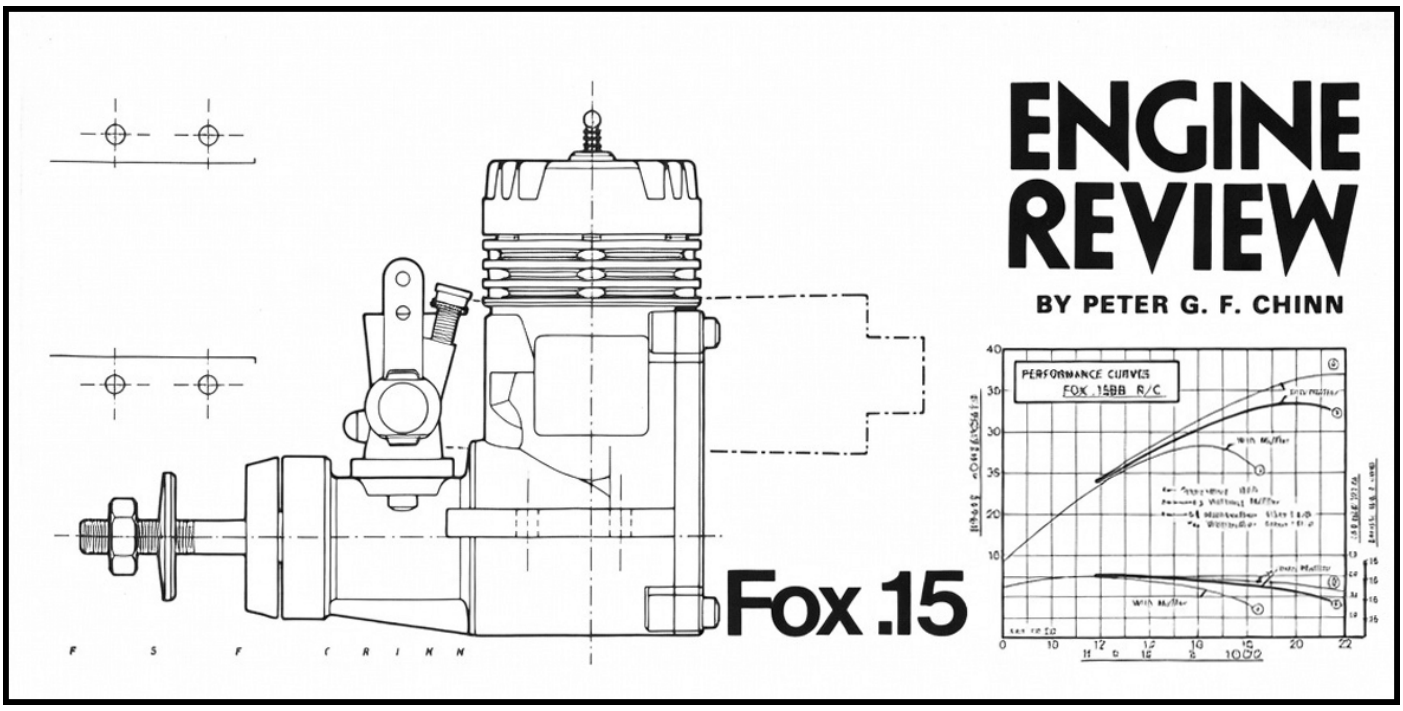
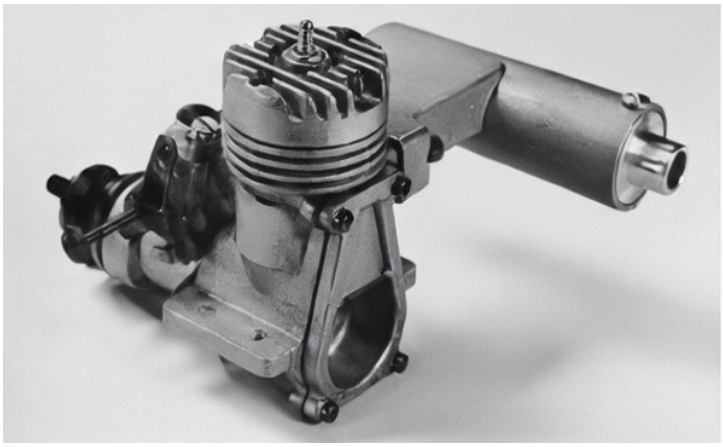
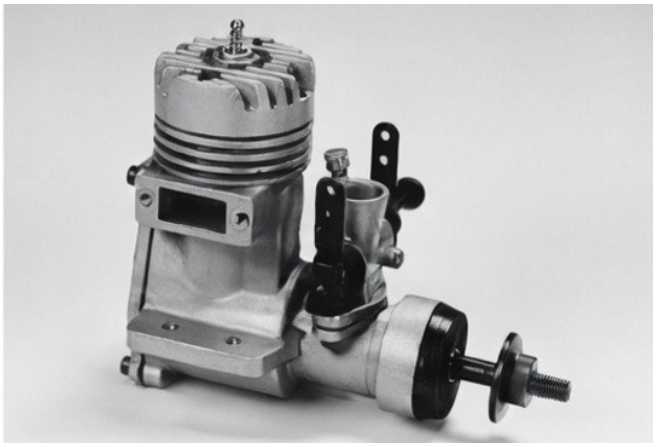
Fox 15 R/C Schnuerle



