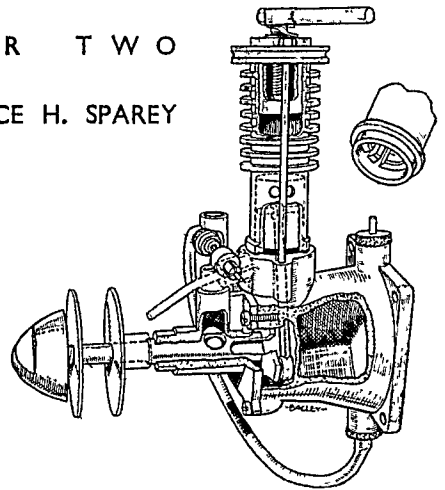


Engine Analysis

THE FROG "100" DIESEL

NUMBER TWO

BY LAWRENCE H. SPAREY



As these series of tests proceed it becomes increasingly evident that considerable benefit to the aeromodelling community can accrue from the co-operation of specialists working along scientific lines. This is apparent from the results obtained with the propellers specially designed by Mr. P. R. Payne for each engine tested. B.H.P. figures are first obtained by Mr. Sparey, after which Mr. Payne takes over, and designs an airscrew to take advantage of the maximum h.p. output of the engine. The amazing results of this scientific approach are evident from the Static Thrust graphs obtained.

TEST

Engine: "Frog 100" 1 c.c.

Fuel: Mills Diesel Fuel (2 parts fuel, 1 part Ethyl Ether).

Starting: Hand starting was used throughout. Engine was run inverted which is the maker's recommended position. As with all gravity fed carburettors, there is a tendency to open the needle valve too much, with consequent liability to flood the engine. Once, however, the correct position is found, the engine starts easily both when hot and cold. No cut-out is incorporated.

Running: Runs well and steadily over a wide speed range, and shows a flexibility unusual with diesel engines. This simplified testing greatly, as a large range of constant speeds could be attained. This is not of great practical value, however, as the b.h.p. falls rapidly with decrease in revs. per minute.

B.H.P. As is normally the case, power rises steeply with increase in revs. from .0145 b.h.p. at 2,800 r.p.m. to a maximum of .0575 b.h.p. at 8,100 revs. This maximum figure for b.h.p. may be considered exceptional for an engine of this capacity. Beyond 8,100 r.p.m. the power falls off steeply, so that at 10,000 r.p.m. the power output is .042 b.h.p. This was the maximum speed at which the engine was tested.

Static Thrust. Using the maker's standard propeller a maximum thrust of 10 ozs. was obtained at 5,760 r.p.m. while at 4,500 r.p.m. the thrust was 7½ ozs. This steep decline in thrust as the revs. decrease is characteristic of most internal combustion engines.

A remarkable increase in thrust was obtained when using the Payne airscrew, as the graph shows a maximum Static Thrust output of 15 ozs. at 9,000 r.p.m. At 7,500 r.p.m. the thrust was 12 ozs. but below this speed the load was insufficient for consistent running. There is also no object in taking static thrust tests at obviously inefficient engine speeds.

It is interesting to note that the Payne airscrew delivers its greatest thrust at a point beyond the maximum power output of the engine. This suggests that a slight modification of propeller design, so that maximum thrust could coincide with maximum power output, might yield yet better results. The engine, however, showed no signs of distress when run at 9,000 r.p.m. for long periods.

As we go to press we learn that improvements have been made to the cylinder head and carburettor assembly.

GENERAL AND CONSTRUCTIONAL DATA

Name: Frog "100".

Manufacturers' Name and Address. International Model Aircraft, Morden Road, Merton, S.W.19. 'Phone No. Liberty 1041.

Retail Price. 60/- with airscrew.

Delivery. Ex stock.

Spares Service. Comprehensive (manufacturers and agents).

Type. Compression ignition "diesel". 2 cycle, rotary valve induction.

Specified Fuel. Equal parts by volume of ether meth diesel fuel oil and lubricating oil (X.L.) etc.

Capacity. 1 cubic centimetre. .061 cubic inches.

