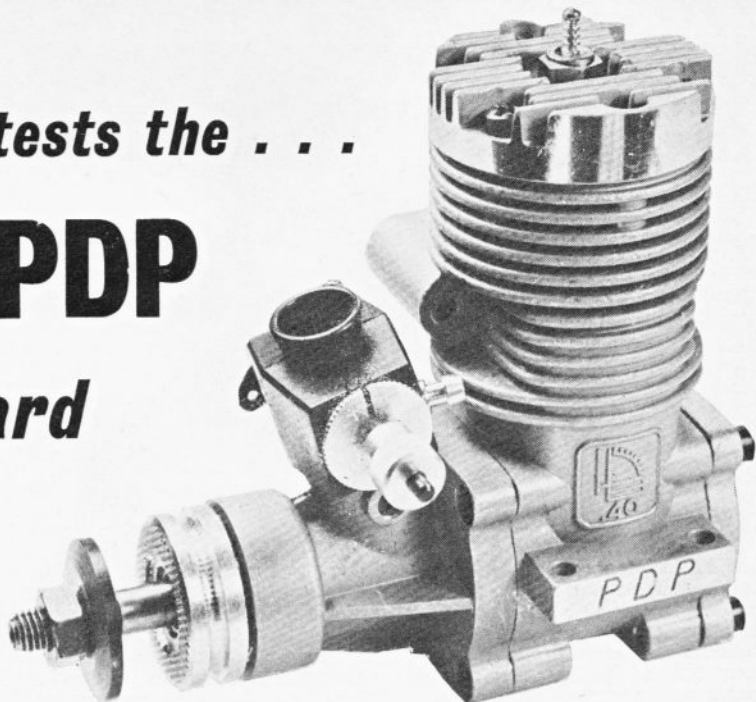


Peter Chinn tests the . . .

HB 40-PDP

and standard

HB 40



THE German made HB 40 is one of two medium sized Helmut Bernhardt motors first announced in 1975, the other being the HB 50. Outwardly the 40 and 50 are identical in both appearance and dimensions. The only real difference is in their cylinder bores (the 50 is 1.8mm larger) and the 40 therefore has a smaller piston and liner but they are both based on the same set of castings and share the same crankshaft and front end assembly.

In 1976, the manufacturer began offering an updated version of the HB 40 incorporating the Perry Directional Porting (PDP) system developed in the United States. John

Perry, of course, is widely known for his Perry carburetors which, incidentally, are made in Germany by the Helmut Bernhardt company.

For this month's report, therefore, it was decided to deal with the HB 40 in its standard version and, for added interest, to test the PDP version as well.

Design and construction

Main casting. This comprises the crankcase barrel, open at both ends, and full length finned cylinder casing in pressure die cast aluminium alloy.

HB engines distributed in U.K. are sold by Ripmax under the Graupner label (left) and by Irvine Engines in their own packaging, but otherwise identical and similarly priced.

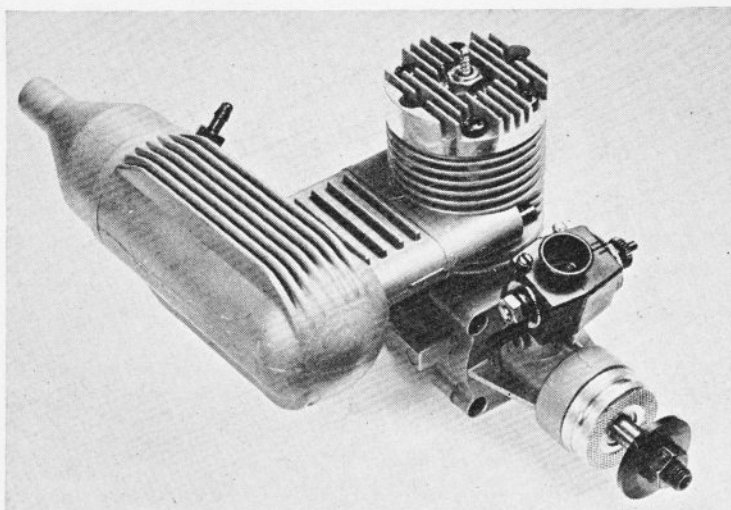
It includes beam mounting lugs and a short exhaust duct on the right side. On the PDP version the transfer passage is milled out at each side so that gas is fed to the Perry ports in the liner.

