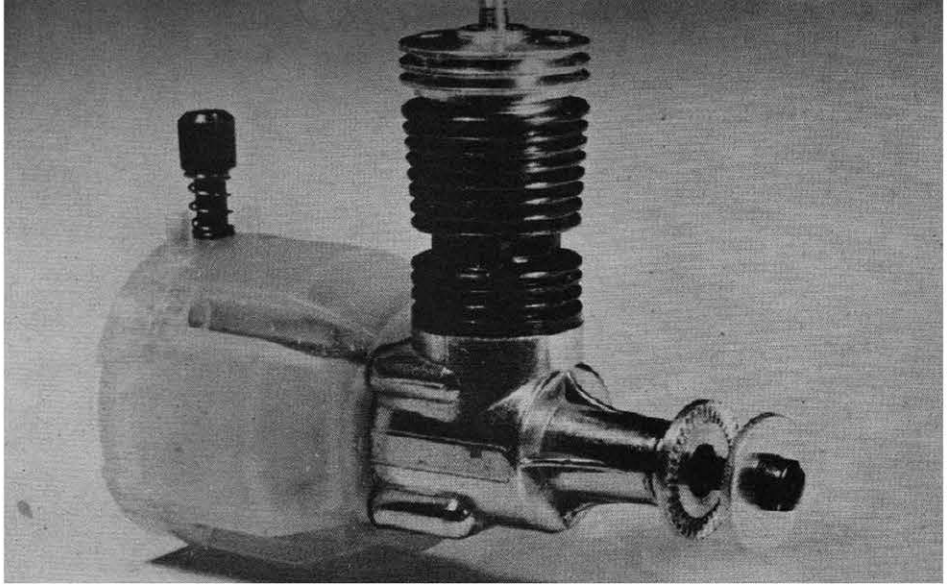
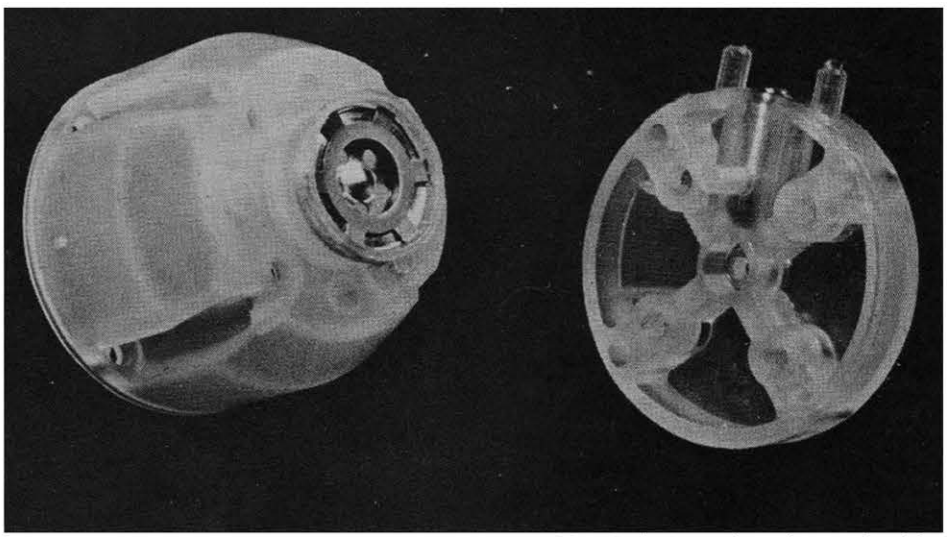
engine review

Beginner and old-timer alike will really get a charge out of this easy starting addition to the outstanding K & B line of excellent engines.

