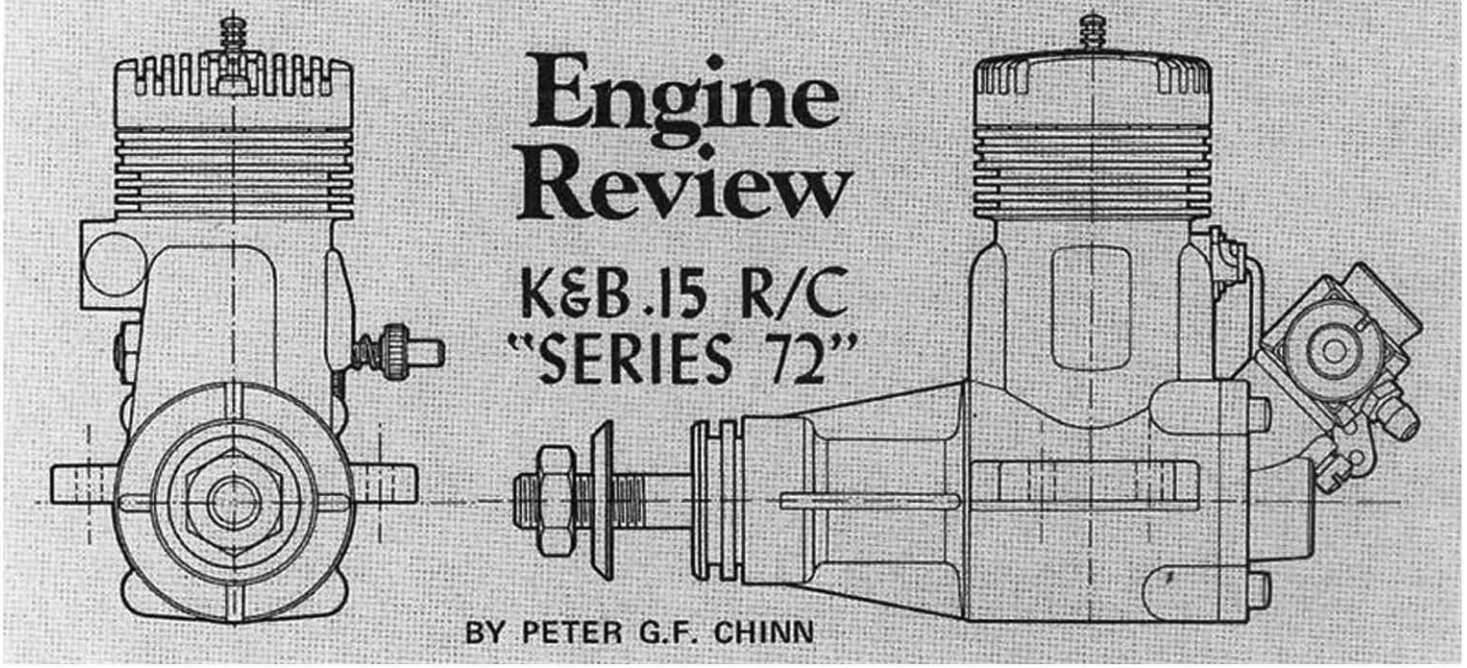
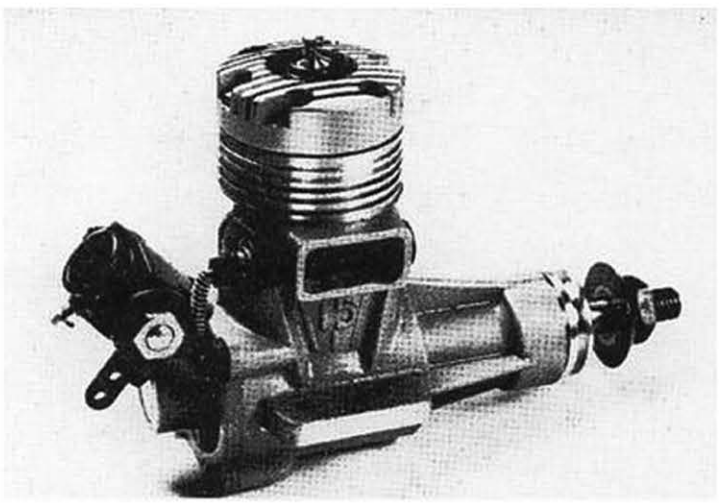
Engine Review

