Cox Queen Bee .074

INSIDE ENGINES

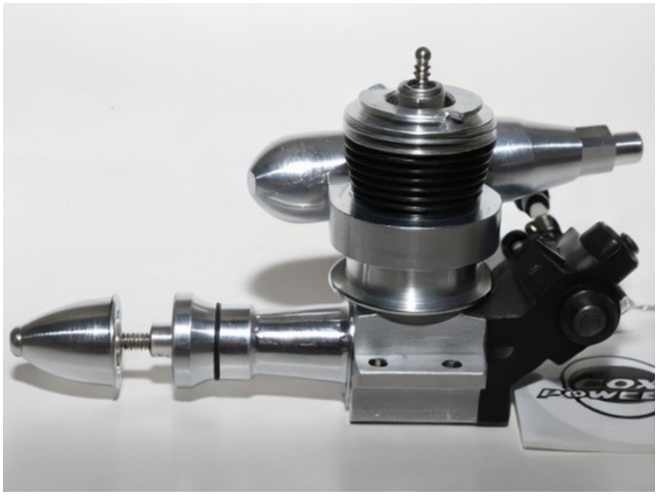
WITH STU RICHMOND

• One of the most treasured model engine books I own has the outline of a Cox engine embossed on its cover. The book details model engine history from 1848 up to today's technology. Subjects include theory and practical applications, ignition, diesel and glow, chemistry of fuels and combustion, tuned pipes, props, metallurgical transformations, and it includes hundreds of photos and engineering drawings. The book is Miniaturowe Silniki Spalinowe, published in Poland and I can't read a word of it! But by having the Cox engine on its cover, you get some idea of the respect these fine American made model engines enjoy all around the world.

So, as the world waits for sunrises, the world's model builders have been waiting for the new Cox Queen Bee .074 R/C engine to become available. Cox's initial order is a huge one going to Europe, but a trickle of the engines should be available as you read this review.

Regular readers of "Inside Engines" know the emphasis I place on usable speed ranges of R/C engines. The rotating Ace exhaust collar has been a substitute for carbureted speed control on Cox engines. I've raced Cox TD's in 1/2A pylon and sport flown the 1/2A's a lot and until now, there has not been a really effective speed control in these small engines. The new Queen Bee features a standard design Cox piston cylinder and uses the Teflon reed induction valve. But now a precision molded R/C carburetor is included, along with an effective muffler. You small model R/Cers now have available a real R/C engine for your small models!

Our test engine is a very early version, and as production progresses there are sure to be minor



The Queen Bee turns a 6x3 about like the familiar Tee Dee .049, but does it with quietness and can idle down for better than a 4.5:1 speed range. A truly throttleable small R/C engine.

manufacturing changes and improvements all manufacturers want us to be satisfied customers. I can see great growth in small field R/C flying now.

A few quotes from the instructions follow:

"A break in period in the ordinary sense is not necessary; in fact, a slow, easy break in is not desirable. Most of these engines will develop full power within one minute of running time."

"Thirty minutes running time will add a few RPM for peak contest operation."

"Remember your Queen Bee engine is designed to perform its best at high speeds. Let it wind up. Do not use oversized props."

The engine comes with a Fox short non idle bar plug. By adding two additional washers, a Fox Miracle plug or a K&B #4520 idle bar plug can be fitted without the top of the piston hitting the bottom of the plug. Al though these two alternate plugs almost al-ways improve idle performance of an engine, testing them in the Queen Bee showed no advantage. Undoubtedly these two plugs stick down into the combustion chamber and somewhat upset the combustion pattern. The short Fox plug worked perfectly from high speed to idle and the same plug survived all testing.

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The .074 Queen Bee should bring out a whole new generation of small R/C models. Latest production run should be ready by middle to late April.

Cox Super Fuel #551 was used for initial running. An unusual design feature of Cox engines is that the top of the connecting rod is a ball in shape and the ball is swaged into a socket that's machined into the lower side of the piston crown. The ball is inserted in the socket and then precision tooling peens or closes the lower skirt of the socket around the ball to freely hold it in place. Cox has always used castor oil (about 20%) in their proprietary fuels to provide maximum lubrication to this socket. But I sense a trend towards lower total oil content in fuels for today's engines. As unburned castor oil exhausts from an engine it carries away much heat from combustion, so an excess of oil can lower performance in engines. As oil content is decreased engine performance (at both idle and top speed as well as acceleration from idle) improves until the total oil content no longer offers adequate protection to moving parts and failure follows. Too much oil can cause unsteady wavering speeds in engines. I discuss this only to help you understand fuels used in this particular review.