This new model Fox 15 features Schnuerle porting, twin ball bearings, interchangeable heads with lots more top power.



Engine carries no name or identifying marks but is unmistakably Fox!



Dual throttle arms are adjustable, prop stud is replaceable as well.

• This recently introduced Schnuerle scavenged motor is the first entirely new Fox 15 for nearly fifteen years, that is to say, since the 15X replaced the original Fox 15 model in January 1962. Over the years we have dealt in these columns with five engines based on the 15X design: the standard 15X and 15XX contest engine, the 15X R/C and the 1965 and 1970 15 R/C models.

All these earlier Fox 15's were open loop or crossflow scavenged motors with bushed main bearings and were notable for their compact overall dimensions, light weight (under 4 oz.) and low cost (the standard 15X originally sold for only $6.95). The new Schnuerle scavenged engine is physically larger, is more heftily constructed and offers the option of a bronze bush or twin ball bearings to support the crankshaft.

For this report we chose the ball bearing model. Most of the component parts are common to both versions but where they differ is explained in the design and construction notes that follow.

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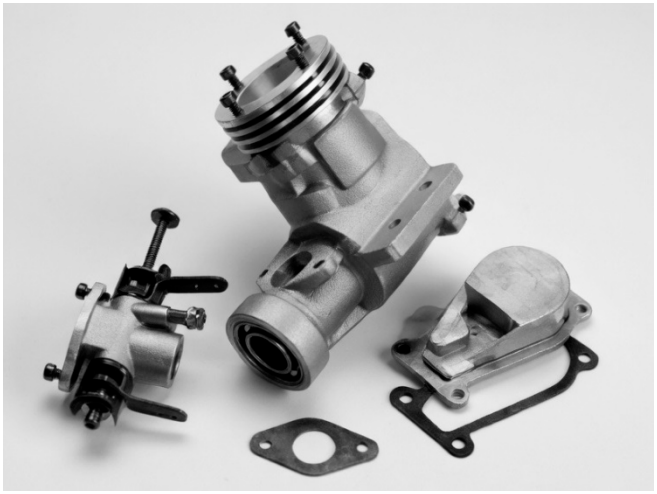

New 15 resembles current Fox 40/45 series in layout with usual crankcase and back plate.

MAIN CASTING.
The main casting comprises the crankcase, cylinder jacket and bearing housing. It embodies large beam mounting lugs, a rectangular exhaust stack and a flat diamond shaped saddle on which the flange fitting carburetor is mounted. Its design follows that of the current Fox 40/45 series in its use of a very unconventional back plate. This extends upward to just below the cylinder cooling fins. Its removal therefore exposes not only the crankcase interior but also the rear of the cylinder liner including the rear bypass port. In the 40/45 series engines this form of construction was adopted to simplify the problem of coring the casting for the three bypass passages and presumably it was chosen for the new 15 for the same reason. The front and side passages are formed in the main casting, while the rear one is formed in the upper part of the extended back plate.