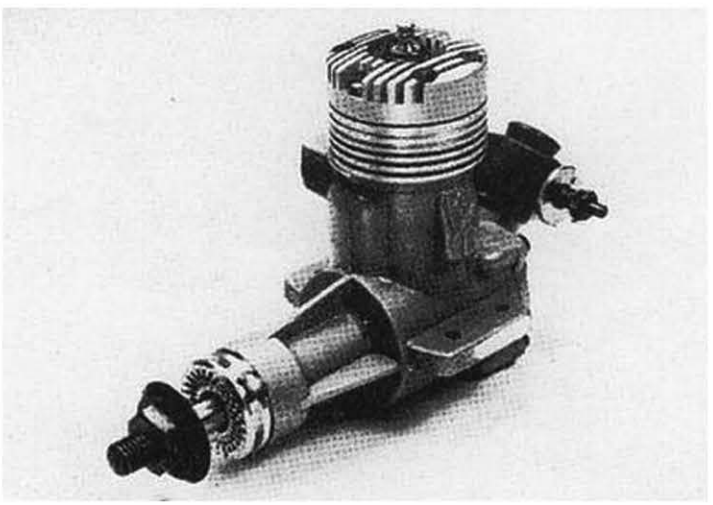
K&B .15 R/C "SERIES 72"



BY PETER G.F. CHINN



New K&B .15 first to feature rear rotary drum valve. Perry carburetor.

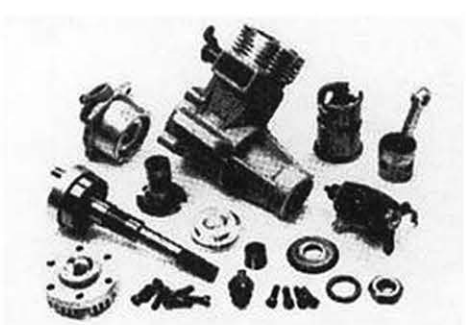


Racing engine features contribute to K&B's power output, tops in 15's.

Quarter Midget racer? Four-engine FAI Scale? Here's your motor! . . . totally new K&B combo of high torque, top end power. Rear rotary drum valve, throttle-equipped carburetor: most powerful .15 R/C engine seen!

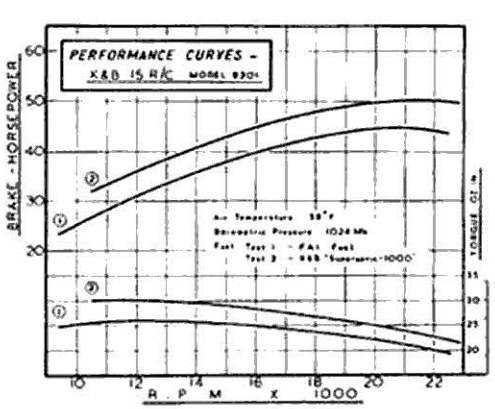
• Quarter Midget Pylon Racing . . .is it likely to become as popular as Formula I? Could be. If so, the hobby is going to have a new breed of engine: the throttle-equipped racing .15. And the first one is here: K&B's new Schnuerle-loop scavenged .15 R/C.

This is a totally new design, quite unlike any previous K&B 15. It is also the most powerful .15 cu. in. R/C motor that has passed through our hands to date.



Rugged new .15 R/C engine parts. Standard C/L and F/F versions also available.

As the graph shows, on test it exceeded 0.50 bhp (at over 21,000 rpm) on Supersonic-1000 fuel, which is about 25 percent higher than the best previously recorded figure for a .15 cu. in. R/C motor on similar fuel, and anything between 50 and 100 percent higher than the power output one gets from the general run of R/C .15's. Admittedly, an output of 0.50 bhp from a high-performance type .15 cu. in. engine is not, nowadays, exceptional so far as non-R/C motors are concerned. However, from an engine equipped with a proper R/C carburetor offering effective throttling down to 2500 rpm idling speeds, it is quite an achievement.



In general design, the new K&B .15 bears little resemblance to previous K&B's but, if it owes anything at all to any one of them, it is to the limited-production 40R Series 72 Pylon racing special made last year. Like the 40R, it has a rugged one-piece crankcase/cylinder-block/main-bearing casting with side exhaust and a similar type of 3-port bypass system.

