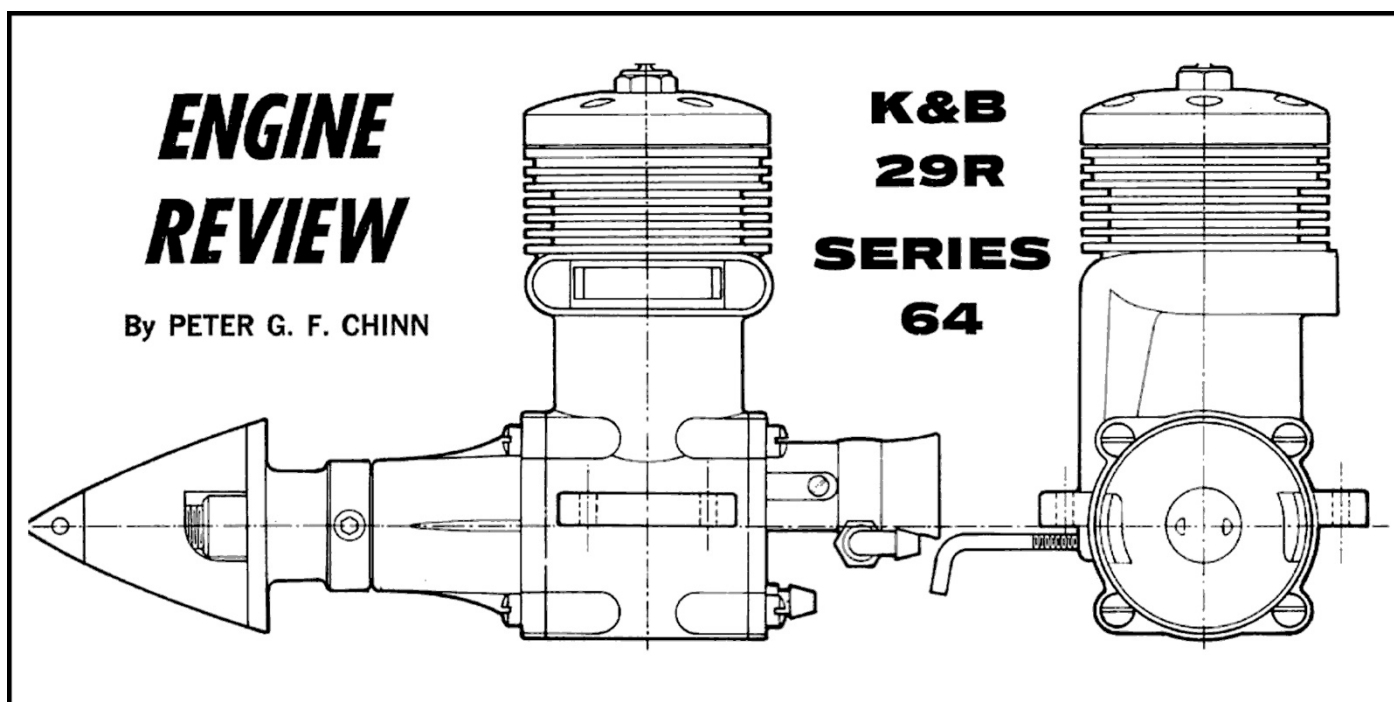


## K&B 29R Torpedo Series 64



Left, 29R modification, 61 series finned head comparison to 64 plain head, also squish band.

Centre, in 29R modification, new piston/cylinder sleeve and, just visible inside casting, widened bypass.

Right, 29R modification, new, improved method keying propeller drive to shaft for 64 series.

### **K&B'S CURRENT RACING 29, RATED TOPS IN THIS REPORT, TOOK B SPEED AT 65 NATS.**

► It is nearly twenty years since model airplane engines that would develop one solid honest-to-goodness horse power became a reality. This month we celebrate, in presenting the Series 64 version of the K&B Torpedo 29R, two decades of progress. . . . Progress because the K&B achieves this same output with only half the displacement of those earlier engines.

The Torpedo 29R "Series 64" is, of course, a development of the "Series 61" 29R dealt with three years ago in these columns.

Externally, there is little to distinguish it from the earlier model. Internally, however, only a few parts have escaped modification. As a result of these changes, the Series 64 develops greater brake mean effective pressure over its entire operational rpm range and especially so at the top end of the speed scale. In terms of power output, this adds up to around 25 percent greater horsepower at a 1500-2000 rpm higher peaking speed: just the sort of performance that the control-line speed expert is looking for.

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**Although plain head is virtually the only outward change since earlier model, Series 64 version of K&B 29R incorporates numerous improvements.**

Examining the parts of the "Series 61" and "Series 64" engines side by side, it looks very much as though the secret of the new engine's performance is to be found in the revised cylinder porting and new head. Two machined flutes, or pouches, have been added to the bypass to aid gas flow towards the sides of the bypass port. The actual bypass port width in the cylinder sleeve (which was formerly slightly obscured by the casting anyway) has been reduced from 140 degrees to 130 degrees of the bore circumference. Port depth remains the same. However, true port area is slightly greater, since the center post which, interrupted port width by 16 degrees, has been removed in the "Series 64" engine. Thus, greater effective port width, better gas flow through the bypass passage and the elimination of the center post obstruction have been achieved.

