

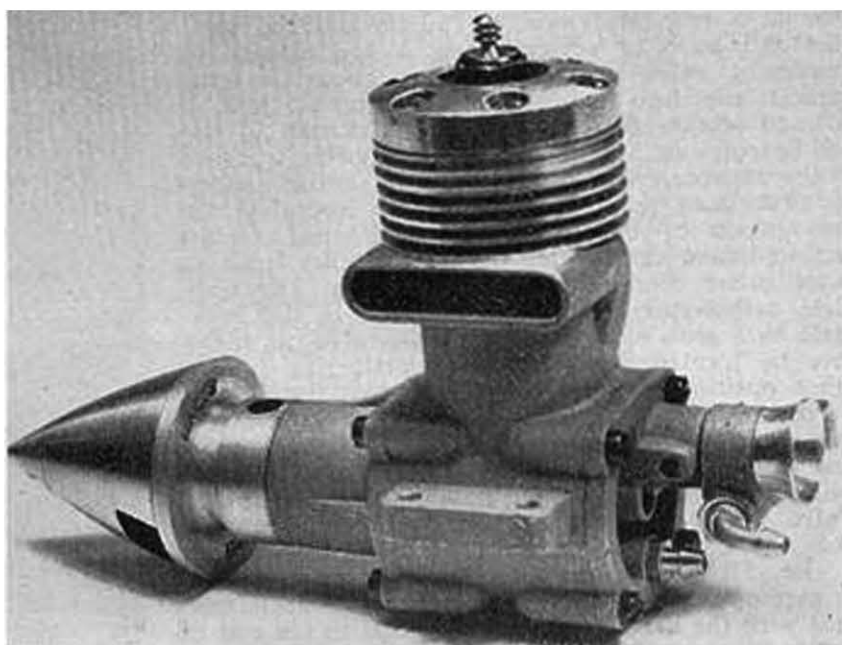
ENGINE TEST

by Peter Chinn

K&B 15R

(Series '64)

"outstanding performance . . . equal to the best with any 2.5cc engine tested to date on straight fuel."



IN 1961, the K&B Manufacturing Corporation of Downey, California, departed from a practice they had pursued during 15 years of model engine production and introduced the first Torpedo disc-valve engines, the "Series 61" 15R and 29R models, aimed primarily at the control-line speed and competition free-flight classes. For many years, K&B had enjoyed periods of success in both classes with their plain-bearing shaft-valve engines but, by 1960, it was becoming increasingly obvious that a more complex and specialised type of design would be necessary to re-establish the K&B reputation in these spheres.

The "Series 61" 15R and 29R reverted, so far as basic design was concerned, to the layout most widely considered to be the accepted formula for racing type performance, namely a loop-scavenged, disc-valve engine with twin ball-bearing crankshaft, separate front and backplate assemblies and a lined cylinder integral with the crankcase barrel. To this, designer Bill Wisniewski added his own special features, the result appearing, in its production version, as an extremely powerful, yet docile and pleasant handling engine. It is, however, rare that a new model, in the light of actual field experience in many hands, is not improved by further development and, during the next two years, several modifications were evolved by the factory. These were successfully put into practice for the 1963 U.S. Nationals where Bill Wisniewski flew a 15R, so modified, to first place at 143.94 m.p.h. Models powered by similar engines took second and third places. These modifications were incorporated in the now current version of the 15R, introduced a year later, known as the "Series 64" model and it is with this engine that our present report deals.

"Series 64" Features

Outwardly, the new 15R has two obvious points of identification to distinguish it from the Series 61. Firstly, the cylinder head is plain and no longer carries the short cooling fins of the original model. Secondly, the crankcase/cylinder casting has been modified to substantially widen the transfer passage.

Internally, there are many more changes. The modified crankcase casting has enabled the interior width of the transfer passage to be increased by 40 per

cent. The inlet port in the cylinder liner is the same width as before, but is no longer masked at the sides by the casting. The liner is much shorter than on the Series 61 engine and the piston skirt ports and matching cylinder ports are omitted. Exhaust and transfer port timing is slightly modified and, with the use of an 11-degree interval between the opening of the exhaust and transfer ports, Bill Wisniewski has shown no inclination to follow the present trend towards an ultra short exhaust lead, or a non-existent one as on the Super-Tigre. Actual port durations, as measured on our test engine in terms of shaft rotation were: exhaust, 136 degrees; transfer, 114 degrees. Timing is disposed symmetrically each side of BDC, there being no cylinder offset.

