ENGINE REVIEW

BY PETER G.F. CHINN

FOX .40 R/C

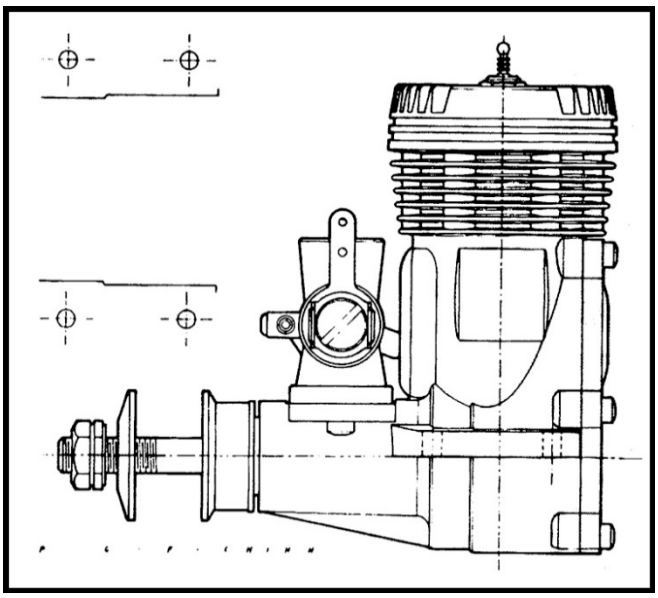
Latest Fox is entirely new model. Has some unusual features. Most powerful, throttle-equipped Fox 40 we've tested.

• Unlike automobiles, model engines arc not generally identified by the year they were manufactured, but perhaps we can be excused for referring to certain Fox models this way. For how else do you prevent modelers horn confusing the latest Fox 40 with the previous model which was also known simply as the “Fox 40”?

If a manufacturer makes no alteration in a new season's offering, other than to change the color of the cylinder head, there is obviously no justification in presenting it as a new model, but this certainly does not apply in the case of Fox engines. The current Fox 40, in particular, demands that we draw attention to the fact that it is a completely new model, quite different from the previous Fox 40 (featured in our March, 1972, “Engine Review”, which was, itself, entirely different from all other Fox 40 models made over the past 14 years or so.

Now you may say, “So it’s new and it’s different. Is it better?" We think it is. Its performance shows an immense improvement. So far as our respective test samples are concerned (both were the standard R/C versions), the new model, running on a mild fuel 5% nitro), developed a 55% higher peak power output than the 1972 engine, and even when the older motor was fueled with Fox Missile Mist the 1975 engine, lignin running on 5% nitro, was still nearly 38% more powerful.

One (lung that the 1975 Fox 40 shares with the previous model is its use of a plain bushed main bearing and a lapped cast-iron piston.
In this respect it differs from all other .40 cu. in. R/C engines of comparable power output, must of which use ball bearing shafts and ringed pistons.

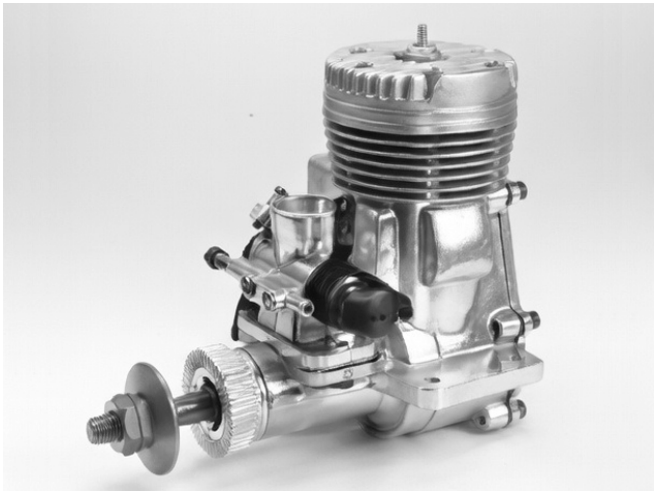


A ball bearing 40-BB version, with the option of a ringed aluminum piston or an ABC type piston/cylinder setup, is also to be offered. Meanwhile, let’s see what makes the standard 1975 40 R/C such u marked improvement over its predecessor.