Exhaust port dimensions too, have been modified. Formerly extending around the bore for 160 degrees, port width has been cut to 146 degrees, but, again, the center post has been eliminated and the resulting port area is virtually unchanged. Port timing, as measured on our two test samples, indicated a very slight modification, the bypass duration being increased by 2 degrees to 126 degrees of crank rotation and the exhaust period increased by 3 degrees to 143 degrees.

Intake timing remains fairly conservative, compared with some shaft-valve type high-speed engines, at 35 deg. ABDC to 45 deg. ATDC. The back-plate and rotary-valve unit of the "Series 64" engine is, in fact, identical with that fitted to the "61" model. It comprises a pressure-cast and machined back-plate, an ultra lightweight valve rotor for minimum imbalance and a multi-jet carburetor. The machined carburetor intake has a true venturi section, commencing at a .600 in. diameter bell-mouth and converging to a 11/32 in. throat, before opening up to 3/8 in., where a smoothly contoured 90 degree back-plate sector admits gas to the crankcase via the non-metallic, bronze-bushed valve rotor.

Many changes have been made to the piston, including a switch to the use of hardened iron and the abandonment of the hard chromed finish used in the "Series 61." The baffle has been moved .050 in. closer to the bypass side to match the new bypass port width. Skirt ports are no longer used. The lapped portion of the skirt now extends from the piston head to just below the wristpin instead of terminating level with the wristpin axis. There is no relief on the top-edge diameter. Compared with the "Series 61." the piston is heavier, but by an insignificant amount.

Conspicuous modifications are evident in the region of the cylinder head. The compression ratio has been raised, the combustion chamber shape revised and the head fins dispensed with. The head itself, formerly a pressure casting, is now machined from bar stock.

The most interesting of these head changes is the incorporation of an annular squish area. This covers (ignoring, for the sake of simplicity, the contortions around the piston baffle). 30 percent of the piston area. For the benefit of readers unfamiliar with the term, "squish" can be defined as an area in which the piston head surface and cylinder head surface are in such close proximity, at top-dead-center, as to be excluded from the surfaces bounding the effective combustion chamber. (In the Series 64 29R. the piston clears the squish band by only 10 to 12 thou.) Squish areas, which can be formed in the cylinder head or piston, or both, are being used increasingly in full-scale engines, as well as in model engines, as a means

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of promoting increased charge turbulence to aid flame propagation and avoid detonation and to permit high compression ratios while maintaining efficient combustion-chamber shapes. In the 29R, as on some other recent high performance model engines to adopt this feature, the squish area is in the form of an outer band which squeezes the charge into a central hemispherical combustion chamber.

Only minor changes mark the crankshaft and front end assembly. K&B's highly original 3-piece shaft design (now copied by such noteworthy names as MOKI and Rossi) is retained. This features a full disc web or flywheel with slots milled in its periphery, one each side of the crankpin, for counterbalancing, leaving the front and rear faces of the flywheel intact. The periphery is then fitted with an aluminum rim presumably shrunk on to cover the slots. In this way, the dead volume in the crankcase normally inseparable from a conventionally counterbalanced crank web, is eliminated, yet sufficient weight is retained opposite the crankpin to balance both the pin and conrod.

The shaft, since it is supported in ball races and has no actual working surfaces, is left in its original unhardened state. It has, however, a blued anti-corrosive finish all over, except for its front and rear journals (respectively ¼ in. and 3/8 in. o.d.) which are ground to size. The separate pressed-in crankpin is, of course, hardened. Our test engine had the "Electrolized" hard-chromed crankpin of the "Series 61," but current "Series 64" models have a case-hardened pin.

As on the "Series 64" 29F and 35, an improved method of keying the die-cast drive hub to the shaft is used. On the "Series 61" 29R, an Allen set screw, through the hub collar, engaged a flat on the shaft end, a satisfactory method only so long as the screw was kept tight. Now, in addition, a .125 in. dia. hardened steel ball is inserted in a hemispherical depression in the shaft and this engages a U-section keyway in the hub to positively locate the hub against movement on the shaft. The set-screw and flat effectively locks the whole assembly.

The 29R is intended for operation solely on pressure feed. The massive intake, un-restricted by a spray-bar, needs either a pen-bladder tank or a crankcase-pressurized sealed tank to force feed the fuel supply to the carburetor's six peripheral jets. We used the crankcase-pressurized system for which the 29R comes ready equipped. The system is a high pressure one and utilizes a back-plate take-off timed by the rotary valve, so that it is open only during the crankcase compression period of the cycle.

We found the "Series 64" 29R, like its predecessor, easy to handle and easy to break in. For the latter operation we used a straight blend of methanol with 25 percent best quality castor-oil, following our usual practice of a series of short, lightly-loaded, rich mixture runs, with cooling-off periods between each and gradually working towards the point where the engine would hold a steady rpm reading when leaned out to optimum mixture strength.

