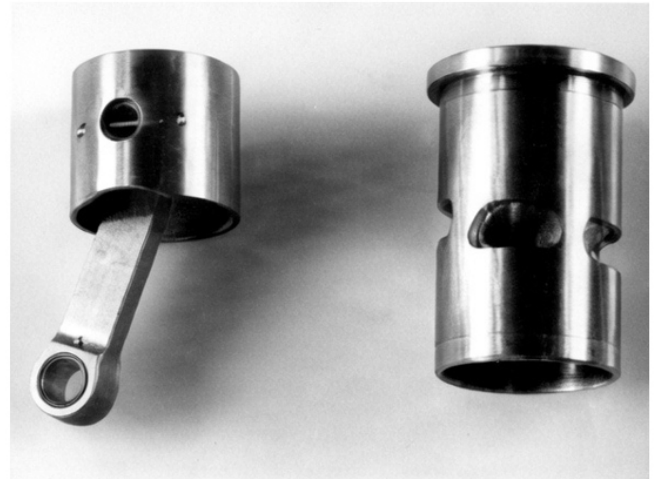


Fox 40 BB R/C Delux

Engine Clinic CLARENCE LEE



Crankshaft and bearings. Both bearings have the same inside diameter, but note difference in outside diameter.

Piston and sleeve assembly. Note hole in side of piston near wrist pin for roll pin to retain the wrist pin.

According to the hobby dealers, the .40 cubic inch displacement size 2 stroke engine is the most popular selling R/C engine. Not too well-known is the fact that Duke Fox was the first model engine manufacturer to market a .40 size U control engine in 1961, following a year later with an R/C version.

The .40 size engine actually evolved from an earlier .35 size engine with Duke Fox again being the first model engine manufacturer to market an engine in this displacement size. The first Fox .35 appeared on the model market in 1949. Over the years, Duke Fox has manufactured a large variety of .40 size engines, always gaining knowledge and making improvements along the way.

Earlier this spring Duke introduced his latest .40 size R/C engine which, according to Duke, is the product of 10 years of refinement of this particular .40 design concept, i.e., a Schnuerle ported engine. This latest .40 size engine is also Duke's first ABC piston/liner engine. Prior .40 size engines have been of lapped iron piston and steel sleeve construction.

Although the present engine is of true ABC construction, i.e., a high silicon aluminum piston running in a chrome plated brass liner, those reading the Fox advertisements for the engine will have noted that the engine is listed as having a composite piston design utilizing an oil absorbing iron band to aid upper cylinder lubrication.

However, early release U control engines exhibited some problems with the iron band sticking up on extremely lean runs and pulling off of the aluminum piston, so this feature was discontinued and all engines with the composite pistons were recalled. Fortunately only a couple of hundred engines had been released before this problem was discovered and corrected.

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Two piece head assembly. Head button very wide eguish area surrounding small combustion chamber bowl.

No matter how hard an engine manufacturer tries to outguess any anticipated problem areas in a new engine design before release of the engine, the final proof is when the engine gets into the hands of the modelers who can usually figure out some way of coming up with a weak point in an engine design. However, Duke Fox has always stood 100% behind his product and if a problem area does show up, he is quick to make changes including no charge modifications to those engines already sold. This is something that cannot always be said of some of the foreign imports as many fellows are finding out the hard way when trying to get warranty service on their engines.

This past month I received one of Duke's new Fox .40 BBR/C Delux engines for evaluation and. in Duke's own words, "observation, testing, use, destruction, or whatever else may please you." I am quite happy to say that the engine performed beautifully in all performance areas with no problems whatsoever encountered.

The first thing that one will notice about the new Fox 40 Delux, besides the very light weight (only 12.2 ounces complete with spinner and muffler), is the unusual back cover design. Rather than a conventional back cover that most modelers are familiar with, the Fox .40 back cover extends all the way up to the bottom of the cooling fins. Duke feels that this type of block shape crankcase design has the advantage of lessening the stretching stresses imposed by the combustion

process from the mounting lugs up to the top of the case, resulting in overall stronger crankcase.

Unlike the Fox .40 BB Compact that uses a single rear ball bearing for crankshaft support, the new .40 BB Delux utilizes both a front and rear ball bearing. However, rather than the front of the crankshaft stepping down for a smaller inside diameter ball bearing, both the front and rear bearings have the same i.d. By eliminating the front bearing step, more accurate bearing concentricity is maintained. This is sometimes a problem when centerless grinding crankshafts follow the heat treating process. Even though both bearings have the same i.d. dimension (.500), the rear bearing is of considerably heavier construction with an o.d. of 1.125" whereas the front bearing has an o.d. of .875" and was specifically made for the Fox application. Another nice feature of the .40 Delux crankshaft is a removable prop stud so that in the advent of a crash and possible bending of the crankshaft, only the removable stud need be replaced rather than the whole crankshaft.

The Fox .40 Delux is of Schnuerle port design with single transfer ports on either side of the exhaust port, but utilizes an extremely large boost port opposite the exhaust port. The single boost port actually has the same width as the single exhaust port but is angled upward to direct the incoming air fuel mixture into the combustion chamber.

