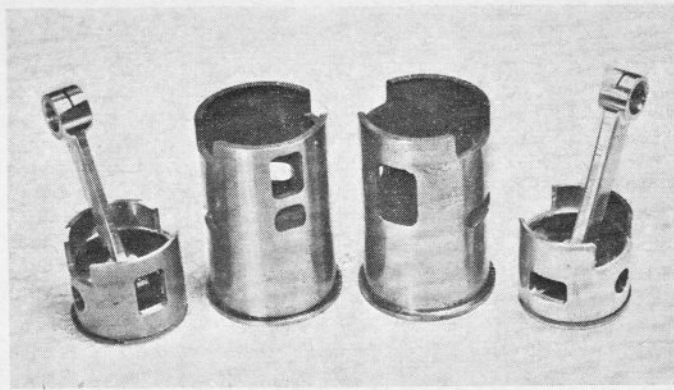


Original HP 40s had separate cylinder jacket casting. Current models use stronger one-piece casting shown on right.



Changes to the HP 40 cylinder - liner and piston assembly include modified third-port windows as shown on right.

HP 61F-RC and 61R-RC/73

Production of an entirely new rear-valve HP 61 began in March this year. It replaces the earlier rear induction model, the original Paul Bugl designed prototype of which appeared in 1967. We had one of the prototype Bugl HP 61's for test at that time and there is no doubt that it was a most outstanding piece of work, both as regards originality of design and performance capability. Marking a distinct break with orthodox R/C 60's of the period, it featured Schnuerle loop scavenging, a unique form of drum valve (called a bell-valve by HP), an unorthodox carburettor design and a distinctive long-shaft layout. As regards performance, we found that it developed a shattering 50 per cent more b.h.p. than typical 60 R/C motors produced at that time. The engine was not, however, without certain practical disadvantages. The carburettor was difficult to adjust and awkward to get at. The engine's length (2 inches more than the average shaft-valve 60) was fine for certain types of scale models but unsuitable for the majority of popular model designs.

Finally, when the production version appeared, it fell somewhat short of the performance of the prototype and the effect of all this was that the engine failed to achieve the hoped for popularity among R/C enthusiasts.

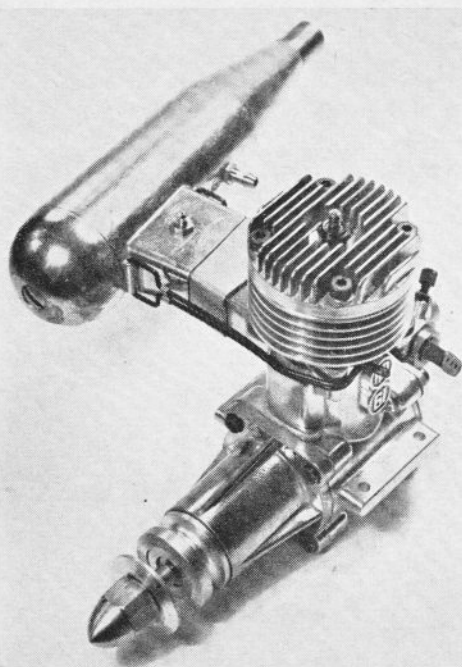
Certain improvements were incorporated during the next year or two but, realising that a more compact motor with a more accessible and simpler-to-adjust carburettor would be necessary to achieve wider acceptance, HP set about producing an alternative, front-induction model. This, designed by Peter Billes, appeared in 1970 using the existing cylinder and piston assembly, together with part of the original main casting, plus an entirely new front end assembly and an efficient, automatic mixture-control carburettor. This model, the HP 61F, was very successful and has, of course, since become very popular, particularly in the U.K.

One of the 1970 production engines was tested and reported upon in RCM&E early in 1971 and earned a favourable overall assessment. Since that time, quality control has improved and some small changes have been

made. Comparing the 1970 and 1973 models, the conrod is now forged instead of diecast and the gudgeon-pin is located by circlips instead of by aluminium pads. The original screw-in backplate is replaced by a flanged one retained by four screws and the carburettor effective choke area has been very slightly increased. In contrast to their previous sandblasted casting finish the latest HP 61's, both front and rear induction, have a tumbled finish.

