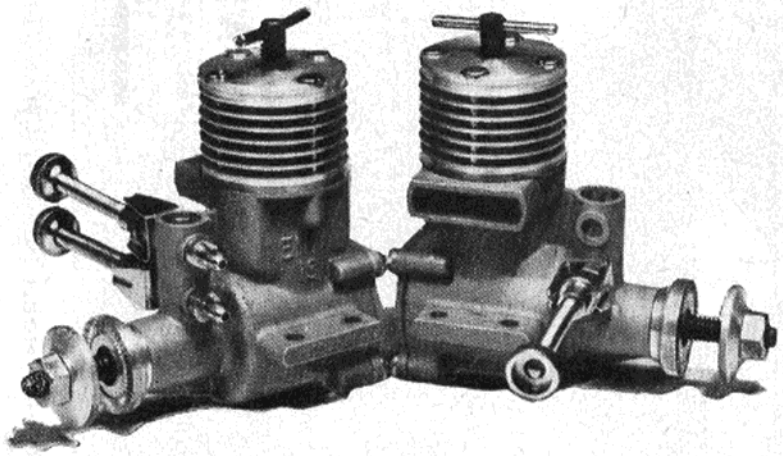
MA **ENGINE TESTS**

THE ENYA 15-D

Japan's new 2.5 c.c. Diesel

"could very well influence the future trend of competition diesel design"



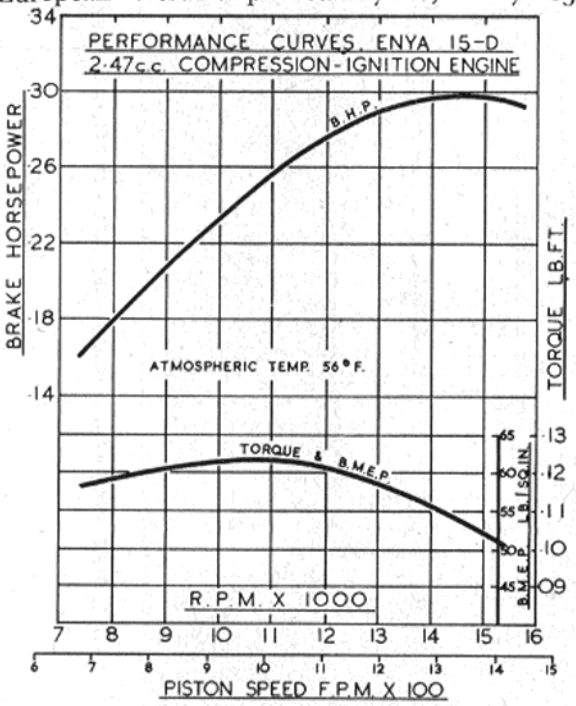
THE new Japanese Enya 15-D is a very remarkable engine.

That the products of Japan's two leading model engine manufacturers are comparable with some of the best motors available elsewhere has become increasingly evident during the past two years and this fact will already be known to readers of MODEL AIRCRAFT. Nevertheless, the Enya 15-D is an eye-opener for a number of reasons.

Firstly, this is the first diesel of its type in a country predominantly glowplug minded. It would therefore be understandable to find that, initially, such a product would lag slightly behind the performance of European diesels: particularly so, having regard to the fact that the 2.5 c.c. class is a highly competitive one and that most manufacturers have had a number of years' experience in designing and producing diesels for this category.

Secondly, Europe being the home of the diesel, where most diesel development has taken place and where compression-ignition engines are most widely accepted, one would assume that the layout of any new Japanese engine of this type would be based on currently accepted European practice, if not closely allied to a specific British or Continental design.

In fact, however, we find that the Enya 15-D is not only a refreshingly original design, quite unlike any of the successful 2.5's produced elsewhere, but that its performance exceeds that of almost every other 2.5 c.c. diesel currently available. In fact, on the basis of our test findings, the only diesel which still has a slight edge in performance over the Enya is the Oliver Tiger Mk. III.