MAIN CASTING. The only thing that this has in common with the earlier type is its one of a cast in bronze main beating bush. Whereas the older unit extended upward only to include the exhaust stack, the 1975 easting includes the finned cylinder casing, like most other current Fox motors. It also has the now familiar Fox rectangular flange mount for the carburetor.

Where it really differs from all other current designs is in its highly unorthodox “back door.” Instead of having a conventional back-plate covering the crankcase portion only, the casting has a very much larger opening that exposes the back of the cylinder, including the rear bypass port as well as the actual crank chamber.
This form of construction has been adopted to facilitate coring for the Schnuerle type bypass passages used by the new 40. The front bypass and the (side) third-port bulge arc formed in the main casting itself, and the rear bypass is incorporated in the extended back plate which is attached with six screws. This unusual form of construction is the subject of a patent application by the Fox Company.

Fox 40 R/C Schnuerle



Now 40 is ruggedly built and fairly heavy. Carb is Fox 60 type. Runs well on low nitro.

An exclusive Fox construction feature is 4O's unique body casting with special back plate.

The crankcase is wider than before and calls for 1 7/8" lateral bolt hole spacing. The exhaust stack is much narrower hut deeper and has tapped holes fore and aft for an optional 1" long pressure cast stub pipe. This has an i.d. of 0.61“ and an o.d. of 0.72" and it is anticipated that it may, in due course, be used in conjunction with a separate Fox muffler.

CRANKSHAFT. A feature of the previous 40 not fully exploited at the time in terms of valve port dimensions was its very large diameter shaft journal. This size, at 9/16" o.d. (14.3 mm.), was the largest then used by any .40 engine and continued in the current model, is still one of the largest in use in this displacement group. However, the 1975 engine makes much better use of the shaft’s 0.410" i.d gas passage with an 0.510" long, rectangular valve port. This port, aided by a parallel-sided intake aperture through the bearing, gives an extended, rapid-opening, rapid closing intake period of 185° of crank angle, timed (our measurements) from 45° after bottom dead center to 50° after top dead center.

The new shaft has an appreciably thicker crank web and a heavier counterbalance, while the crankpin o.d. is unchanged at a nominal 7/32'' and is much shorter There is now a small oil hole at the rear of the journal, strategically placed so that crankcase compression is utilized to force lubricant into the vicinity where it is must needed, i.e. between the journal and the lower inner urea of the ilium hearing where maximum loading occurs during the power stroke.

At the front end, the shaft has the familiar Fox short spline method of keying the prop driver, but has the shaft diameter increased at this point, compared with earlier models, in order to accommodate the separate, screw in prop stud. The prop drive itself is of aluminum, although n steel one is available as an option.
The prop stud thread is the usual ¼ UNF size.

CYLINDER & PISTON ASSEMBLY. The slip fit, leaded steel cylinder sleeve has a considerably thicker wall than has been customary with the Fox medium displacement motors. Actual wall thickness is .084" (compared with .050” for the previous 40) which, obviously, is helpful in maintaining effective port angles. The Schnuerle type scavenging system featured by the new Fox 40 consists of a fairly large unbridged exhaust port that is uncovered’ for a lengthy 150° of crank angle, a pair of angled main bypass ports, open for 122° and. diametrically opposite the exhaust, a very large third port that begins to open approximately 6° later than the main bypass ports for a total of 110° of crank angle.

The lapped, ringless piston is machined from Meehanite cast iron and is a flat-topped, reflectorless design with a third-port window and a skirt cutaway on the bypass side. I he wristpin is located high in the piston, and this has enabled a longer connecting rod to be used without increasing overall engine height.

Fox 40 R/C Schnuerle

Large diameter crankshaft journal note oil hole behind valve port, unusual piston design.

The longer conrod, 1.5” between centers, has the advantage of reducing rod angle and. in turn, piston side thrust.

