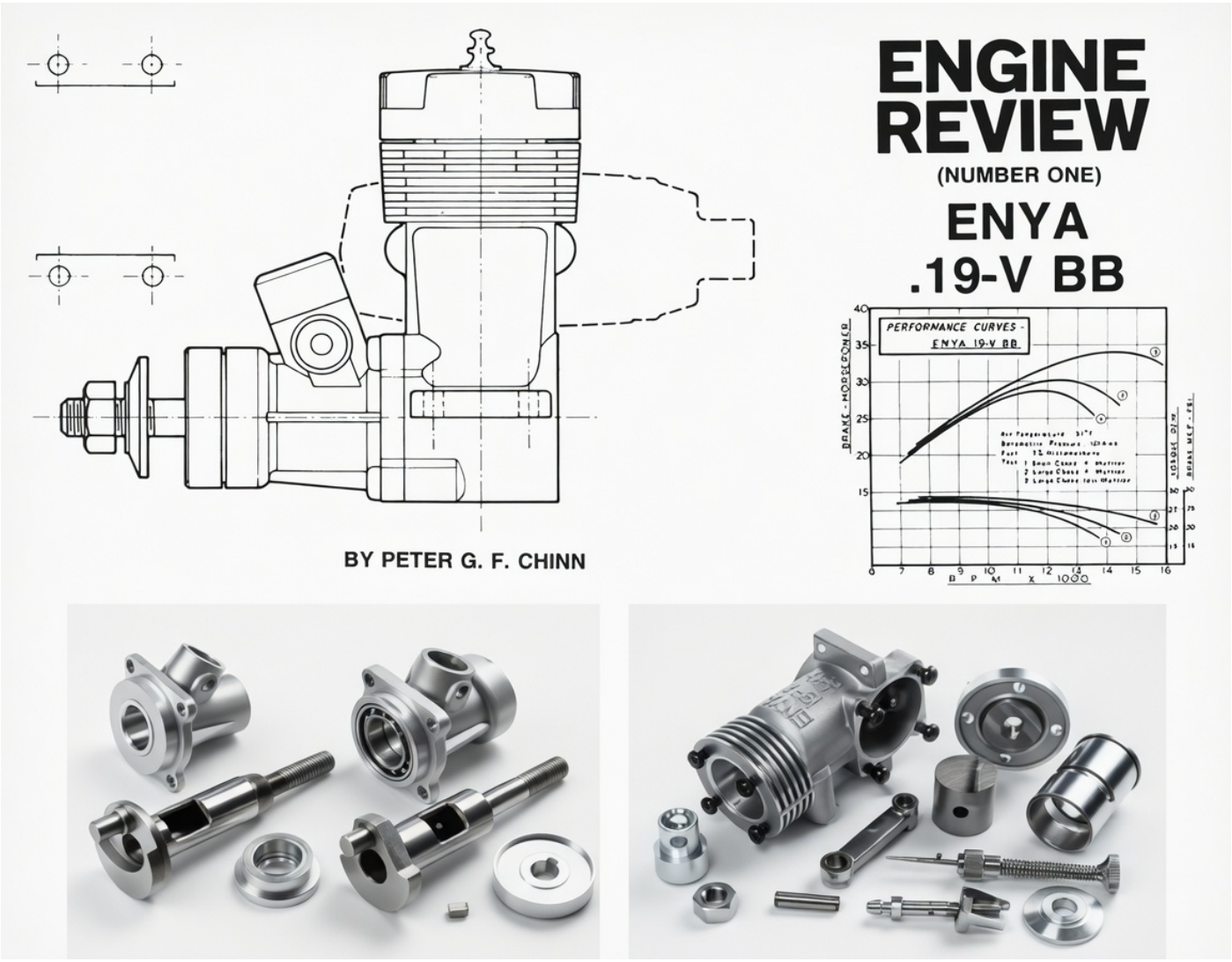
Enya 19-V BB



19-V BB shaft and bearing set-up (right) compared with 19-V model parts. The 19-V BB differs in that it uses bail races. See text for full details. Remaining parts are similar to 19-V except for modified head, plus slightly different port timing and venturi. Carries same embossed lettering as 19-V.

Sixth version of Enya's long established 19 has twin ball bearings. Well mannered and a good performer.

• One of the world's most extensive ranges of model engines is that produced by the Enya Metal Products Company Ltd. of Tokyo. Currently, the Enya line consists of seventeen basic types and these, subdivided into air-cooled standard and R/C models plus water-cooled marine versions, add up to no less than forty-seven different motors in all.

Not all of these are sold in the United States but Enya's domestic customers can buy a motor in practically every displacement group from .049 cu.in. to .607 cu.in. For the record, the displacements currently listed are .049. .06. .08. .09. .10. .15. .19. .29, .35, .45 and .60 cu.in. The obvious omission here is a .40, but the Enya brothers now have such a motor ready to go and the announcement of its availability is expected shortly.