Its induction system, however, is quite different and features a rear rotary drum valve. This is the first K&B to be so equipped in 27 years of engine production. The valve, of hardened steel, has a 0.374 in. o.d. and a 0.325 in. i.d. and runs in a deep housing that is an integral part of the pressure-cast aluminum crankcase-backplate. The valve port is rectangular and uncovers a similarly shaped aperture in the rear housing

to give a quick-opening, quick-closing admission period of (according to our measurement of the test engine) 192 deg. of crank angle, opening at 39 deg. ABDC and closing at 51 deg. ATDC. Mixture is drawn through an inclined intake boss into which is fitted a Perry carburetor having an effective choke area of 13 sq. mm.

The main casting of the new .15 is of sturdy proportions with sizable beam mounting lugs and generous webs bracing the crankcase nose. The main bypass channels are located fore and aft and there is a small third-port transfer passage diametrically opposite the exhaust. The cylinder fins are machined.

The crankshaft, quite generously dimensioned for a rear-valve .15 glow engine, features a 3/8 in. o.d. rear journal. It has a full disk crank with peripheral counterbalancing slots sealed off by an aluminum rim and a separate, pressed-in, hardened 5/32 in. dia. crankpin. The shaft is supported in a 3/8 x 7/8 in. 7-ball brass-caged bearing at the front. Breaking with traditional K&B methods of mounting the prop drive assembly, the new .15 uses a split taper collet to secure its machined aluminum prop driver.

As is normal with the smaller displacements, a lapped piston is employed and, in accordance with the requirements of the Schnuerle scavenging system, the piston has a flat, deflectorless head. Above the wrist-pin, the piston interior contains an annular rib as an aid to maintaining roundness and, below the pin, the piston skirt is relieved .002 in. on diameted to reduce drag. The wrist-pin is tubular, 5/32 in. o.d., fully-floating but with wire circlips to prevent it from scoring the cylinder wall. The connecting-rod is an aluminum forging with plain eyes and oil slits at both ends.

The drop-in cylinder sleeve has a generous wall thickness (0.062 in.) and is located in the usual way by a flange at the top. The two main bypass ports, positioned each side of the single exhaust port, are angled to direct the gas flow across the top of the piston away from the exhaust port towards the opposite side of the cylinder, where it is joined by an upward flow from the steeply inclined third port. Port timings, as measured on our test engine, were 71-71 deg. for the exhaust, 63-63 and 64-64 deg. for the two main bypass ports and 63-63 deg. for the third port.

The machined cylinder head features a fairly wide (3/32 in.) squish-band surrounding a small bowl-shaped combustion chamber with a centrally located short-reach KB-1S glowplug. Six fillister head 3-48 screws tie the head to the main casting.

As already stated, the K&B .15 R/C uses a Perry carburetor. The type fitted is the Micro Series 72-B. It is equipped with an L-shaped throttle arm that is linked to a semi-rotary baffle in the exhaust stack. There is no provision for fitting a muffler.

The literature that accompanies the K&B .15 R/C does not quote the engine's bore and stroke measurements. We checked the test engine and found these to be 0.575 in. x 0.574 in., which gives a displacement of 0.1490 cu. in. or 2.442 c.c.

Although the maker's instruction leaflet contains no specific recommendations as to fuel, it does advise that blends containing more than 10-12 percent nitromethane should be avoided until the engine has had at least 30 minutes running time. This would suggest that the .15 is set up for operation, after break-in, on the hotter grades of fuel (e.g. 25-50 percent nitro) such as one would expect to use for contest work where the rules impose no fuel restrictions.

However, since this new K&B .15 is also obtainable in a standard non-throttle version (which is identical except for the omission of the exhaust baffle and the replacement of the Perry carb by a normal venturi), and as some purchasers may well expect this model to be competitive in FAI Free Flight, we began our tests (after break-in) by first checking out the .15 R/C on a straight methanol/castor oil fuel as required by the FAI rules.

These tests did, in fact, confirm the impression that, in stock trim, this new K&B is primarily intended for operation on nitro. This reasoning had little to do with the engine's power output. Provided that the needle-valve was very carefully adjusted, the bhp reached on FAI fuel over a wide rpm range was very good (and should be even better with the larger, standard engine venturi), but the K&B would tolerate this fuel only when mixture strength was held to within very narrow limits: i.e. a very slightly rich needle-valve setting produced uneven firing and loss of power, whereas leaning out just a fraction too much would result in an immediate cut. So far as flight performance is concerned, such a condition is commonly reflected in an engine's inability to tolerate variations in fuel delivery pressure caused by normal flight maneuvers.