Mainly due to thicker bosses, the piston is somewhat heavier than the earlier 40 piston and weights 13.2 gm. or just under 15 gm. with wrist-pin. I he machined aluminum conrod adds a further 4 gm. It has a narrower lower-end eye than the previous model, but this is now bronze-bushed instead of plain.

CYLINDER-HEAD. Although the large, external diameter of the new 40 cylinder-head gives the impression that the engine has a larger bore than previous Fox 40’s, this is unaltered. In fact, all Fox 40‘s produced to date have had the same bore and stroke (.800" x .790"); just as all Fox 35’s and 36’s have been .800" x .700" and .800" x .715" respectively.

I he head is of pressure die cast aluminum with tapered cooling fins and is recessed to fit over the cylinder sleeve flange without a gasket. I he head shape is a shallow cone with a small central depression surrounding the glow plug. Six Phillips screws tic the head to the main casting.
The measured geometric compression ratio of the test motor was approximately 9:1.

CARBURETOR. The Fox carburetor fitted to the 1975 Fox 40 R C is identical to that used by the Fox Eagle 60 and carries the same part number. It features a pressure die cast body, a machined steel, butterfly type throttle rotor; two needle-valves and an automatic fuel metering device to maintain correct mixture strength at all throttle settings. It works like this: Fuel is fed into the carburetor through an inlet nipple at the front on the left side. From here it takes two routes:
First, fuel for the low speed mixture is conveyed to an idling jet drilled directly into the carburetor throat, and the amount released through this is adjusted independently from the mam needle-valve by means of a small needle screw at the front on the right hand side.

Secondly, fuel for the main jet flows through a delivery hole in the carb body, well over to the left side, where it is picked up by a hole in the surface of the throttle rotor and conveyed to the interior of the rotor. From here it is discharged through the main jet located in the middle of the Hat, center section of the rotor. The amount of fuel metered to this jet is controlled by the main needle-valve which is a large screw installed in the left hand end of the throttle rotor.

When the throttle is partly closed, the pick-up hole in the throttle rotor is no longer exactly aligned with the delivery passage in the carb body. However, a tapered groove in the surface of the rotor, extending from the hole, allows a reduced quantity of fuel to he admitted into the rotor, and this automatically maintains a correct fuel, air mixture strength ratio in accordance with the throttle opening.

Further rotation of the throttle rotor towards the closed position eventually seals off the fuel supply to the rotor so that the engine now runs on its idling jet only.

In the previous model Fox 40 R/C, the carburetor was sealed into the crankcase intake boss with epoxy adhesive, and the throttle was linked to a semi-rotary exhaust restrictor valve. I he current model has the carburetor flange mounted with two screws, and no exhaust restrictor is fitted.

PERFORMANCE. Each Fox40 is supplied with an instruction and spare parts sheet that contains some good commonsense advice for the purchaser.

Model Airplane News Magazine October 1975 by Hlsat

Fox 40 R/C Schnuerle

In the past, medium- and large-sized lapped piston engines often took a tediously long time to break in. and when more ringed piston motors began to appear, many of us breathed a sigh of relief. However, lapped piston motors have improved a lol during the last ten years, and although the Fox instruction leaflet cautions new owners to take care to throttle back immediately if the engine shows any sign of sagging, we found the new Fox 40 to be commendably trouble free. We used a straight three-to-one mixture of methanol and castor oil during the break-in period, following our usual procedure of building up break-in time in a series of short rich-mixture runs, and within a very short period the 40 was holding peaked-out runs without the slightest sign of overheating or loss of power.

One thing that will please Fox's export customers is the 40's willingness to run perfectly on mild fuels. As the instructions point out, it will work quite well on fuel with no nitromethane. Our tests were carried out on our standard R/C engine test fuel which contains 5% pure nitromethane. Fox Super fuel can be expected to give much the same performance, while "Duke's Fuel." containing 10% nitro, should add another couple of hundred rpm to the top end.

