

The FROG 249 BB Modified

“ . . . the most powerful quantity built 2.5 c.c. diesel made in Great Britain at the present time.”



THE Frog 249BB-Modified model, which we first described in the June, 1957, issue of *MODEL AIRCRAFT*, just before it became available on the home market, is the most powerful quantity-built 2.5 c.c. diesel made in Great Britain at the present time. It is, in fact, a most important addition to the home market, because it brings to the ordinary modeller, a standard of performance that is otherwise obtainable only in foreign or specialist-built engines, generally costing considerably more.

The original model Frog 249BB was dealt with in the Engine Test series upon its introduction in Decem-

ber, 1955. Some months later a few “Modified” models were built especially for the American market and two of them were handed over to *MODEL AIRCRAFT* for test and evaluation. It was immediately apparent that this version offered at least 10 per cent. more power than the already very useful performance of the standard engine, but nearly a year passed before we were able to mention this engine as available on the home market. During the past two years, however, a few small additional improvements have been made to the 249BB and it is felt that a further full test report is now justified.

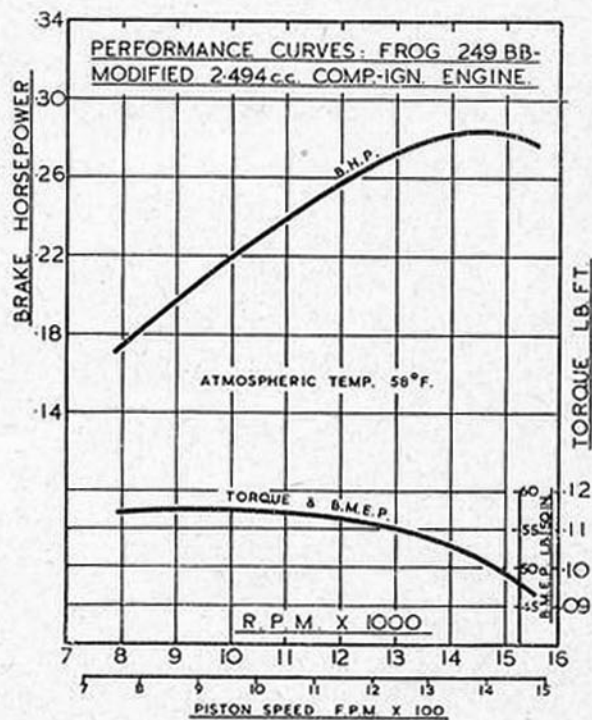
Externally, there is little to identify the 249BB-Modified from the original model, other than the colour of the finned cylinder barrel which is colour-anodised red instead of natural aluminium. There are, however, one or two subtle changes which distinguish the new 249 from the earlier models. Crankshafts, for example, are now an easy sliding fit in the ball-races—a practice which is becoming increasingly widely used as a means of reducing the risk of damage to the bearings in a crash. To limit rearward movement of the shaft (which might cause damage to the crankcase backplate and a strained con-rod) the front bearing seal is now provided

with a small brass bushing which acts as a distance piece between the drive hub and front bearing.

The principal difference between the 249BB-Modified and the standard model is, as previously related in *MODEL AIRCRAFT*, found in the cylinder porting. A new liner is used in which the inclined circular transfer ports, as originally designed, are replaced by circumferential slits of the same shape and area as the exhaust ports immediately above them. Unlike other standard production engines having this type of porting, however, the outside of the skirt portion of the liner is carefully contoured to smooth the gas flow towards the ports. The actual port timing is also altered appreciably. The exhaust ports are lowered, as a result of which the very long exhaust period of the original engine is reduced by about 15 degrees, thus lengthening the effective expansion stroke while also increasing the sub-piston air induction period. The transfer period is drastically reduced but since the transfer port shape has been entirely altered, this has less significance than the actual timing diagram suggests and it is necessary to plot transfer port area against crankshaft travel to obtain an accurate comparison. The rotary-valve timing remains substantially unchanged and the engine is noteworthy for the quite modest size of the crankshaft port and intake passage.

Specification

Type: Single-cylinder, air-cooled, reverse-flow scavenged two-stroke cycle, compression ignition. Rotary-valve induction via crankshaft journal,



with sub-piston supplementary air induction.

Swept Volume: 0.152 cu. in. (2.494 c.c.).

Bore: 0.581 in. Stroke: 0.574 in.

Stroke/Bore Ratio: 0.988 : 1.

Weight: 6.15 oz.

General Structural Data

Pressure diecast LAC.112A aluminium alloy crankcase with integral main bearing housing, mounting lugs and carburettor intake. Semi-counterbalanced crankshaft of 3 per cent. nickel-steel, hardened and ground, with 13/64 in. dia. crankpin and running in two 3/8 in. ball journal bearings. Front bearing protected by synthetic rubber cap acting as dust cover and oil seal. Cylinder of close grained mild steel, hardened, ground and bored. Piston of Brico cast iron with 5/32 in. dia. full-floating silver steel gudgeon pin. Drop-forged RR.56 aluminium alloy connecting rod. Contra-piston of mild steel. Diecast aluminium-alloy cylinder-head and machined aluminium alloy cylinder barrel, sliding fit over liner, clamping entire cylinder assembly to crankcase at liner flange by four long screws. Alloy prop driver pressed on to splined section of crankshaft. Beam mounting lugs. Spraybar type assembly.