Cylinder liner. The drop-in cylinder liner has a wall thickness of 1.5mm and is located by the usual top flange. It incorporates five exhaust ports and four transfer ports and, on the standard engine, these are timed to open and close at 72deg. each side of BDC, and 60 deg. each side of BDC, respectively. On the PDP model, the transfer ports are supplemented by a pair of Perry directional slots each side and the measured timings of our test model of this engine were slightly shorter than those of the standard 40 test engine the ports being timed to open and close, each side of BDC, at 70 deg. (exhaust), 58 deg. (transfer) and 57 deg. (Perry ports).

Crankshaft and prop drive assembly. Counterbalanced crankshaft having 12mm o.d. main journal, 8mm o.d. front journal and 5mm solid crankpin. Rectangular valve port timed to open at 34 deg. ABDC and close at 42 deg. ATDC (measured timing of PDP engine: 35 deg. ABDC to 48 deg. ATDC) and admitting gas to 9.5mm i.d. passage. Machined aluminium alloy prop driver mounted on brass split taper collet. Steel prop retaining washer and hexagon nut on $\frac{1}{4}$ UNF thread.

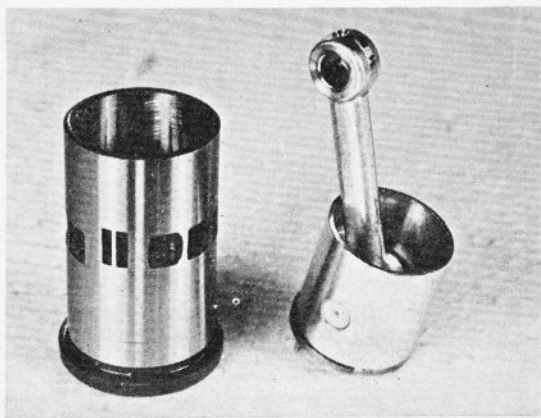
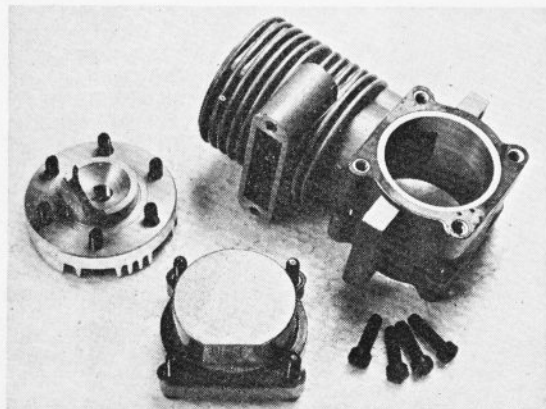
Front housing and bearings. Pressure diecast aluminium alloy main bearing housing with 12.5mm i.d. intake boss for carburettor and containing





one 12 x 28mm 8-ball steel caged ball bearing at rear and one 8 x 22 mm 7-ball sealed bearing at front. Housing secured to crankcase via substantial mounting flange with four 3.5mm Phillips screws and paper gasket between joint faces.

Piston and connecting rod assembly. Piston machined from aluminium alloy bar stock with flat crown and straight baffle. Single Dykes type piston ring. Forged aluminium alloy connecting-rod, bronze bushed at big end only. Fully floating 5mm o.d.



tubular gudgeon-pin with PTFE pads.