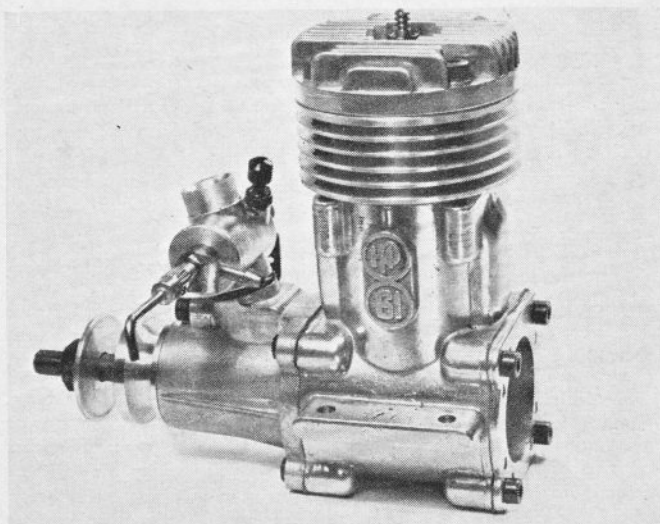
It is from the HP 61F, rather than the earlier rear induction 61, that the new HP 61R-RC/73 has been developed. It has the exhaust on the right hand side like the 61F and uses the same main casting and cylinder and piston components as the 61F, but with completely new front and rear assemblies.

The front end consists of an internally counterbalanced 12 mm. crankshaft running in twin ball-bearings mounted in a new pressure diecast housing. The rear assembly features a disc type rotary-valve mounted on a new back cover with horizontal intake, instead of the bell-valve system and upwardly inclined intake of the original HP 61. The



Left: New for 1973 is HP 61R-RC/73 with rear rotary valve. Note also optional angle extension duct on silencer to direct exhaust further away from fuselage.

1973 HP 61F-RC. Engine now has tumbled casting finish like HP 40s but is otherwise little changed.



valve disc is of a hardened steel counter-balanced pattern similar to that used by current disc-valve Super-Tigre engines. The carburettor is the same as on the 61F, featuring helical barrel movement with a separate low speed needle installed in the barrel and restricting fuel flow as the barrel moves towards the idling position.

At 16.4 oz. bare, the 61R-RC/73 is a trifle heavier than the earlier rear induction 61 but is about $\frac{1}{2}$ inch shorter – most of which is in reduced frontal overhang.

The manufacturer's claimed power output for the 61R-RC/73 is 1.55 b.h.p. at 15,500 r.p.m. on straight fuel. This is comparable with the output obtained with the original pre-production Bugl design and is about 20 per cent better than our test figures for the production model of that engine and for the 61F. We shall be seeing how the engine shapes up in an independent test in due course.

HP's neat and effective clip-on silencer continues in production for both versions of the 61 but is now equipped with an outlet nipple for fuel tank pressurisation. Another option is a 10-degree angled extension duct. This moves the entire silencer sideways $\frac{1}{2}$ inch and brings the tailpipe approximately $1\frac{1}{4}$ in. farther out. A spare pair of suitably lengthened clips are supplied for attaching the silencer to the engine when the extension duct is used.

Incidentally, a recent HP bulletin on the 61R-RC/73 quoted the bore and stroke as 24 x 21.5 mm. and the swept volume as 9.79 c.c. These figures are incorrect. The engine's bore and stroke are unaltered at 24.5 x 21 mm., giving a swept volume of 9.900 c.c.

HP 40F-RC and 40R-PR

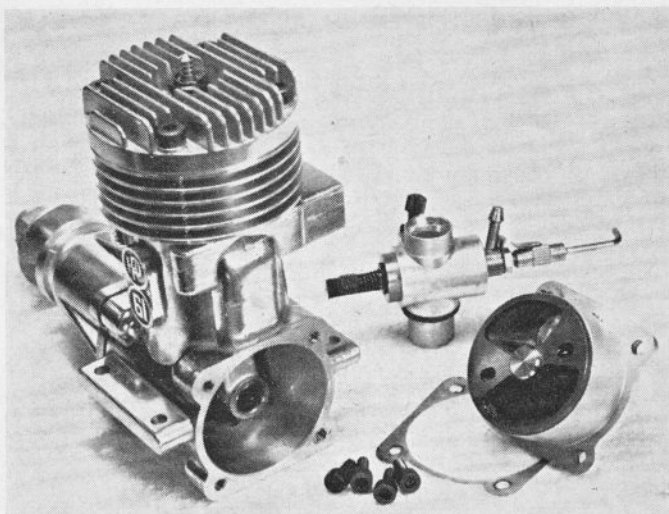
The prototypes of these two engines were designed in 1970 by Peter Billes and were first marketed later in the following year. The latest models have not been significantly changed since last year but as our only previous reports on the HP 40's were concerned with 1970 pre-production samples, a few words are necessary to bring our earlier reports up to date.