The piston is now of hardened iron instead of hard-chromed steel and has a slightly larger lapped surface now extending to below the gudgeon-pin, instead of only to the axis of the pin. The piston continues to feature a flat crown with straight baffle filleted at its root and couples to a hot-forged aluminium alloy connecting-rod via a fully-floating gudgeon-pin. Incidentally, the cylinder-head which, as we have said, is now of the plain non-finned type, is also slightly modified internally, retaining the basic hemispherical shape of the Series 61, but with a narrow squish band.

One of the most interesting features of the Series 61 K&B's, since copied by Moki, Rossi and Super-Tigre and continued in the Series 64 models, is the crankshaft design. A description of this has been given in previous articles but, for the benefit of readers unfamiliar with it, will bear repeating.

Unlike the normal type of crankshaft, the Series 61/64 is made in three parts. The main component, machined from high-tensile steel, consists of the actual shaft complete with a full disc or flywheel type web. This latter is $\frac{1}{4}$ in. thick and has an aluminium rim shrunk onto its periphery. Appearance, therefore, resembles a non-counterbalanced shaft, but, in fact, counterbalancing slots are milled in the periphery of the flywheel each side of the crankpin, which is a separate, hardened component, pressed in. Covering the counterbalancing slots with a rim seals them off from the main crankcase volume, thereby increasing crankcase compression for better charge transfer.

Since a rear-rotary valve is used and the shaft does not have to accommodate a gas passage or weakening valve port, the shaft diameter is quite modest and has two $\frac{1}{4}$ in. dia. journals with a relieved section between them. It is carried in two ball-bearings in a separate diecast housing attached to the crankcase with four screws. A similar method of attachment secures the backplate assembly. On the outside of the backplate a machined venturi section intake draws fuel via six jet holes from an outer collar containing the needle-valve. The complete carburettor assembly is retained in the backplate by a grub screw and the needle-valve can therefore be located vertically, horizontally, or in any other position convenient to individual installation. From the .250 in. bore carburettor choke, the intake gas enters a smoothly contoured backplate sector and thence through the ultra-lightweight valve rotor which is bronze bushed and runs on a pressed-in pin. Valve timing measured on our test engine was 35 deg. ABDC to 45 deg. ATDC.

The 15R is equipped with a spinner assembly that is part of the engine. The spinner backplate is integral with the drive hub and is secured to the end of

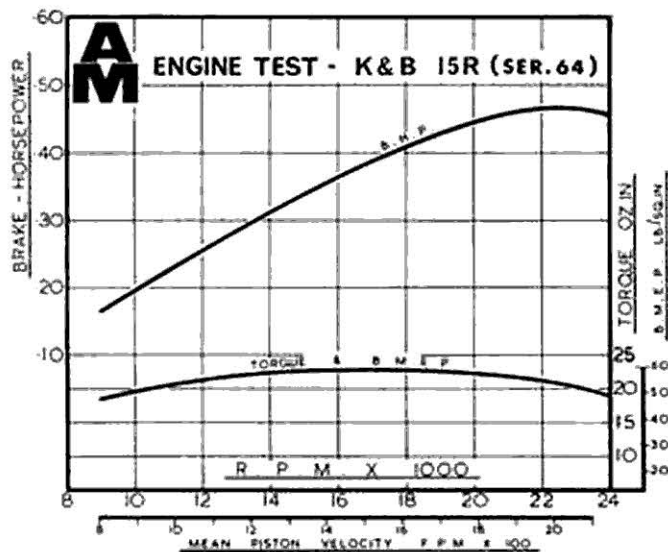


Three-quarter front view of the Torpedo .15R, shows bolt on front housing and peripheral six jet carburettor mounted on backplate. Note the unfinned cylinder head and large transfer passage.

K&B do not at present offer a silencer unit specifically designed for the 15R.

The trend, with modern high performance 2.5 cc. glowplug engines, is towards higher and higher b.h.p. peaking speeds and it is essential, if their full potential is to be realised, to prop them for such speeds. Maximum torque, in fact, is now being developed at speeds (16-18,000 r.p.m.) corresponding to b.h.p. peak speeds a few years ago and below such speeds, performance can be quite disappointing.