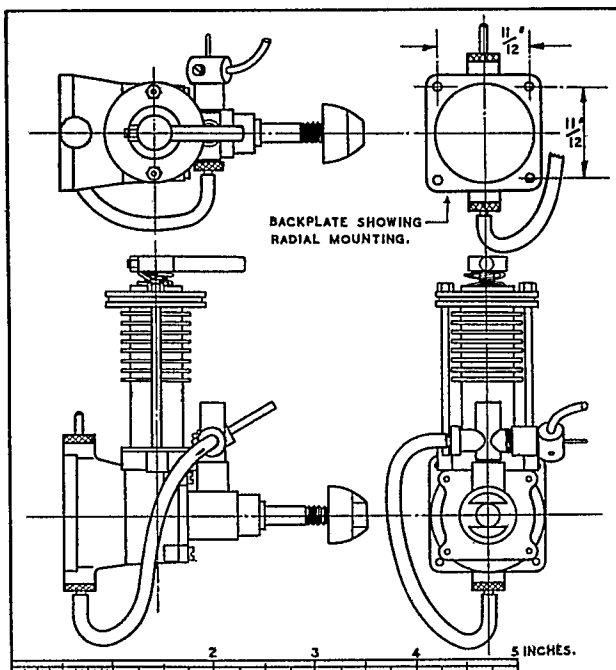
Weight. Bare 3.125 ozs.

Compression Ratio. 12-1 to 20-1.

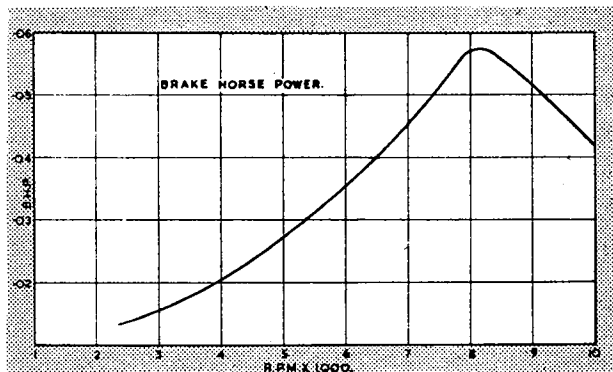
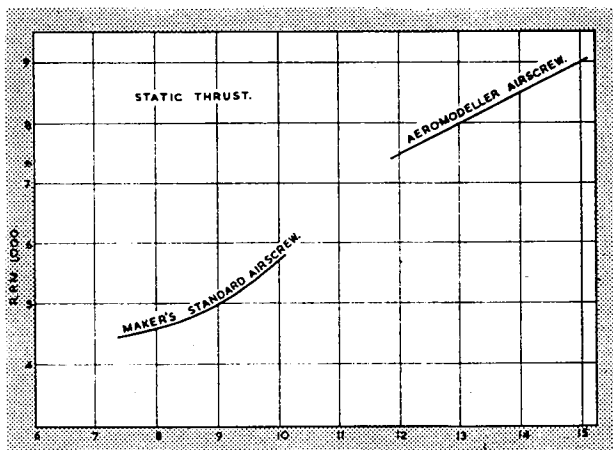
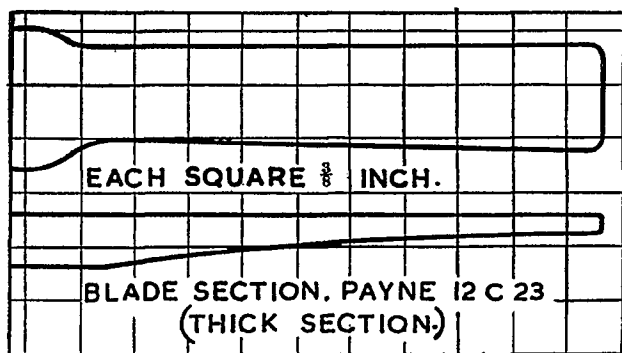
Mounting. Radial, upright or inverted.

Recommended Airscrew. Free flight 9" diameter 5" pitch Control-line, 8" diameter 8" pitch.

Recommended Flywheel. 1½" diameter, weight 2¼ oz.