The same basic main casting is used for the plain bearing version of the 15. It differs only in that it is fitted with a full-length bronze bushing and has the o.d. of the front housing machined down to a smaller diameter and tapered in profile.

CRANKSHAFT AND BEARINGS.
The hardened steel crankshaft has a larger diameter main journal than that of previous Fox 15 motors. This is now 10 mm o.d. compared with 3/8 in. (9.5 mm) of the earlier models and runs in two 10x19 mm 9 ball steel caged bearings.
The integral solid crankpin is 4.7 mm (nominally 3/16 in.) dia. and counterbalancing is by cutaway web flanks and a shallow crescent counterbalance.

The shaft is bored 6.35 mm (1/4 in.) for the gas passage which is fed from an 11 mm long rectangular valve port. This uncovers a parallel sided intake port for a 190° induction period, timed, according to our measurements. 40° ABDC to 50° ATDC.

At the front end, the shaft is fitted with a 3/16" dia. prop stud and has the familiar Fox short spline type fitting for the steel prop drive washer.

A different crankshaft is installed in the bushed bearing motor. It has a smaller crankpin (3.9 mm, or a nominal 5/32 in. dia.) on a 360° crank disk with crescent counterweight. The shaft we examined also had a larger gas passage (6.7 mm or 17/64 in. id.).

New Cylinder head features interchangeable inserts for different compression ratios.

CYLINDER AND PISTON ASSEMBLY.
The drop-in steel cylinder liner has a 0.590 in. bore, a .048 in. wall thickness and is located in the casting in the usual way by a flange at the top. It has porting arrangements that are very similar to those of the Fox Hawk 60. The exhaust port is on the right side and is flanked fore and aft by bypass ports angled to direct incoming gas to the left side in the approved Schnuerle manner. Here the two streams are met by an upward flow from the inclined “third” or "boost” port but instead of using a single port of moderate area here, the

Fox 15 R/C Schnuerle

15, like its big brother, has two elongated ports of very large area.

Cylinder port timing features a long exhaust period of 160° of crank angle. The flanking bypass ports, according to measurements on our test sample, are open for 132° and the boost ports for 126° of crank angle.

The lapped piston, machined from Meehanite, has a flat reflectorless head and a wide skirt port. Internally it is machined to provide adequate bosses for the wristpin plus an annular stiffening rib above the bosses. The unbushed connecting rod is machined from extruded alloy bar and is coupled to the piston with a lightweight tubular wristpin. The latter has an o.d. of 3.9 mm (5/32" nominal) and is retained by wire circlips. Reciprocating weight, as in previous Fox 15s, is low. The bare piston weighs 5.4 grams or 6.1 gr. with wristpin. The conrod weighs 1.7 gr.

CYLINDER HEAD.

This is of a new two piece design, comprising a finned die-cast outer component and a machined central insert or "button" as Fox calls it. The button plugs into the top of the cylinder bore and forms the combustion chamber, held in place by the finned part which is tied to the main casting by four screws. The idea is to enable different head buttons to be used for low, medium or high compression. The combustion chamber shape is unusual in that it comprises a wide (3.5 mm) sloped band surrounding a small diameter but deep central depression containing a Fox short-reach glow plug.

CARBURETOR.

The unusual flange-fitting carburetor is of typical Fox design and differs appreciably from the R/C carbs used by most other manufacturers. It features a butterfly type, rather than a barrel type, throttle valve and has separate low-speed and high-speed jets, each with its own mixture adjustment.

The carburetor has a die-cast aluminum body into which is fitted a steel semi rotary throttle valve. The latter is milled to form flats front and rear to allow intake air to pass each side of it when in the open position. It is drilled axially and threaded to take, from the left side, a conventional needle-valve and. from the opposite side, a threaded tubular fuel inlet fitting. The fuel, metered by the needle valve and released into the interior of the throttle valve, is then fed into the intake via two jet holes. One of these (the low- speed jet) is placed in the front "flat" and the other one (the high-speed jet) is located in the bottom of the throttle-valve and offset to one side. Below the throttle valve the carburetor bore changes shape, as a result of which the offset high-speed jet is completely masked as the throttle is closed and the engine then runs only on its low-speed jet.