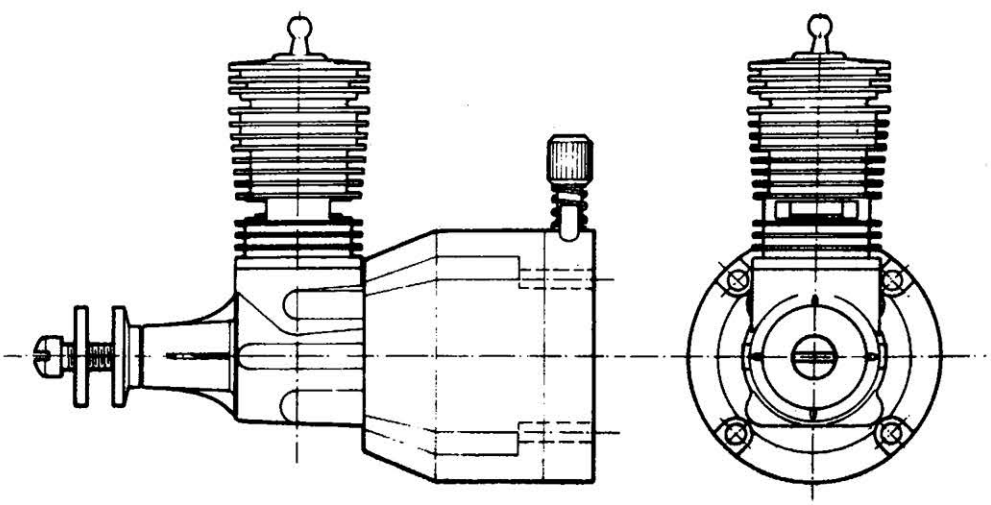
By P.G.F. Chinn



Note translucent tank of fuel proof plastic with needle valve out of harm's way. Mounting bosses molded in fuel tank have lead drafted for easy access to attaching screws.



Tank of special plastic is said to be stronger than nylon and of course impervious to special hot fuels. Note the unique and original "flex-o-valve," fuel induction system.



► Of all the time-worn claims that have been used to sell model airplane engines, "easy starting" surely tops the poll. Remember the Sludgepump Super-29 that squirted oil all over the timer points? Or the 2 c.c. Moto-Macaroni diesel for which you mixed a fuel of 17 sundry liquids ranging from olive oil to paint stripper and still it didn't go? Or did you alternately grind your teeth and suck your fingers over a Decapitator 60? Yes, "easy starters", all of them, but they left the manufacturer of a genuine easy starter with a problem: who would believe him?

However disdainfully the hardened modeler may view plastic controlliners, the coming of the ready-mades had at least one thing in its favor: it focused attention on the need for really simple to handle engines that could be successfully operated by ten-year-olds, and the engines that have resulted have put the much-abused phrase of "easy starting" in something like its true perspective.

K&B's Tornado .049 is the latest development in the trend towards simpler handling and, when we remark that we started our test sample, cold, for the first time, on the very first flip of the prop, it will be appreciated that here is one engine for which starting claims can be fully substantiated.

The Tornado was developed, last year, specifically for the Aurora Plastics Corporation for their new ready-to fly models and, until the end of April this year, was not available to modelers generally. Following the merging of K&B with the Aurora Corp., however, the Tornado is now being packaged as a separate item for the model market.

Aurora's prime requisite was fast starting by finger-flipping only—i.e. without the aid of any sort of spring starter device—and the engine was to start even easier than existing reed type motors. This, clearly, was not going to be an easy assignment. Recent beginner type engines have reached a point where handling qualities are generally good, and where, aided by spring starters, even those that are not inherently quick-starting, have been much improved.

To produce an engine that would start as easily as the best starter equipped motors, therefore, K&B designer Johnny Brodbeck decided that something new and different was needed on the induction side. The answer was found, after three months of development work, in the Tornado's unique diaphragm valve, or "Flex-O-Valve" as it was subsequently named. This valve

features a non-metallic diaphragm that is impervious to all glow fuels. It operates on the same principle as the reed inasmuch as timing is controlled by crankcase compression and depression, but should be less subject to interference by the entry of particles of dirt and other foreign matter.

The Flex-O-Valve is mounted in a molded fuel-tank and backplate unit of an undisclosed plastic material. This material, translucent, and white in color, is similar in appearance to nylon, but has a higher tensile strength, will withstand greater heat and is 100 percent inert to all fuels.