Cylinder-head. Pressure die cast aluminium alloy finned cylinder head with bowl shaped combustion chamber surrounded by 2mm wide squish band slotted on transfer side for piston baffle clearance. Head secured to cylinder casting with six 3.5 mm Phillips screws. No head gasket.

Backplate. Pressure die cast aluminium alloy, stepped to clear piston skirt and secured by four 3.5mm Phillips screws. Paper gasket.

Carburettor. Standard Perry carburettor with adjustable automatic mixture control. Moulded plastic body. Brass throttle barrel with adjustable throttle arm on right side. Adjustable throttle stop. Choke bore 6.7mm. Effective choke area approx. 27sq. mm.

Silencer. The standard silencer for use with the HB 40 and 40-PDP is the same as that now supplied with the HB 61 (also the HB 50) namely the HB Type 75. This is a conventional pressure die cast expansion chamber weighing just over 4oz. and attaches directly to the engine's exhaust duct with two long screws.

The particular silencer used for the two test engines had an outlet i.d. of 10mm giving an outlet area of 78.5 sq. mm. However, some examples of the Type 75 have smaller bore outlets; ranging from 8.5mm i.d. (56.7sq.mm.) to 9.6mm (72.4 sq.mm.). These latter can be expected to give a slightly lower noise level at the cost of small reductions in power output.

Performance.

Our test model standard HB 40 was one of a pair submitted direct by the manufacturer for test and had been briefly run at the factory. The 40-PDP, however, came from the

Special cylinder-liner of 40-PDP models, showing supplementary slots of Perry directional porting system.

stock of one of the U.K. distributors. Each engine was carefully run-in on a straight 75/25 mixture of methanol and castor-oil, after which all tests were carried out on our standard test fuel containing 5per cent nitromethane. HB engines are supplied without glow-plugs. We used K&B long-reach idle-bar type. These were recommended by HB originally for their engines, although they are now able to supply their own plugs. Atmospheric temperature at the time of testing was 13deg. C (55deg. F) and barometric pressure was 1006 mb (29.7in. Hg).

Starting and running. When cold, both engines started easily by hand. When hot response to flicking the prop by hand was less rapid but application of an electric starter gave an instant start. Running qualities were generally good, both engines holding steady rpm and at moderate vibration levels, especially in the case of the PDP model.

Power—Standard 40. The standard 40 was tested first. Less silencer, it delivered a maximum torque of 64oz. in. at 8,000 rpm and a peak power output of 0.75bhp at around 15,500rpm. Adding the silencer resulted in a relatively modest drop in power to 0.67bhp at about 14,400 rpm. Typical prop revolutions, with the silencer, included 8,600 rpm on a 12 x 6 Top Flite maple, 8,900 on a Top Flite Standard, 10,100 on an 11 x 6 Top Flite maple, 10,750 on an 11 x 6 Power Prop maple, 11,500 on an 11 x 5 Power Prop standard, 11,650 on a 10 x 6 Top Flite maple, 12,200 on a 10 x 6 Taipan glassfibre-nylon, 13,000 on a 9 x 6 Top Flite maple, 13,400 on a 9 x 6 Taipan glassfibre-nylon and 13,600 on a 10 x 4 Taipan glassfibre-nylon.

Power—40-PDP. Removing the silencer from the standard HB 40, as we have seen, would increase its power output from 0.67 to 0.75bhp, an increase of 12 per cent. Corresponding checks on prop rpm using the props listed above resulted in improvements ranging from 150 to 600 rpm. At this point, we were able to anticipate that the power loss due to the addition of the silencer to the standard HB 40 might well be restored by switching to the 40-PDP.

This was, in fact confirmed. As is usual, the power loss due to the silencer was more apparent at the top end, so that, on an 11 x 6 prop, the 40-PDP *with silencer* was about 150rpm faster than the standard *without silencer* whereas, on the 10 x 4 Taipan, it was slower by approximately the same amount but, give or take 100-200 rpm, prop figures for the 40-PDP with silencer could

GENERAL INFORMATION

Manufacturer: Helmut Bernhardt GmbH u. Co.KG., 8354 Metten, West Germany.

