motors. Main new feature of technical interest on the Mark II Enya 15, therefore, is the truly enormous crankshaft — a full 11·5 millimetres diameter (·4515 in.) running in a ball race at the rear end with the front length supported by a bronze bushing in the crankcase.



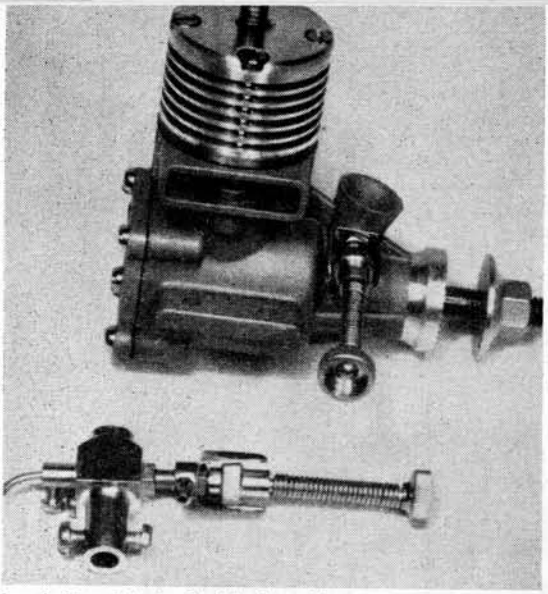


Large shaft diameters have been a favoured point in previous Enya designs and in the Mark II would appear to be carried to a logical limit. Specific advantages of a large diameter are reduced bearing loads and greater strength, at the expense of increasing the actual rubbing speed. Strength does not automatically follow as much depends on how the front end is "stepped" or reduced in section, as well as material specification and heat treatment. In this instance the front end of the shaft is stepped down to a ¼-in. diameter threaded length, the dural prop driver fitting on a narrow chamfer on the main (full diameter) section. In a sense, this does not realise the full material strength since the ¼-in. diameter length is entirely unsupported and virtually "cantilevered" from the front of the main section. Plenty of strength is left in the main length of shaft, the ¼-in. diameter central hole leaving a wall thickness of some 0·1 inch whilst the purely circular port opening is 5/16 in. diameter. Were it not for the fact that Enya obviously favour large shaft diameters we would be tempted to say that the use of a shaft of this diameter in a 2·5 c.c. diesel was as much a "gimmick" as anything else as similar overall strength and performance could undoubtedly be realised in a smaller size.

Accommodation of the shaft has called for a new crankcase design, although the external proportions are quite normal and the actual bearing length and overhang does appear to have been reduced, compared with earlier models. The intake tube is now quite short and angled forwards, bringing the needle valve rather near the propeller disc. However, the properly-engineered flexible extension means that adjustment can be carried out with complete safety — and it is a pleasure to handle a needle valve extension which is so positive and sensible.

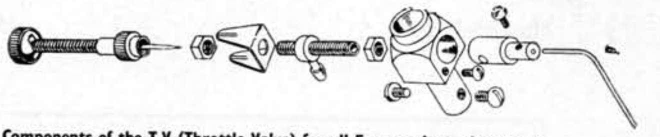
For normal running alternative venturi inserts are provided to fit the intake tube, locating around the spraybar. There is very little actual difference in throat diameter, or in performance on bench test until the high speeds are approached. However, with the smaller throat opening, specified for stunt work, needle settings are definitely less touchy.

The throttle unit fits inside the intake tube (after removing the conventional spraybar) and is held in position by two screws through the holes in the wall left by removing the spraybar. A cubical section at the top houses a brass barrel valve controlling the throat opening whilst the fuel feed is from a tube on the right



hand side with the fuel feed teed into this tube at about its mid-length, controlled by a needle. This simple arrangement cleverly avoids the difficulty of having to locate the fuel feed hole accurately with respect to the barrel valve, as is the case when a barrel throttle is employed with a conventional spraybar arrangement.

Throat diameter is appreciably reduced with the throttle control and results in a loss of approximately 1,000 r.p.m. at 11,000 - 12,000 r.p.m., compared with the standard set-up. The loss is somewhat greater than 10 per cent. at higher speeds, and less at lower speeds. Throttle effect is positive and progressive, with a minimum of lag. At minimum throttle setting, the engine is running slightly rich, but responds immediately to opening the throttle without hesitating. The Enya will start at low throttle setting, which is seldom the case with throttle controls. Minimum "low" speed which could be held consistently was 3,000 r.p.m., from full throttle load speeds in the region of 10,000 to 13,000 r.p.m. Although the throttle responds over the whole of its movement, it is only over the latter part that a substantial reduction in speed is achieved, but the performance is most consistent. Enya have obviously paid a lot



Components of the T V (Throttle Valve) for all Enya engines, shows how needle valve body is firm, while choke revolves around the jet

of attention to developing this throttle and they have certainly got it just about as good as possible.

General running characteristics need little description, except to say that the Enya Mark II is a very easy engine to handle for a racing diesel. The chief characteristic is that a prime through the exhaust is virtually essential for starting — which may be a bit of a handicap for team racing applications. Also at propeller loads corresponding to *high* speeds one is not always quite sure of the settings and considerable inter-adjustment of needle and compression may be called for.

Slow speed performance is very good, with torque continuing to increase down to 9,000 r.p.m., although there is quite a marked loss of power on warming up at low load-speeds. With increasing speeds progressive opening of the needle is called for. Whilst peak power was achieved on test at 15,500 r.p.m., performance remains smooth and consistent at much higher speeds, even approaching the 20,000 r.p.m. figure.

Construction-wise, the Enya 15 D Mark II features an elaborate pressure-die-cast crankcase unit incorporating the lower cylinder housing and stub exhaust, with cast-in transfer passages. The cylinder is of substantial section, ·709 in. overall diameter, with a large diameter flange seating on the crankcase unit and sealing with a gasket. A rectangular transfer port 9/16 in. wide and $\frac{1}{8}$ in. deep is cut through the wall slightly staggered below a diametrically-opposed exhaust port of similar dimensions. Actual transfer, governed by the crankcase passages, takes place through the ends of the transfer port, the centre of the port being blanked off when the cylinder is assembled. The cylinder is of unhardened mild steel, ground outside to finish. The bore is, rather surprisingly, chromium plated.

The piston is of cast iron, with a conical top and one side wall cut away to provide transfer timing, leaving incidentally what could be a weak point since some 1/16-inch only of metal is left by the gudgeon pin hole. The gudgeon pin itself is 5 mm. diameter, fully floating, hollow