The tank/backplate unit is in two parts. The front portion is a cup-shaped unit having a center boss which plugs into the engine crankcase and carries the Flex-O-Valve parts, comprising a flat ½ in. dia. aluminum disc, the valve diaphragm and a keeper. The disc forms the valve seat and covers the bell mouthed exit from the carburetor venturi. It has five 1/16 in. dia. admission ports spaced around a raised conical center. The valve membrane is .003 in. thick, mounted in an aluminum ring and has a 7/64 in. dia. hole in its center through which mixture is admitted when crankcase depression draws the membrane away from the valve seat. When crankcase compression closes the valve, the membrane shuts off the five admission ports and its center hole is sealed at the same time by the conical portion of the valve seat. The complete valve assembly is retained in position by an annular clip or keeper.

The back cover of the tank is of the same molded material as the main section except for a brass bushing to carry the needle-valve. It makes an excellent joint with the edge of the tank and with the carburetor intake tube which passes through the center of the tank. Fuel filler, vent and delivery tubes are all molded as part of this back cover. As with other engines having this basic type of tank and carburetion set-up, the intake venturi is quite small (5/64 in. bore), the entry communicating with a channel in the rear face of the cover so that air can be admitted between it and the firewall. Four screws pass through the tank, from rear cover to the crankcase casting, to secure the entire fuel and carburetion department to the engine.

The rest of the engine is fairly orthodox, incorporating features of the earlier baby Torpedo designs of ten years ago, plus modern improvements. The hardened crankshaft is of a counterbalanced pattern and is blued on non-working surfaces. The shaft is relieved at the center to provide two 7/32 in. dia. journals which run direct in the pressure-cast alloy crankcase. It has a splined front end for the prop driver and is internally threaded for the prop retaining screw. The 7/64 in. dia. crankpin couples to a hardened steel conrod which is ball jointed to the flat-topped piston via a swaged socket in the underside of the piston head.

The blued one-piece steel cylinder features diametrical exhaust porting with a single internal flute type bypass. The cylinder is relieved below exhaust level and is threaded and flanged to screw into the crankcase. The aluminum alloy cylinder head incorporates an integral glow filament and screws into the cylinder where it seats on a copper gasket.

As we have said, out test Tornado started on the very first flick of the prop. The maker's instructions were followed precisely. This instant starting was achieved throughout subsequent tests, although, on the smallest props, there was a fairly frequent tendency to start backwards. The reduced flywheel effect of a small prop will often cause this with any non-rotary-valve type motor, especially on the hotter varieties of fuel. Persistent reverse starting can be counteracted by flipping the prop backwards.

Hot restarts were performed at first flick without recourse to port priming or choking—a rare quality. The safely-located needle-valve was positive in operation. It was found that, on certain props, if the needle adjustment was cut down too lean, the motor would slow, then quit before reopening of the valve had time to take effect, but on others, particularly some 6 x 3's and 6 x 4's, needle response was as flexible as could be desired. Notable was the longer-than-average motor run given by the generous capacity tank—2¾ minutes on a Top Flite 6 x 4. The translucent material of the tank enables fuel level to be easily observed.

From the performance angle, the most noteworthy feature was the above average torque developed by the Tornado—over 5 oz. in. at around 10,000 rpm. Peak horsepower reached on our test was at 14,000 where a figure of just under .065 was reached. This is an extremely good level for an engine which does not profess to be a contest type powerplant. Actual course of the power curve was as folows:

At	8,000	rpm —	.0450 bhp.
	9,000	" —	.0462 "
	10,000	" —	.0517 "
	11,000	" —	.0566 "
	12,000	" —	.0608 "
	13,000	" —	.0637 "
	14,000	" —	.0648 "
	15,000	" —	.0630 "

All in all, we would rate the Tornado 049 an ideal engine for beginners and other modelers requiring a reliable well-performing engine at an extremely competitive price.

Summary of Data

Type: Reverse-flow scavenged two-cycle with automatic diaphragm valve induction.
Weight: 1.7 oz.
Displacement: .0495 cu.in. or 0.818 c.c.
Bore: 0.40 in. Stroke: 0.394 in.
Stroke/Bore Ratio: 0.985 : 1.
Specific Output (as tested): 1.31 b.h.p./cu. in.

Power/Weight Ratio (as tested): 0.61 bhp/lb.
Manufacturer: K&B Manufacturing Corp., 5732 Duarte Street, Los Angeles, 58, California.
Price: $3.95.