Undoubtedly, this new motor by designer-manufacturer Saburo Enya is a notable achievement—perhaps a significant one because it may very well encourage some revised thinking on the part of other designers and could, therefore, presage a partial abandonment of the reverse-flow scavenged cylinder layout that has hitherto been employed by all the most successful 2.5 c.c. competition diesels. Enya's loop-scavenged cylinder offers further scope for development at a time when, seemingly, we are running out of ideas for the improvement of the existing reverse-flow scavenging systems.

A description of the Enya 15-D was given on pages 57-8 of the February issue of MODEL AIRCRAFT, together with photographs showing the internal features of the design. To recapitulate, these include rigid construction, shaft-valve induction, with optional twin needle-valves, and a counterbalanced crankshaft supported in a large inner ball-bearing, supplemented by an outer bronze bush.

The design of the crankcase, cylinder-liner and piston is a clever combination which gives rigid support for the lower part of the liner, while offering an easy route for the ingoing charge. A large volume divided transfer passage is used and a 5/32 in. deep section of the piston skirt is cut away on the transfer side so as not to restrict the movement of gas from crankcase to transfer passage. The supporting sections of the crankcase walls fit the cylinder liner closely and the liner is located vertically by a flange slightly above port level which also seals the top of the transfer passage. Over the upper section of the liner a machined dural finned

cooling barrel is an equally good fit. A notable and worthwhile refinement here, incidentally, is the threaded steel insert fitted in the duralumin head for the compression screw.

Specification

Type: Single-cylinder, air-cooled, loop-scavenged two-cycle, compression-ignition. Shaft type rotary-valve induction. Conical crown piston with matching contra-piston.

Swept Volume: 2.474 c.c. (0.151 cu. in.).

Bore: 15 mm. (0.5905 in.).

Stroke: 14 mm. (0.5512 in.).

Stroke/Bore Ratio: 0.933 : 1.

Weight: 5.1 oz. (5.4 oz. with twin needle-valves).

General Structural Data

Pressure diecast aluminium alloy crankcase and main bearing housing with integral exhaust and transfer ducts, air intake and beam mounting lugs. Diecast flange-fitting rear cover of similar material and secured with four screws. Counterbalanced crankshaft with 10 mm. dia. journal and running in one ball bearing (inner) and bronze outer bearing. Heavily proportioned diecast connecting-rod with bronze big-end bearing. Lightweight lapped piston with 5 mm. dia. fully-floating gudgeon-pin with aluminium end pads. Cylinder-liner flanged above ports and secured to main casting with four long screws from cylinder head. One piece cylinder barrel and head of machined duralumin, with steel compression screw thread insert. Duralumin prop driver fitted on mating taper on crankshaft. Nickel-plated brass needle-valve assembly with spring ratchet device and flexible control stem.

Test Engine Data

Running time prior to test: 1½ hours.

Fuel used: 40 per cent. I.C.I. technical ether, 30 per cent. Shell Royal Standard kerosene, 27 per cent. Castrol M castor-base lubricating oil, 3 per cent. amyl-nitrate.

Venturi insert retained for all tests, but upper needle-valve assembly removed for dynamometer tests.