Except for the rather different construction adopted for certain of their smaller motors (.049. .06. .08 and .10 models) the Enya brothers have maintained a remarkably consistent style of design over the years.

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All their engines are shaft, rotary-valve, cross-flow, scavenged units and equally significant is the fact that, in more than twenty years, general appearance and layout has changed so little as to make an Enya motor instantly recognizable: the motors' "styling." like a Rolls-Royce radiator-shell, now seems to have developed into a company trade-mark that the manufacturer may be loath to abandon.

The most obvious features that identify an Enya are its one-piece crankcase/cylinder block with integral back-plate and detachable front housing and its external finish which consists of matte castings relieved by contrasting bright machine-finished edges to the cooling fins and cylinder-head. There are no highly unorthodox features that set Enya motors apart: their distinction lies in the fact that they all maintain a family likeness, yet still look up to date.

The engine that is the subject of our present report is the sixth model in the long his-tory of the Enya 19 which began with small scale manufacture of a sandcast model in 1950, prior to the introduction of the first die-cast, quantity-built version known as the Model 4002. In 1956, the 4002 was replaced by the Enya 19-III or Model 4003, and this was later offered in a "TV" (throttle-valve) version for R/C. Six years later, the 19-III and 19-III TV were superseded by the further improved Model 4004 19-IV and 19-IV TV. Each succeeding model was new insofar as it employed redesigned eastings and certain improvements such as modified port areas and timing, larger bypass volume, larger crank-shaft and various minor refinements. However, the basic layout remained unaltered, including the 16 x 16 mm. bore and stroke combination.

Manufacture of the Model 4004 continued for seven years, finally giving way to the Model 4005 or 19-V which broke with the previous "square" bore and stroke tradition by adopting a more modem short-stroke layout of 16.6 x 15.0 mm.

Our test motor is the most recent Enya 19.-the 19-V BB. This differs from all previous Enya I9's in that it uses two ball races instead of a bronze- hushed main bearing. Its crankcase/cylinder casting is produced

Similar to standard 19-V, but with new front end, 19-V BB is slightly longer and only ½ oz. heavier.

from the same die as the original 19-V (which remains in production) and consequently carries the same "Model 4005" lettering embossed on the bypass side, but the engine is easily identified by its completely new front end. Design and construction details are as follows. Crankshaft and Hearings. In the past the use of ball bearings to support a crankshaft has some times had the effect of limiting the size of shaft journal by comparison with that which can be accommodated by using a bushed bearing, but this is not so in the case of the 19-V BB which actually has a bigger main journal than the 19-V. The journal is 12 mm. o.d., compared with II mm. o.d. for the bushed bearing engine and this has allowed the gas passage through the shaft to be opened up to 8.5 mm. bore, while at the same time increasing the strength of the shaft wall. All this has been made possible by the use of a special. 12-ball, steel-caged, rear ball bearing having an o.d. of only 21 mm. At the front the shaft is supported in a standard. English-size bearing (1/4 x 5/8 in.) with six balls contained in a steel cage and protected by a steel shield.

Unlike the 19-V shaft which has a disk-type crankweb with crescent counterweight, the 19-V BB has its shaft counterbalanced by cutaways each side of the 6 mm. solid crankpin. Also different is the front end of the shaft and the method of mounting the prop driver. This is keyed to the shaft by means of a short 2.5 mm. square sunk key and the shaft end is threaded ¼ UNF

instead of metric. The prop driver itself is 4.5 mm. larger diameter, and both it and the front bearing-housing are machined so that the former partially encloses the latter to protect the front ball bearing.

The new and more solidly proportioned pressure-cast bearing-housing has a larger intake boss that is less sharply raked forward (20° instead of 30°) and leads into a parallel-sided intake port through the main bearing, where it lines up with the shaft valve port to give an induction period of just over 180' timed, according to measurement of our test motor, to open at 49° ABDC and to close at 50° ATDC. This compares with approximately 188 (40° ABDC to 48° ATDC) for the 19-V. but it has to be remembered that the 19-V has a round bearing aperture which admits very little gas during the first and last few degrees of the induction period.

Cylinder Components. The cylinder/crankcase casting and the cylinder-liner are essentially the same as those of the 19-V. However, the 19-V BB is tapped for larger front housing screws (3.5 mm. instead of 3 mm.), and when port timings were checked, the 19-V BB was found to have slightly shorter exhaust and bypass periods: respectively 116C and 98° of crank angle, which are uncommonly brief and up to 6° less than for the 19-V previously examined.

The cylinder-head is of pressure die-cast aluminum with a central cast-in brass thread insert for the glow plug. Externally it is identical with the 19-V head but its curved wedge pattern combustion chamber has been modified to increase squish area and raise compression-ratio. Hour 3 mm. Phillips-type screws tie the head to the cylinder and no head gasket is used.