Although the instructions state that no break-in is necessary, in running the Cox # 551 fuel I found the more the engine was run the better it performed. I made a long series of full speed, heat-raising short (30- 90 seconds) runs and allowed a complete cooling between these runs. Initially the test engine showed high speeds wavering up and down 300 to 400 rpm at full throttle as well as at the 5.000 idle speed I tried. Had I simply put the new engine in a model and gone out to fly it after a minute of running I think I would have not been satisfied with the performance due to unsteady, wandering rpm's at all throttle settings. I detail this so that in case you experience this unsteadiness, please recognize that more high speed running, along with cooling, will allow the engine's moving parts to better seat and give you optimum performance. Unsteady initial running is often an indication that something is too tight a fit, is expanding with heat and causing a metal to metal bind that brings rpm's down. Lower rpm's are caused by metal to metal galling. The best protection against galling the metal surfaces and causing damage is, in the case of the Queen Bee, to initially use the manufacturer's recommended heavy castor content fuel! The first fuel through this engine really ought to be a pint of Cox #551 Super Power fuel. But high castor content can also cause varnishing on the piston/cylinder walls and the instructions address this problem too. I feel the simple fix is, after the first hour of running, to switch to fuel that is a castor/synthetic blend with detergent cleaning action and use somewhat less than 20% oil. After the Queen Bee testing was done on Cox fuel I made a switch to a castor/synthetic fuel of less oil percentage this was after about 90 minutes of total running and the engine smoothed out at a// speeds and became a real honey to run. Going back to the Cox #551 all-castor fuel brought back the varying rpm performance. The purpose of “Inside Engines" is to enable you to get the best performance from your purchase and to show/tell you what's inside your engine that yields this performance. While on this long discourse on fuel for the Queen Bee, let me tell you I made a mix of 35% nitro and 22% castor to study the nitro/rpm performance and feel that the lower 15% nitro, as Cox Super Fuel contains, is the better nitro choice.

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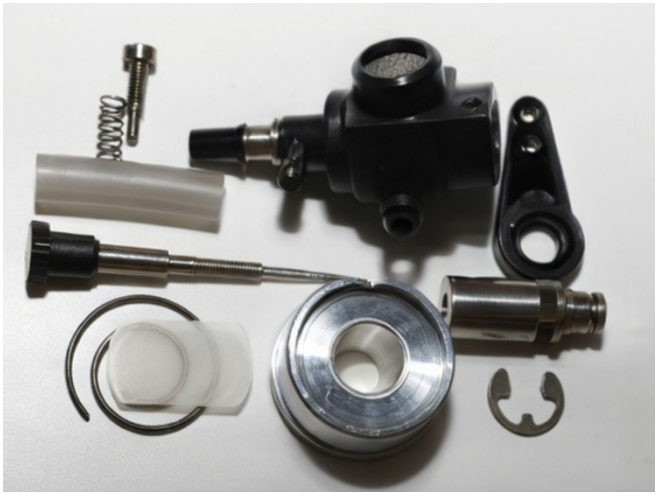
QB pretty much follows traditional Cox practice. A notable exception is the normal glow plug in place of the familiar Cox glow head.



Disassembled carb. Note the teflon reed (laying on the coiled retaining ring) which serves as the inlet valve for the fuel/air mixture.

After the first hour of running, performance was noticeably improved. The 5.000 rpm idle speed was lowered to 4500 by adjusting the barrel closure and the needle valve while at idle speed. This same needle setting technique finally yielded an ultrareliable idle at 4250 rpm on a 6x3 Cox gray prop! This is truly great for such a small engine while holding your hand behind the engine at 4250 you felt very little prop blast. The exhaust from the pretty aluminum muffler offered more "squirt" on your hand than the prop blast. I walked away tail this so that in case you experience this unsteadiness, please recognize that more high speed running, along with cooling, will allow the engine's moving parts to better seat and give you optimum performance. Unsteady initial running is often an indication that something is too tight a fit, is expanding with heat and causing a metal- to-metal bind that brings rpm's down. Lower rpm's are caused by metal to metal galling. The best protection against galling the metal surfaces and causing damage is, in the case of the Queen Bee, to initially use the manufacturer's recommended heavy castor content fuel! The first fuel through this engine really ought to be a pint of Cox #551 Super Power fuel. But high castor content can also cause varnishing on the piston/cylinder walls and the instructions address this problem too.
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I walked away no tendency to load up.
Dam nice performance.