Something not previously seen before in a model engine is the method of retaining the tubular steel wrist pin in the aluminum piston. A small hole has been drilled through the side of the piston wall and the wrist pin boss 90° to the wrist pin axis, and a 1/16" roll pin is pressed in, locking the wrist pin into place. Needless to say, if it should be necessary to replace the connecting rod it would be best to return the engine to the Fox factory rather than attempting removal of the roll pin on one's own. However, since the rod is fabricated from 2024 bar stock aluminum and bronze bushed at the crank pin end, it is very unlikely that it would need replacing very often due to wear.

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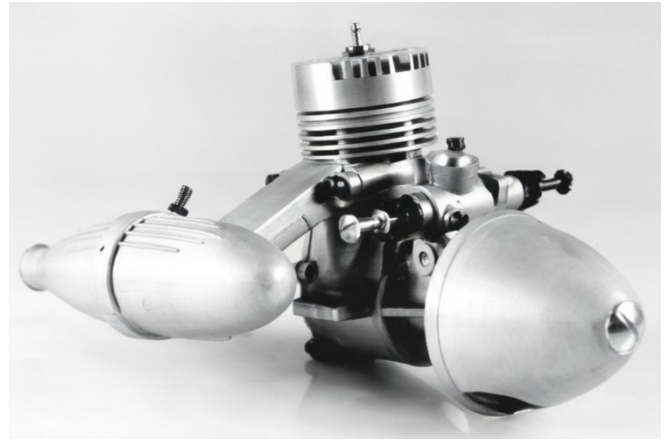
A bad crash would more likely be the reason for replacement, in which case the engine should be returned to the Fox factory for service.

The engine uses a two piece head assembly consisting of the finned section and separate combustion chamber button. The combustion chamber shape is a bit different in that it is completely flat bottomed with a small hemi shaped domo in the center where the glow plug screws in. This would appear to be an extremely wide squish band; however, the distance from the top of the piston to the head is such that little or no squish action would be taking place.

This combustion chamber shape, in conjunction with other design features, did make for a nice broad high speed mixture adjustment range, easy starting, and excellent idle.

For carburetion, the Fox 40 Delux uses a rotating barrel, two-needle type design which is the same basic design as the well-proven Mark X carburetors used on the large displacement Fox engines. The rotating barrel features a high spiral action which means that it has considerable in and out action as it is rotated. This helps to make the carburetor self cleaning and foreign matter that might clog up other types of carburetors can be passed right through.

The Fox .40 BBRC Delux comes equipped with both a muffler and spinner. The muffler is of the tilt-down design as most modelers seem to prefer this type. However, if your particular installation would work better with a tilt-up style, the mufflers can be exchanged by mailing the original back to the Fox factory. The spinner supplied with the



Fox .40 BB R/C Delux

engine has the nice feature of the spinner back plate being broached to match drive splines on the crankshaft, i.e.. the spinner back plate also serves as what would normally be the prop drive washer with no separate drive washer being used. This completely eliminates any spinner back plate slip. If you choose to operate the engine without the spinner, a standard prop drive washer is also available.

With the basic technicalities out of the way, let's get to the engine's performance. One very nice advantage of all Fox engines is that they are all factory run and the carburetor adjustments made before shipment. Fox has even designed their display box so that the engine can be boxed with the needle valves in place and adjusted so that the modeler need only install the engine in his aircraft and fly without ever touching the mixture needles. This is a great help for the beginning modeler who many times has a difficult time finding the initial needle valve setting for starting, etc. So, without touching the needle valve settings, the engine was installed on our test stand and using a fuel consisting of 10% nitromethane, 19% Klotz KL-200, 3% castor oil, and balance methanol, was started.

The engine fired first flip after choking and connecting the starting battery which always wins points with me. The factory adjustments did prove to be somewhat on the rich side which would certainly be desirable for a new engine and a setting that would easily give the engine enough power to fly a sport trainer type aircraft. Even though previously run by the factory, the engine

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was given an additional 30 minutes of break-in time varying the mixture between rich and lean with several cooling off periods between runs. Following the loosening up period, we were able to record 14.700 with a 9 x 6 Rev-Up, 14.500 with a 9 x 7 Rev-Up, 13.400 with a 10 x 6 Rev-Up, and 10.900 with an 11 x 6 Rev-Up. These are all very respectable figures, especially when the temperature was 78° and relative humidity 60% on the day we ran the engine. Hot, humid days are not ideal conditions for engine testing, but this time of year here in California (early May), we do not have too much choice.

The engine would hold a reliable 2.250 idle with the 10 x 6 prop and 2.150 with the 11 x 6 with excellent recovery and the engine was very smooth vibration-wise. It is one of, if not the, smoothest running .40 size engines I have ever run. Duke Fox terms his new engine "user friendly" and we would have to agree. It is a neat running and handling engine. Duke is quite proud of his new engine and justifiably so.

Fox 40 BB R/C Delux Specifications

Type: Single cylinder, 2 stroke cycle, Schnuerle ported, glow ignition.

Bore: .840"

Stroke: .715"

Displacement: .3962 cu. in.

Compression ratio: 7.62:1

Weight: Bare 9.6 oz. - with spinner 11.1 oz.
with spinner and muffler 12.2 oz.

Manufacturer: Fox Manufacturing Co., Fort Smith, Arkansas



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