Anyone checking the bench r.p.m. of the Series 64 15R on an 8 x 4 prop with straight methanol/castor fuel, might be tempted to assume that it had no more to offer than the Series 61 model or, for that matter, a good 2.5 diesel. In the air, the Series 64 would, of course, pull away, as greater power would be released as the load was taken off the prop, but the true potential of the Series 64 cannot be appreciated until it is allowed to turn at 20,000 r.p.m. or higher. This can be checked by comparing the bench performance Revised parts of the Series 64 engine include a new crankcase, cylinder liner, piston and cylinder head. Performance is substantially up on that of earlier model.

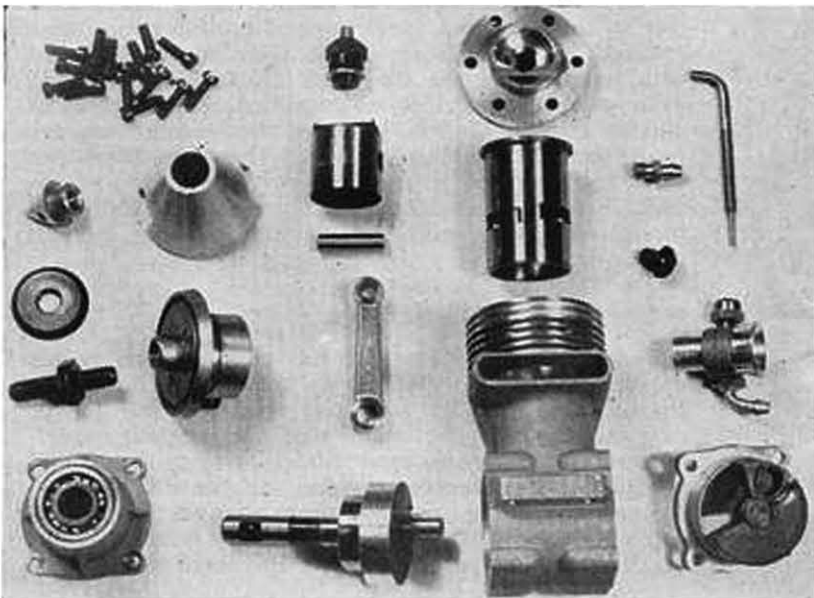


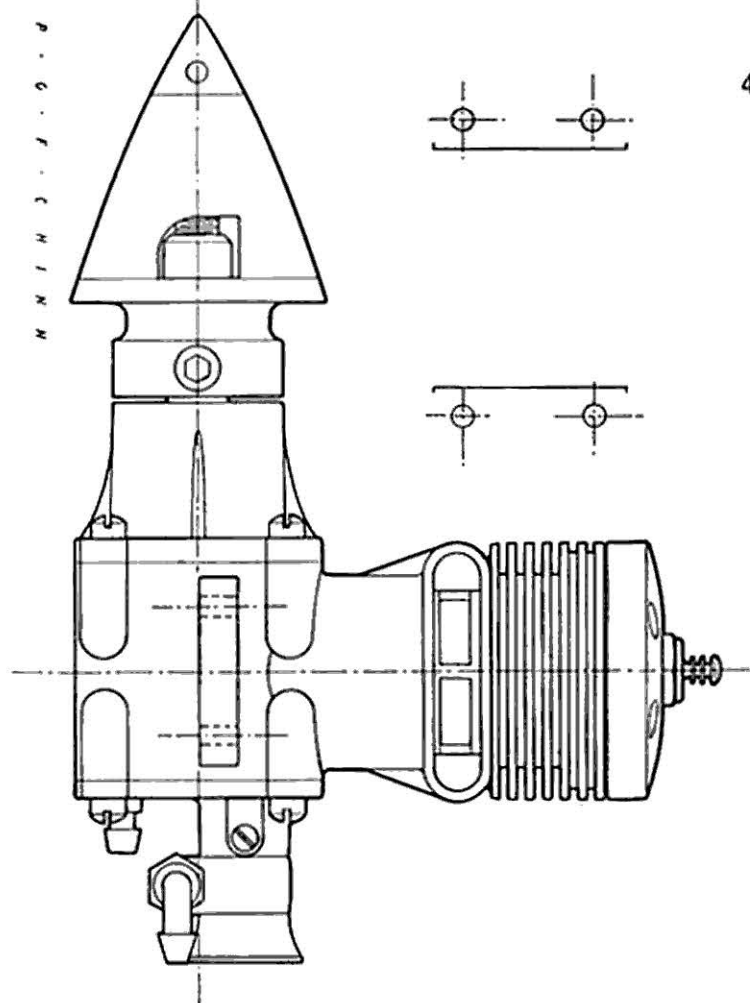
the crankshaft with an Allen grub screw. At the front, the hub is threaded for the prop stud and the projecting end of the stud provides the means of retaining the spinner shell by a conical spinner nut, after the prop has been secured with a steel washer and hexagon nut.