The most obvious alteration from the original layout is the use of a one-piece crankcase and cylinder casting in place of the earlier arrangement in which the cylinder jacket, including exhaust duct, was a separate casting attached to the base unit with three long screws.

The rear induction 40R-PR is, of course, intended solely for pylon racing (it was very successful in FAI racing last year) whereas the front intake 40F is intended for more general R/C flying. The two versions use a common main casting and some related parts, such as the piston, conrod and cylinder-head are identical.

Cylinder porting, slightly changed since our review of the earlier models, is the same for both the 40F and 40R. Port timings checked out at a 140 degree exhaust period, a 120 degree transfer period and a 108 degree third

In HP 61R-RC/73, Bugl Bell – valve system of original HP61 is replaced by conventional steel disc valve similar to that used by HP 40R-PR.



port period. The third port, incidentally, is now considerably wider. As one might expect of an engine designed to deliver its peak power output at very high r.p.m., rotary-valve closure on the 40R is considerably later than on the 40F and the carburettor choke area very much greater. Measurement of the engines submitted for examination revealed a 179 degree induction period for the 40F (44 deg. ABDC to 43 deg. ATDC) and a 200 degree induction period for the 40R (43 deg. ABDC to 63 deg. ATDC).

Carburettor effective choke areas are 23 sq. mm. for the 40F and 62 sq. mm. for the 40R-PR. Both these have been enlarged compared with the earlier models examined and the 40R-PR choke is now approximately the same size as that of the 1972 K&B 40R Special. The 40F uses the same carburettor as the 61F-RC and 61R-RC/73 but with a slightly smaller bore choke. The 40R-PR carburettor is a single-needle valve type with a simple barrel throttle and no means of adjusting the mixture strength at part throttle settings. It is,

of course, intended for use with a pressurised fuel system and the engine has provision for this via a crankcase pressure tapping, now located in the rear transfer passage instead of the crankcase backplate.

In contrast to the very effective silencer supplied with the 61, the 40 silencer is a front-vented type with large outlet areas. Actual escape area totals 160 sq. mm. and, not surprisingly, this 'silencer', while causing minimal power loss, is very noisy. The 61 silencer, with a closed expansion chamber surrounding a slotted outlet tube of 78 sq. mm. tailpipe area, is very much quieter and it would be nice to see HP offering a silencer of this type for the 40F.

There has been a steady improvement in the standard of finish of the production HP engines over the past five years and examination of these latest models indicates that overall quality is now at a high level.

General specifications of the latest 40 and 61 models are given in the accompanying table.

1973 HP ENGINES				
	HP 40F-RC	HP 40R-PR	HP 61F-RC	HP 61R-RC/73
Swept Volume:	6.442 c.c. 0.3931 cu.in.	6.442 c.c. 0.3931 cu.in.	9.900 c.c. 0.6041 cu.in.	9.900 c.c. 0.6041 cu.in.
Bore:	21.0 mm	21.0 mm	24.5 mm	24.5 mm
Stroke:	18.6 mm	18.6 mm	21.0 mm	21.0 mm
Stroke/Bore Ratio	0.886:1	0.886:1	0.857:1	0.857:1
Checked Weight less Silencer	272 gr.	284 gr.	435 gr.	464 gr.
Checked Weight with Silencer	9.6 oz.	10.0 oz.	15.3 oz.	16.4 oz.
Length (from prop. driver face)	328 gr.	340 gr.	511 gr.	540 gr.
Height (crankshaft axis to top of cylinder head)	11.6 oz.	12.0 oz.	18.0 oz.	19.1 oz.
Crankcase Width	78 mm	117 mm	90 mm	123 mm
Crankcase Width (required bearer spacing)	62 mm	62 mm	78 mm	78 mm
Carburettor Type and method of mixture control	32 mm	32 mm	38 mm	38 mm
Effective Choke Area	Barrel throttle with automatic mixture control	Simple barrel throttle with-out idle mixture adjustment.	Barrel throttle with automatic mixture control.	Barrel throttle with automatic mixture control.
Induction System	23 sq.mm	62 sq.mm	28 sq.mm	28 sq.mm
Claimed Power Output (less Silencer)	Crankshaft rotary valve	Rear rotary disc valve	Crankshaft rotary valve	Rear rotary disc valve
	0.90 bhp at 15,500 rpm.	1.20 bhp at 18,000 rpm.	1.42 bhp at 14,800 rpm.	1.55 bhp at 15,500 rpm.
		(40R-RC model)		