Test Engine Data

Running time prior to test: 2 hours.

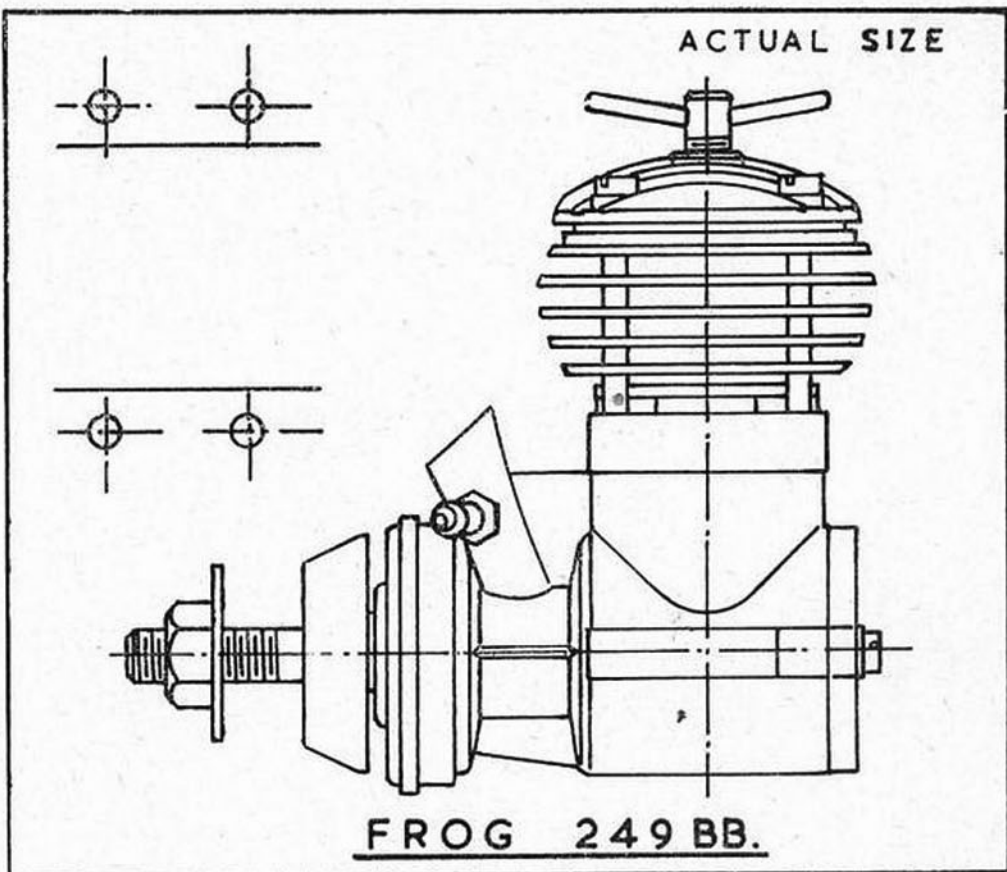
Fuel used: 40 per cent. technical ether BSS.579, 30 per cent. "pink" paraffin, 30 per cent. Castrol "R," plus 5 per cent. amyl-nitrate.

Performance

Writing of the original Frog 249BB in the January, 1956, issue of MODEL AIRCRAFT, we said: "The Frog is quite the most well-mannered diesel that we have encountered for a long time. Starting is exceptional. Without actually making a time check, we had the engine started within a matter of seconds. This required no priming: we merely choked the intake for three or four flicks and, after two or three more flicks to get the feel of the required compression setting, we had the engine running steadily."

These comments just as accurately describe our findings on the 249BB-Modified model, which is all the more remarkable having regard to the increased performance of the newer model.

The 249BB has shown a liking for a heavily nitrated fuel when running at anywhere near its peaking speed. Such a fuel is not obtainable in any



currently available commercial blend (these latter being intended for general use and in other engines that would overheat with too much nitrate) and, after running-in, our test engine was fuelled with a mixture containing 5 per cent. amyl-nitrate.

Compared with the test of the earlier model, the torque curve obtained with the 249BB-Modified was of a slightly different pattern. At around 8,000 r.p.m., for example, torque was up about 6 per cent., but at 13,000 r.p.m. it had risen by 11 per cent. Thereafter the curve began to drop off more rapidly so that the b.h.p. peaking speed remained substantially unaltered at around the 14,500 mark. This, of course, is exactly what is wanted and means that the biggest increases in

propeller speeds over the standard model will be realised on the size props popularly used for the F/F competition work. The actual maximum output achieved in test was some 0.285 b.h.p.

We find it very difficult to fault the Modified 249BB. Some people may criticise its slightly above-average weight or its mounting lugs, which do not provide centre-line mounting. If such objections should be voiced, however, they are surely of little account when placed against the exceptionally good performance, easy starting and modest price of this welcome addition to the 2.5 c.c. class.

Power/Weight Ratio (as tested): 0.74 b.h.p./lb.

Specific Output (as tested): 114 b.h.p./litre.

This photo of the Frog's components, clearly shows the modified transfer porting which largely accounts for the increase in performance.