Initial testing quickly showed the 1975 Fox 40 to have considerably greater torque than our 1972 model in the normally used rpm range. Maximum torque was indicated at between 10.000 and 11.000 rpm and was well maintained as load was reduced, resulting in a peak horsepower output of nearly 0.84 at between 15.000 and 16.000 rpm.

This is the highest figure we have recorded to date for a lapped piston, plain bearing, throttle-equipped 40 and (excluding Pylon racing types) has been bettered only slightly by a select few of the more expensive, twin ball bearing ringed piston R/C 40's.

Manufacturer's recommended prop sizes for the 1975 Fox 40 R/C are 10 x 6 (or 10 x 7 narrow blade) for average size 5 lb, R/C models. Checked on a Top Flite maple 10 x 6, our test motor indicated 12.600 rpm which was 1.400 rpm faster than was obtained on a similar prop and fuel with the earlier 40 R/C and still over 1.000 rpm faster, even when the latter had the advantage of Fox Missile Mist fuel.

Other prop rpm figures returned by the new 40 R/C included 10.000 rpm on a 12 x 4 Top Flite, 11.500 rpm on an 11 x 5 Top Flite, 12.300 on an 11 x 5 Power Prop, 13.200 on a 10 x 6 Taipan fiberglass nylon and 14.200 on a 9 x 6 Top Flite maple.

As regards running qualities, the 40 did not show quite such low vibration levels as have been indicated with the smoothest aluminum-piston 40's we have tested (not surprising, since an aluminum piston can be only about half the weight of an equivalent cast-iron one), but, as we have previously remarked, it ran very steadily, and this applied to a wide variety of prop sizes. Handling qualities were good, and starting, whether by hand or with an electric starter, presented no problems. For use with an electric starter, the manufacturer recommends the optional, steel prop driver in place of the standard, aluminum one.

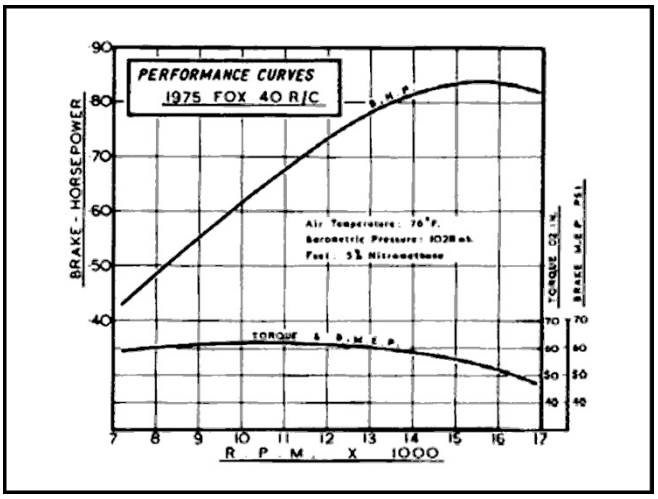
Throttle response was very good. The engine idled happily at 2.600 rpm on a 10 x 6 prop with reliable recovery and good mid-range control. We also found the throttle control very easy to set up.

On all counts, we think that this is the best throttle equipped Fox 40 yet produced which is not to say, of course, that the 40-BB ringed-piston version will not be even better.

SUMMARY OF DATA.
Type: Single cylinder, Schnuerle loop-scavenged, two-stroke cycle with crankshaft rotary valve and bronze-bushed main bearing. Throttle type carburetor with automatic mixture control.
Cheeked Weights:
11.5 oz. less exhaust stub.
11.8 oz. with exhaust stub
Displacement: 0.3971 cu.in. (6.507 c.c.)
Bore: 0.800".
Stroke: 0.790"
Stroke / Bore Ratio: 0.9875 : 1
Measured Nominal Compression Ratio: 9 : 1

Fox 40 R/C Schnuerle

Specific Output (as tested): 2.11 bhp/cu.in.
Power / Weight Ratio (as tested): 1.17 bhp/lb.
Manufacturer: Fox Manufacturing Company, 5305 Towson Avenue, Fort Smith, Arkansas 72901. ■



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