Tank. Integral with crankcase, capacity 9 c. cms.
Bore. .375"
Stroke. .55"
Cylinder. Meehanite, honed. Ports, two sets of exhaust and transfer ducts. Method of attachment, spigotted to crankcase with two holding down bolts through head.
Cylinder Head. Aluminium die-casting. Finned, with two holding down bolts.
Contra Piston. Meehanite, centreless ground, adjusting screw and lever.
Crankcase. Aluminium die casting.
Piston. Meehanite, centreless ground, flat-top.
Connecting Rod. Forged hyduminium.
Crankpin Bearing. Plain.
Crankshaft. Machined from solid.
Main Bearing. Meehanite, plain, drilled for valve.
Little End Bearing. Plain (silver steel gudgeon pin).
Crankshaft Valve. Rotary shaft (case hardened mild steel).
Special Features. Fully controllable from tick-over to maximum revs. High power to weight ratio. Special two-way adjustment is incorporated for needle valve. A cut-out is available as an extra.



ETHEREAL LADY (Continued from page 364)

for ham-fisted fliers! A small area of sheet is essential round the finger choke-hole and round the timer site.

Wing.

The construction of the wing requires little comment. The 1/16" x 1/16" stiffeners were found to greatly reduce tissue sag between ribs. The leading edge may be covered with 1/32" sheet if desired. The tips may be constructed from sheet, or, for the builders who look askance at one 1/8" x 1/16" spruce tip, a second length of spruce may be glued round the first.

Tail Surfaces.

These are straightforward and call for no special comment. **Motor Mounts.**

The engine bearers and undercarriage are attached to F1 before gluing the former in. It should be borne in mind that this former is the keystone of the model—it is, in effect, an engine and undercart securely fastened to a ply bulkhead which is sort of followed around by a model. Remember that the strength of cement relies largely on its soaking into the material being cemented—ply will not absorb it and therefore Croid, Pafra, or a similar glue should always be used.

The near-cantilever bearers used on this model have proved satisfactory on many models built by the designer, but modifications may be made by anyone viewing the idea with suspicion. Metal mounts may be employed, in which case some means of rigidly affixing the noseblock must be devised. A piece of soft iron wire soldered between each (side) pair of bolt-heads, and a retaining strap under the heads (to prevent them from dropping out) makes a simple and foolproof means of bolting the engine in—the nuts may be dropped into place and tightened without the need to hold the heads.

The installation shown on the plan necessitates moving the motor forward and tilting to remove. This system is not possible with all types of motors; in the event of any difficulty a small piece of the noseblock at the top may be cut out and cemented to the front of the top hatch. With motors weighing

5 ozs. or under, the nose may be lengthened slightly, and in the event of a petrol motor being used, the positioning of the batteries allows the use of a considerably longer nose. The location of the timer is left to the individual builder, since this is a controversial point, though a box sited between F3 and F4 is recommended.

Undercarriage.

This is formed to plan from 12 s.w.g. piano wire and is bound and sewn to F1 before the insertion of the former into the crutch. The fairings are carved from 1" x 1/2" block—notice the clearance at the upper ends to avoid penetrating the covering in the event of excessive backward travel. The wire leg fits in a groove cut into the fairing, and the whole is secured by four wrappings of rag-pulp, liberally cemented.

Finish and Flying.

Rag-pulp is recommended; this again is a matter of personal taste. If a lightweight tissue is used, double-covering is well worth while. This type of model can be made to look very attractive, and, as mentioned elsewhere, there is room for the builder to spread himself on his colour-scheme. A hole drilled in the bottom of the cowl at the extreme rear of the engine compartment, and a small V-piece cemented outside will protect the finish by collecting superfluous oil and allowing the slipstream to blow it clear of the model.

When glide tests seem satisfactory, trimming should be carried out for right-hand circles under power. The diameter of the circles will vary with the power available—with small motors a wide circle produces the most pleasing results. The higher-powered "Ladies" have all exhibited the ability to hold a tight spiral. A slight amount of sidethrust allows the model to be trimmed for a wider circle while gliding. The designer's present model (Movo-powered) requires two degrees right-thrust and slight right rudder.

Full size plans of Ethereal Lady (see 1/4 scale reproduction) are available price 3/-, post free, from the Aeromodeller Plans Service Ltd., Allen House, Newarke Street, Leicester.