The engine is intended for operation on a pressurised fuel system and is supplied with a backplate nipple to permit tapping crankcase compression to pressurise a sealed tank. Alternatively, a bladder tank may be employed. Recommended glowplug for the 15R is the K&B KB-1S short-reach. Tests indicated that this can be relied upon to give a performance as good as, or better than, any other type of plug in this particular motor.

Performance

Our torque and power curves show the performance of the Series 64 15R on regulation FAI fuel (straight methyl-alcohol and castor-oil) since this is now required for international free-flight as well as speed competition. No silencer was used as these are not yet required for international events and





of the Series 64 with other engines on 7 x 3 props. Our 15R achieved speeds of between 20,900 and 22,200 on various PAW and Top-Flite wood props. For free-flight, one assumes that the optimum prop sizes would be somewhere around 7½ x 3½ (on straight fuel) but this is obviously something that can only be settled by individual experiment.

Under the conditions existing at the time of testing, our 15R indicated a maximum output of 0.47 b.h.p. at just over 22,000 r.p.m. This is an outstanding performance and equal to the best we have achieved with any 2.5 cc. engine tested to date on straight fuel. Tests on nitromethane content fuels indicated that the b.h.p. figure may be raised by at least 20 per cent on 50 per cent nitromethane, where the use of such fuels may be permitted as in normal open free-flight contests.

Starting, we thought, was a little less easy than with the Series 61 model, due to its greater sensitivity to correct starting mixture strength, but in general, handling and running qualities were excellent. Plug life at peak speeds was, surprisingly, better than with the Series 61.

Inevitably, the performance of individual examples of the 15R Series 64 will vary to some extent, but on the basis of tests of our sample and of other racing type glow 2.5's, the K&B appears to have the potential to equal the performance of other highly regarded engines in this very competitive class. *Power/Weight Ratio* (as tested): 1.47 b.h.p./lb. *Specific Output* (as tested): 189 b.h.p./litre.

SPECIFICATION

Type: Single-cylinder, air-cooled, loop-scavenged two-stroke cycle glowplug ignition with ball-bearing crankshaft. Rear disc type rotary-valve induction.

Bore: 0.600 in. **Stroke:** 0.537 in.

Swept Volume: 0.1518 cu.in. (2.488 c.c.)

Stroke/Bore Ratio: 0.895 : 1

Weight: 5.1 oz.

General Structural Data

Pressure diecast aluminium alloy crankcase/cylinder-block unit with drop in cylinder liner. Pressure diecast aluminium alloy main bearing housing secured with four screws and containing two ½ x ½ in. Fatir ball journal bearings. Counter-balanced crankshaft of "Stressproof" steel with pressed-in hardened tubular, 0.178 in. dia. crankpin. Cast-iron, lapped piston with baffle and annular stiffening rib above gudgeon-pin bosses. Forged Alcoa 2014 aluminium connecting-rod, unbushed, with two lubrication holes at lower end. Hardened, 0.156 in. dia. tubular fully-floating gudgeon-pin with aluminium end pads. Pressure diecast aluminium alloy cylinder head secured with six screws. Valve rotor of special moulded material, bronze bushed and rotating on steel pin pressed into pressure diecast aluminium alloy backplate. Machined aluminium alloy carburettor venturi with separate needle-valve body containing brass fittings and stainless steel needle. Integral pressure diecast aluminium alloy spinner assembly. Provision for high pressure crankcase pressurised fuel supply via screw-in brass nipple in backplate. No gaskets—metal to metal joints throughout. Beam mounting lugs.

TEST CONDITIONS

Running time prior to test: 2 hours

Fuel used: 75 per cent I.C.I. Methanol, 25 per cent Duckhams Racing Castor-oil.

Glowplugs used: Maker's KB-1S 1.5 volt platinum filament as supplied.

Air Temperature: 70 deg. F.

Barometer: 30.10 in. Hg.

Silencer Type: Nil (see text).