Some slight improvement may be expected under hot summer conditions (our tests were carried out in late February but during a mild spell when air temperatures reached the high 50's), but we suspect that the real solution to satisfactory operation on FAI fuel (as in the case of many other engines set up for operation on nitro) is a special cylinder-head or, at least, a higher compression-ratio.

So far as the standard engine is concerned, therefore, we think it will be of interest mainly to Control Line and Free Flight modelers who require a powerful motor for operation on hot fuels. For FAI Free Flight, it is reasonable to anticipate that a modified cylinder-head will be offered – by tuning specialists, if not by the factory.

Continuing the tests on the .15 R/C, we then switched to K&B's Supersonic-1000 fuel. This, as expected, made a world of difference. Apart from an increase of approximately 15 percent in maximum torque, the engine now ran very steadily and was no longer excessively critical to needle-valve adjustment. Typical prop revolutions included 11,400 rpm on a 10 x 3-1/2 Top Flite wood, 11,500 on a 9 x 5 Top Flite wood, 13,000 on a 9 x 4 Top Flite nylon, 13,600 on an 8 x 6 Power-Prop, 15,100 on an 8 x 5 Power-Prop, 16,500 on a 7 x 6 Bartels-Tornado epoxy-fiberglass, 16,800 on a 7 x 6 Top Flite, 17,700 on an 8 x 4 Taipan nylon-fiberglass, 18,200 on a 6 x 7 Bartels-Tornado epoxy-fiberglass and 19,800 on a 7 x 4 Top Flite wood.

These are very impressive figures, not only in respect of the high rpm reached on the smaller sizes, but for the exceptionally good performance on the larger diameters. Calling for a level of torque at medium speeds rivaling that of a tolerably good .19, this is rare in a modern high-speed .15 cu. in. glow engine. It means that the .15 R/C's usefulness is by no means confined to Quarter Midget racers. In fact, looking at the performance available on the larger diameter props, we were made aware of the fact that here is *power to spare* for anyone planning a four-engined Scale R/C job within the FAI 10 c.c. (.61 cu. in.) total engine displacement limit.

The starting qualities of the .15 R/C were good. We found that it liked to be port primed when cold (even when a starter was used), but restarts were achieved quickly after first choking the intake for one or two preliminary turns of the prop. The engine started most easily when the throttle was either fully open or partly open and responded less willingly to attempts to start it with the throttle in the idling position.

The throttle itself worked extremely well, and safe idling speeds down to 2500-2600 rpm were readily obtained on the 8 and 8 in. dia. props, rising to around 3,000 rpm on the smaller sizes. The engine held full throttle speeds steadily and remained relatively cool running.

The only problems we encountered during the tests were plug filament failures at high rpm on nitro fuel. This may *not* be typical. The original plug lasted through the break-in period, right through tests on FAI fuel including runs of up to nearly 23,000 rpm and then through a series of runs up to 18,000 rpm on Supersonic-1000 fuel. At this point it failed and was replaced by another of the same type, but this also failed as soon as revs were pushed up around the bhp peak on nitro. There was no evidence of this being caused (as is sometimes the case) by foreign matter in the engine: the .15 R/C was also notable for its extremely clean exhaust residue. Probably we were unlucky, but this is something that is being further investigated.

One final point: the design and construction of the K&B .15 are well adapted to receive the ministrations of hop-up specialists. One can visualize many possible lines of attack, from the simple reworking of head shapes and induction assemblies to the more subtle modifications of ports, etc. Even in stock trim, however, its performance, as we have seen, is more than adequate. Another top notch K&B product.

Summary of Data

Type: Single sylinder Schnuerle loop scavenged two-stroke cycle with twin ball-bearings and rear rotary drum valve induction. Throttle-type carburetor with coupled exhaust restrictor.

Checked Weight: 6.74 oz.

Displacement (measured): 0.1490 cu. in. (2.442 c.c)

Bore (measured): 0.575 in.

Stroke (measured): 0.574 in.

Stroke/Bore Ratio: 0.998 : 1

Specific Output (as tested, no muffler):
2.98 bhp/cu. in. (FAI fuel)
3.39 bhp/cu. in. (Supersonic-1000 fuel)

Power/Weight Ratio (as tested, no muffler):
1.06 bhp/lb. (FAI fuel)
1.20 bhp/lb. (Supersonic-1000 fuel)

Manufacturer: K&B Manufacturing Division, Aurora Products Corporation, 12152 Woodruff Avenue, Downey, Calif. 90241. ■