U.K. Distribution and Service:

- (i) Irvine Engines, Unit 8, Alston Works, Alston Road, High Barnet, Hertfordshire.
- (ii) Ripmax Ltd., Ripmax Corner, Green Street, Enfield, Middlesex.

Type: Throttle equipped shaft rotary valve glowplug engine with twin ball bearings and ringed aluminium piston.

Bore and Stroke: 20.0 x 20.6mm (0.7874 x 0.8110 in.)

Stroke/Bore Ratio: 1.03:1.

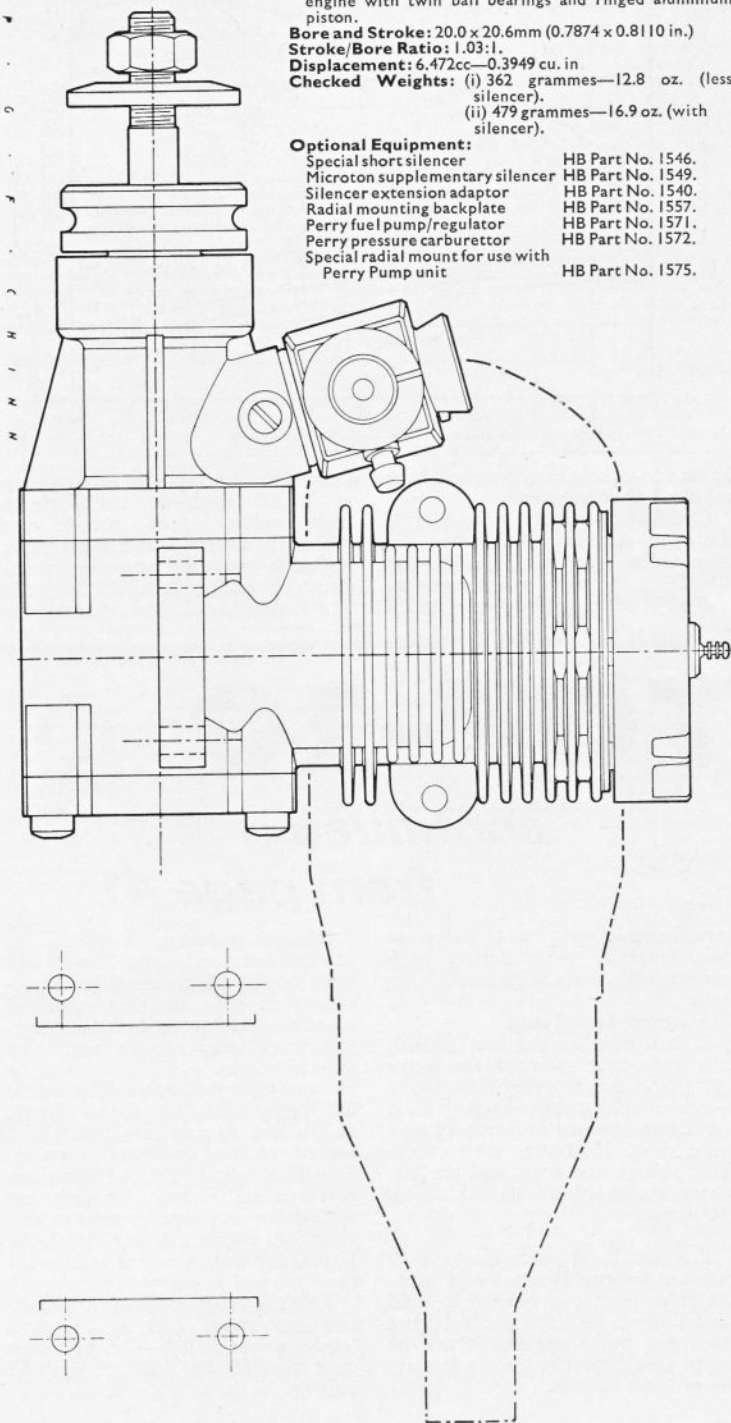
Displacement: 6.472cc—0.3949 cu. in

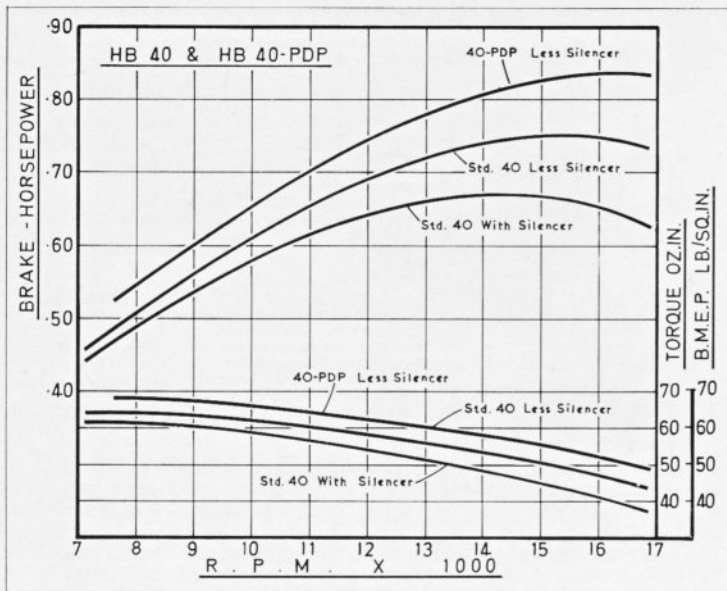
Checked Weights: (i) 362 grammes—12.8 oz. (less silencer).

(ii) 479 grammes—16.9 oz. (with silencer).

Optional Equipment:

Special short silencer	HB Part No. 1546.
Microton supplementary silencer	HB Part No. 1549.
Silencer extension adaptor	HB Part No. 1540.
Radial mounting backplate	HB Part No. 1557.
Perry fuel pump/regulator	HB Part No. 1571.
Perry pressure carburettor	HB Part No. 1572.
Special radial mount for use with Perry Pump unit	HB Part No. 1575.





be said to closely match those of the standard 40 unsilenced.

Checked on the dynamometer in the open exhaust condition to determine its gross performance, the 40-PDP indicated a maximum torque of 68oz. in. at 8000rpm and a