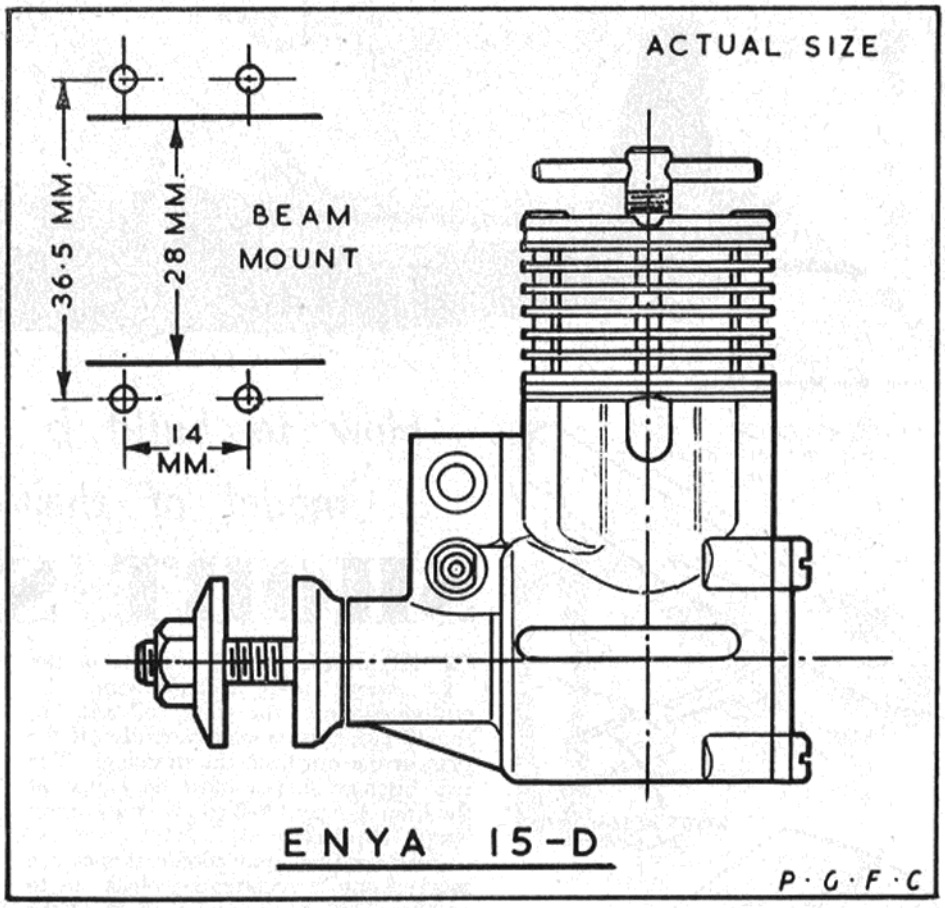
Performance

The original engine received for test was fitted with dual needle-valves. When so equipped, the engine is, of course, intended for such applications (notably R/C) where two-speed control is desired, one needle being set for maximum (weak mixture) speed, while the second needle, set rich, gives a lower performance. The Enya was first tried with both valves fitted and was found to give a useful variation in speed. An unduly oily exhaust characterises all twin-needle installations on the low-speed setting, but this would not be difficult to deal with on the Enya as the engine is provided with an exhaust stack to which an exhaust pipe could be connected without much difficulty.

After initial tests, the upper needle valve unit was removed so as not to restrict top end performance.

We found that a prime through the exhaust port was useful for an initial start from cold, but, thereafter, re-starting was easily performed with a preliminary choked flick. The engine started easily under all loads, including small props allowing speeds up to and exceeding the peak r.p.m.

Handling and running characteristics inspired confidence. The usual slight falling off of power with warming up, common to virtually all diesels, was present but in no very marked degree at the higher speeds, and the 15-D was notable for its smooth and consistent running qualities. The compression control worked well and with no tendency to seize.



On the torque reaction dynamometer, the above average output of the Enya diesel was quickly made evident by its indicating torque figures in excess of 0.12 lb./ft. at speeds of from 9,000 to 12,000 r.p.m. Peak performance apart, this meant that the 15-D would turn low and medium-pitch 9 and 10 in. props faster than almost any other 2.5 c.c. motor.

In actual fact, the 15-D turned a P.A.W. Trucut 10 × 4 at 9,400 r.p.m., a 9 × 6 Frog nylon at 10,800 r.p.m. and a 9 × 4 Trucut at nearly 12,000.

The peak of the power curve came out at approximately 14,700 r.p.m., a speed, incidentally, that also approximates to the r.p.m. obtainable on an 8 × 4 Trucut. The actual output recorded was 0.298 b.h.p., which, of course, is outstandingly good, especially for a quantity produced engine. Maximum b.m.e.p. was 62 lb./sq. in., again an exceptional figure.

In all, this new Japanese engine is an interesting achievement and one which could very well influence the future trend of competition diesel design.

Power/Weight Ratio (as tested): 93.5 b.h.p./lb.

Specific Output (as tested): 120 b.h.p./litre.