Piston and Conrod Assembly. These remain the same as those fitted to the 19-V. The lapped cast-iron piston has a straight baffle and uses a full- floating 4 mm. tubular wrist-pin with brass pads. The connecting-rod is of pressure die-cast aluminum alloy with a cast-in bronze bush at the lower end.

Venturi and Needle-Valve Assembly. Our 19-V BB came equipped with a 6.8 mm. venturi installed, plus an alternative larger size with 7.3 mm. throat. After allowing for the area taken up by the spray-bar, these give effective choke areas of approximately II sq.mm, and 14 sq.mm. The needle-valve assembly is of the standard Enya pattern, consisting of a plated brass 4 mm. spraybar and a conventional needle with flexible extension and the usual ratchet device.

Muffler. The stock muffler for the 19-V BB is the small size Enya expansion chamber type. This is of pressure-cast aluminum construction, made in two parts with a screw-in rear part containing a 6 mm. i.d. outlet. It simply butts against the exhaust stack and is held in place by a semi-circular strap and two screws. It has a pivoted plate on the outside that gives access to the exhaust for a starting prime.

Performance

Handling and running qualities of the 19-V BB were good. The engine started readily hot or cold and ran evenly and very freely, showing no tendency to lose power on warming up even prior to break-in. The maker's recommended nominal break-in period is 30 to 60 minutes. It was clear that our particular engine was adequately broken- in well within half-an-hour of intermittent running but it was given the benefit of any doubt by being run for the full hour.

The initial series of tests were conducted with the small venturi installed, such as might be used for U-Control Stunt and with the muffler fitted. Maximum torque was 27 oz.in. at 8,000 rpm, and a peak output of just under 0.29 bhp was deter-mined at close to 12,000 rpm.

Switching to the larger venturi, but retaining the muffler, made little difference to output at speeds below 10.000 rpm but raised the maximum bhp to just over 0.30 and increased the peaking speed to approximately 12,500 rpm. Suitable props to match this performance in the air would be 9x4, 8 ½ x5 or 8x6. We obtained 11,000 rpm on a 9x4 Tornado nylon. 11,500 on a 9x4 Top-Flite nylon and 12,300 on a 8x6 Power Prop wood.

Finally, the muffler was removed and a repeat series of tests were run with the large venturi.

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This raised maximum torque to 28.5 oz.in. but, as expected, flattened the torque curve considerably so that the peak of the power curve was extended to over 14,000 rpm and the output substantially in¬creased to 0.34 bhp. Prop speeds, compared with the speeds recorded with the muffler fitted, were raised between 300 and 700 rpm in the 11,000-14,000 rpm bracket.

We have to admit to being slightly disappointed that the 19-V BB did not noticeably better the performance previously recorded with the 19-V. The manufacturer's figures rate the 19-V BB at approximately 10% more horsepower than the 19-V, whereas the two test motors proved to be about equal. However, it is not unusual with small engines to encounter up to 10% variation in power output between individual examples of the same engine (This is only the equivalent of a variation in prop speeds of just over 300 revs at 10,000 rpm.), so one may conclude that our 19-V BB was a bit below standard while our 19-V might have been very slightly over par.

In any case, it needs to be emphasized that, although higher figures have been recorded with 19 class engines, an output of 0.34 is still rather better than average. Add to this the Enya's other good qualities, and there can be no doubt that it qualifies for inclusion among the better .19 cu.in engines presently on the market.

Stripped down and examined at the conclusion of the tests, our 19-V BB was found to be in excellent condition. No plugs were bunted out during tests.

Summary of Data

Type: Single cylinder two-stroke cycle with shaft type rotary-valve and twin ball bearings. Optional muffler.
Checked Weights: 6.1 oz. less muffler 7.6 oz. with muffler.
Displacement: 3.246 cc. 0.1981 cu.in.
Bore: 16.6 mm. (0.6535 in.) Stroke: 15.0 mm. (0.5905 in.)
Stroke/Bore Ratio: 0.9036 : 1
Specific Output (as tested on 5% nitromethane fuel):
1.45 bhp/cu.in. (small choke, with muffler)
1.53 bhp/cu.in. (large choke, with muffler)
1.72 bhp/cu.in. (large choke, less muffler)
Power/Weight Ratio (as tested on 5% nitromethane):
0.61 bhp/lb. (small choke, with muffler)
0.64 bhp/lb. (large choke, with muffler)
0.89 bhp/lb. (large choke, less muffler)
Manufacturer: Enya Metal Products Co. Ltd., Nakanoku, Tokyo, Japan.
U.S. Distributor: Model Rectifier Corporation, 2500 Woodbridge Avenue, Edison, New Jersey 08817.