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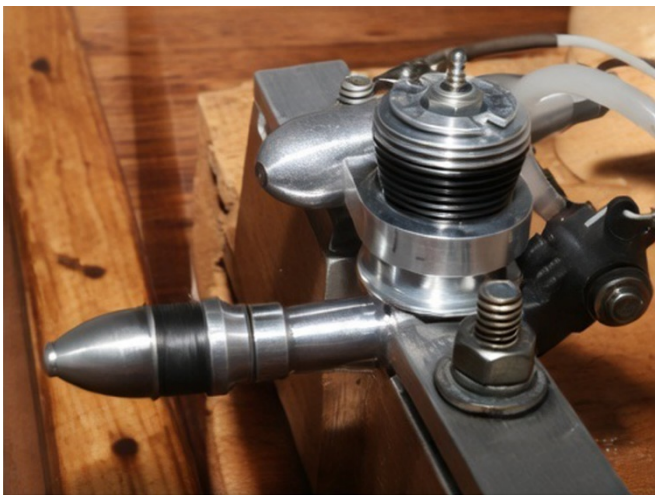
This means we now have a small, powerful Cox engine that will allow a model to sit still on the runway and idle slow enough to work like an airbrake for shooting touch and go's.
As the instructions say, the engine was happiest running at high rpm on small props.
It was not easy running on the 7x4 and 6x4.
It happily screams out a muffled bunch of power with the 6x3.

All props you run on this engine should be very carefully balanced... best to simply shorten the tip of the heavy blade. My test engine seems to have a vibration mode around 17.000. The needle valve tended to back out so a 3/4-inch long piece of medium fuel line was used to replace the needle valve's spring, and that minor problem was easily solved. It simply is not possible to stop a single cylinder engine from vibrating.

TECHNICAL SPECS

Crankshaft diameter is .250 inch at the front and rear surfaces. There's minor anti-drag relief down to .245 inch between the two bearing surfaces. The piston and connecting rod assembly weighs a scant four grams! The top of the piston, in Cox practice, is copper plated to promote uniform heat across the piston. The cylinder head is machined from aluminum and will accept any 1/4-32 glow plug. The head seals to the cylinder with a single .006 inch copper gasket. The cylinder looks scaled up from a TD .049 sleeve twin exhausts and twin bypass flutes. Most Cox engines have sub-piston induction, that is, with the piston at TDC the bottom of the piston skirt uncovers a minor bit of the exhaust ports for additional combustion air to enter great for high speed, but it inhibits pumping at idle speeds. The Queen Bee has no sub-piston induction and idles beautifully. The distance from the top of the piston up to the head's squish band measures .029 inch at TDC and the cylinder head has a single bubble 325 inch in diameter surrounded by the .070 inch wide squish band that is not angled. The bottom of the Fox short plug fits well down into the combustion chamber instead of being flush with its roof.
The exhaust timing measures 153 degrees.



The Queen Bee turns a Cox 6x3 at 16.000 to 18.000 rpm, depending on the fuel and needle valve setting, but will idle beautifully at less than 4.500 rpm.

Top I.D. of the cylinder is .463 and the bottom is .465 (slightly tapered as is so modern).

I suspect the hop up experts will have lots of fun with this new engine and that some of their tricks will eventually find their way into factory production. There's room to experiment with the exhaust manifold and the passageway between the manifold and the beautifully turned muffler. The engine should respond well to running on a muffled tuned pipe. Some may experiment with balancing by removing metal from the disc of the crankshaft on both sides of the crank pin.