peak brake horsepower of 0.84 bhp at 16,500 rpm—an unexpectedly high peaking speed, though not perhaps, so very surprising having regard to both the improved scavenging obviously provided by the Perry directional porting and the

relatively large choke area (27sq.mm.) of the carburettor.

Among the prop rpm recorded by the 40-PDP, less silencer, were 10,700 on an 11 x 6 Top Flite maple, 11,300 on an 11 x 6 Power-Prop maple, 12,500 on a 10 x 6 Top Flite maple, 12,900 on a 10 x 6 Taipan, 13,750 on a 9 x 6 Top Flite maple, 14,200 on a 9 x 6 Taipan and 14,000 on a 10 x 4 Taipan.

Throttling. Used in conjunction with an exhaust pressurised fuel supply (the type 75 silencer is provided with an outlet nipple for this purpose) the Perry carburettor worked well, with safe idling and, when correctly adjusted, instant throttle response.

Comment

General-purpose engine of conventional design and construction. Externally rather large for a .40cu.in. motor (engine is, as already noted, a smaller bore version of the HB50, with which it shares many parts) and fairly heavy, especially with Type 75 silencer, but soundly made and well finished. Power output is not as good as current high performance Schnuerle scavenged .40cu.in. engines, but fully adequate for most purposes. Fairly easy to handle. Good throttle. Excellent range of optional parts and accessories available.