As recommended in the manufacturer's instructions, we used smallish props during the rich-mix break-in so as to let the engine turn freely and accelerate the break-in time, but it is, perhaps, appropriate to add a warning note here, in view of the very high leaned-out rpm which the Series 64 29R is capable of generating on small props. Purchasers intending to use the 29R for contest free-flight may be tempted to try the engine on small diameter fine pitch props to take rpm up to peaking speed static i.e. the speed at which it may be expected to turn a bigger and stronger prop when in the air. We would regard a 9x4 or 8x5 as the minimum safe F/F sizes for static testing and even with these it might be prudent to stand well back and be ready to cope with a shaft-run if the prop disintegrates! This applies to wood as well as to nylon.

As is our normal procedure with engines of this type, initial torque tests were run on straight 3/1 methanol-castor fuel, a mixture on which, incidentally, the "Series 61" engine had performed relatively poorly. Starting torque readings at 9-10,000 rpm, the "Series 64" showed little improvement, both engines developing around 40 oz. in. torque, but, as load was reduced and rpm increased, the promise of greatly improved performance became increasingly evident.

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At 12,000 rpm, where the "Series 61" had started to drop below 40 oz. in. the "64" had climbed to 45 oz. in.; at 14,000 it levelled out to its maximum torque of just over 46 oz. in., and did not drop below 40 oz. in. again until load had been reduced sufficiently to put the rpm beyond 19,000 on the tachometer. The result: a jump in bhp from 0.53 to 0.76, at a peaking speed over 3,000 rpm higher than that of the "61" on similar fuel.

It has to be admitted; since 29R users are most likely to employ high nitro fuels, that this comparison on straight fuel is largely of academic interest only and merely serves to lend weight to the theory that the "61" engine needed a higher compression ratio to improve its performance on such fuel. It also suggested to us that we could not expect the "64" to demonstrate quite such an astonishing response to nitro as had the "61" (52 percent) increase in power on 45 percent nitromethane). Nevertheless, a very substantial improvement was achieved.

After preliminary checks, we chose a mixture containing 50 percent nitromethane, 716 percent nitrobenzene, 1214 percent castor-oil, 10 percent Ucon LB.625 polyoxide synthetic lubricant and 20 percent methanol. This pushed up torque by 30 percent to 60.5 oz. in. at 14,000 rpm and maximum power by 34 percent to 1.02 bhp at just over 19,000 rpm.

We need hardly remark that this is by far the highest output for a .29 yet recorded in the M.A.N. test series. It is all the more remarkable for the fact that it was achieved alongside impeccable handling characteristics: quick, easy starting, with no tendency towards viciousness when hand-starting on small props.

The slight time lag in response to needle adjustments that often occurs with pressure systems, was apparent when running on straight fuel, but was less evident with nitro due to the latter's wider mixture strength range. We found the present 29R a little harder on plugs than the older model. This was to be expected but, in fact, once the engine had been well broken in it was rare that plug failure occurred at

speeds below 18,000 rpm or before several runs at peak speeds had been made.

We don't think we are being too rash if we rate the "Series 64" Torp 29R as the best racing 29 we have handled to date . . . a couple of them did, after all, set the fastest ever "B" speeds at the 1965 Nationals.

## Summary of Data

**Type:** Loop-scavenged, two-stroke cycle with rear disc rotary-valve and twin ball-bearings.

**Weight:** 8.5 oz.

**Displacement:** 0.2982 cu. in. or 4.887 c.c.

**Bore:** 0.750 in.

**Stroke:** 0.675 in.

**Stroke/Bore Ratio:** 0.900 : 1

## Specific Output (as tested):

2.55 bhp/cu. in. on straight methanol/ castor-oil fuel.

3.42 bhp/cu. in. on 50 percent nitromethane fuel.

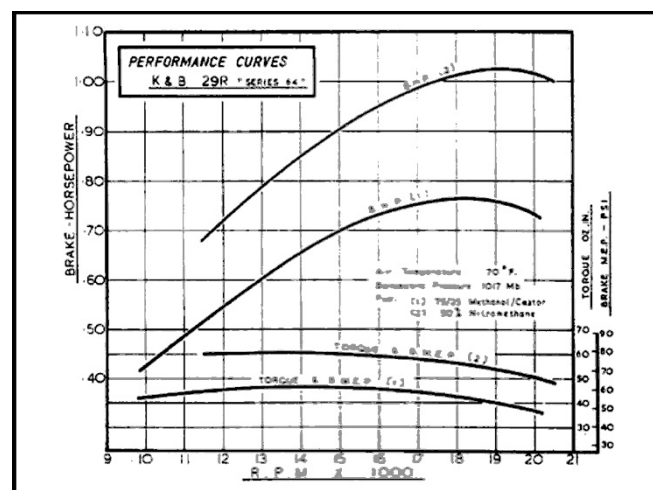
## Power/Weight Ratio (as tested):

1.42 bhp/lb on straight methanol/castor- oil fuel.

1.93 bhp/lb on 50 percent nitromethane fuel.

**Price:** \$24.95.

**Manufacturer:** K&B Manufacturing Corporation, 12152 S. Woodruff Avenue, Downey, California.



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