This is the very first production of an entirely new Cox engine. It's a great piece of made in America model machinery which will cost you about $40.00. If you completely wipe one out in a crash a total rebuild will only cost you $21 plus $4 for postage and handling. I see tremendous growth in smaller R/C enthusiasm, a fine engine for a new breed of ready-to-fly models and a resurgence of small hand launched R/C pylon racers and a new generation of designs and kits for the Sunday sport flyer to enjoy. The engine is a honey! I'm so enthused I'm building an original design three-channel open cockpit model with a shoulder wing and trike gear and I'm calling it you guessed it “Honey Bee"!

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PERFORMANCE COMMENTS

Full throttle on a 6x3 prop yields four or more minutes running per ounce; a two- ounce tank is sufficient for sport flying. I had lots of easy hot restarts. The rear of your props will need to be drilled out with a #3 drill bit. The muffler makes the engine plenty sociable. General performance matches a Cox TD .049 at high speed, except the Queen Bee is much quieter and throttles beautifully. The engine will run backwards just as happily as forwards. The single needle valve controls both high and idle speeds so adjustment becomes a trade-off between the two rpm extremes. A slightly rich safer setting yielded lower figures a slightly leaner setting yielded somewhat higher figures. The test engine was "uncomfortable" and strained on the 7x4 test prop; it wasn't at its best with the 6x4 either. As the directions state, the Queen Bee is happiest at highest rpm and I'd advise using only the 6x3 prop size.

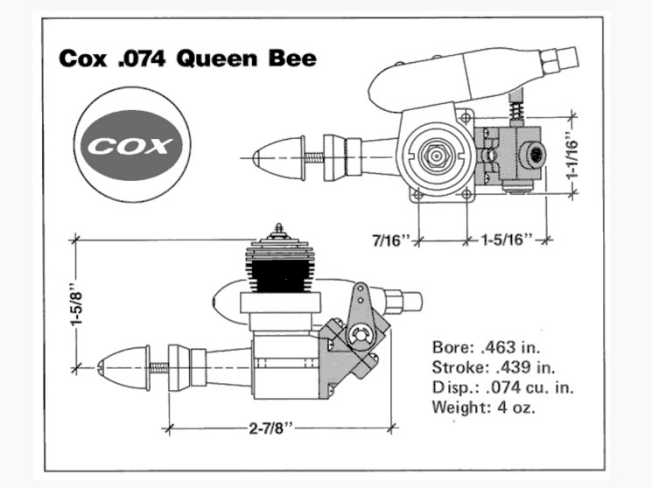
Performance with Cox #551 fuel and Cox props:

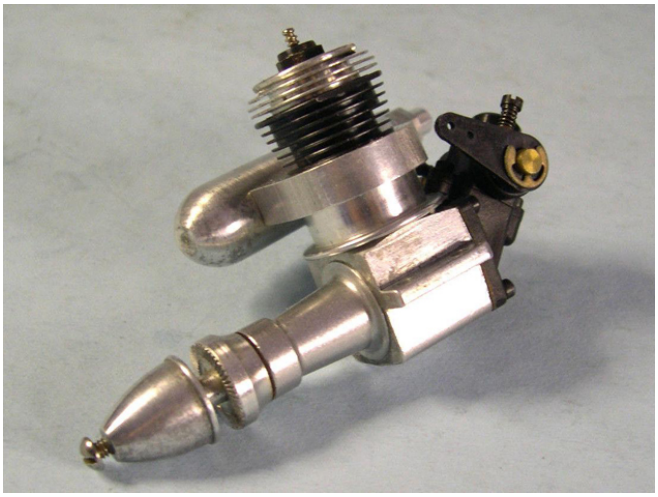
Prop Size	High Speed		Idle Speed
6x3	16.200	slightly rich	4250
6x3	17.500	slightly lean	4750
6x4	13.400	slightly rich	3500 (erratic)
6x4	14.300	slightly lean	4000 (erratic)

With fuel containing only 10% oil (half castor, half Klotz), and 10% nitro (a four stroke fuel mix) and after 1-1/2 hours running:

6x3	16.700	slightly rich	3600
6x3	18.000	slightly lean	4250

The last set of high/low rpm figures yields a 4.64:1 speed range at the safe, slightly rich setting which is truly astounding for such a small engine turning such a light prop. I didn't think the Cox accessory engine mount is quite stiff enough (it's being im-proved) and there are minor dimensional errors quoted in the instructions.
I cannot find fault in the .074 Cox Queen Bee engine itself. It's great! •





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