The correct mixture strength for full-speed running is determined, in the usual way, by means of the needle-valve. However, as noted in the preceding paragraph, the same needle-valve also feeds the low speed jet. To control the actual amount of fuel released through the low-speed jet, therefore, this has its own adjustment via the threaded inlet fitting previously mentioned. This fitting can be screwed in or out as required. The inlet fitting itself acts as a needle-valve here since its tip, in addition to being drilled to accept the main needle-valve tip, is externally tapered and projects just beyond the position of the low-speed jet hole in the throttle-valve. Its precise position thereby controls the actual amount of fuel fed back to the low speed jet.

Both adjustments arc provided with ratchet devices to hold mixture settings and there are adjustable throttle arms on both sides. There is a screw at the rear of the carb for setting the idling speed.

The carburetor effective choke area is approximately 13 sq. mm., a quite generous area for a 2.5 cc motor.

MUFFLER.

This resembles previous Fox closed front designs. It comprises a die-cast aluminum alloy body and inlet duct, with a machined bar stock full length tubular insert. The latter has an i.d. of 8 mm and exhaust gases escape into it via six entry slots on the side opposite that facing into the exhaust stack. The entry slots have a total area of

approximately 60 sq. mm. while the outlet area is 50 sq. mm. The muffler fits firmly over the engine's exhaust stack and is secured with two hexagon head screws into threaded holes in the stack that arc drilled and tapped to angle inwards. The muffler weighs just over 1.2 oz.

PERFORMANCE.

In the interest of easy starting, the bushing type Fox Schnuerle 15 is normally supplied with a low compression head button, whereas, with the ball-bearing motor, a medium compression head is the standard fitting. Our test motor, being of the latter type, was presumed to have the medium compression head. We checked the nominal geometric compression ratio and found this to be approximately 12.5:1 which is fairly high. One has to take into account, however, the engine's lengthy exhaust period of 160° which means that the effective compression stroke is slightly shorter than on engines having more conservative timing in the 130° - 140° bracket. The medium compression head button used by the 15BB is stated to release somewhat greater power, still with reasonably easy starting characteristics. However, for those who wish to experiment and seek maximum contest performance from the 15BB, Fox will also be offering two high compression bead buttons, one for use with FAI fuel and one for use with nitro.

For this new Fox 15, Duke Fox recommends either “Duke's Fuel" (approx. 10% nitro) or “Missile Mist” (approx. 25% nitro). We started with a series of runs on our standard R/C test fuel (containing 5% nitro-methane) in order to obtain comparative sets of readings, both with and without muffler, and then later switched to Missile Mist for a third set of readings. The Fox ran perfectly satisfactorily on the standard 5% mix in fact it fired steadily and smoothly and with only slightly less power on a straight 75/25 methanol/castor oil break-in fuel. While this ability to run well on little or no nitro may be only of academic interest to the majority of readers, it is a point in the engine’s favor so far as export markets are concerned because in most countries outside North America, nitromethane is still very expensive or in some cases, completely

expensive or in some cases, completely unobtainable.

Fox 15’s have never been noted for low speed torque and the new Schnuerle 15 is no exception. It likes to be allowed to rev. Maximum torque was realized at around the 12.000 rpm mark and, on 5% nitro, less muffler, our test unit actually reached its peak output at nearly 20.000 rpm where a figure of over 0.33 bhp was determined.

Adding the muffler made very little difference to the maximum torque recorded. With the engine loaded for speeds below 12.000 rpm, torque dropped off markedly but not noticeably more than had been the case without the muffler fitted. At higher speeds, however, the gap between the figures achieved with and without the muffler began to widen and. as the torque curve declined, the power curve levelled off to a much earlier peak at just over 16.000 rpm, power output being reduced to slightly above 0.28 bhp.

Switching to Fox Missile Mist fuel had only a slight effect on output when the engine was relatively heavily loaded but, when it was allowed to rev freely on a light load, the extra performance available on this more powerful fuel began to show itself. As a result, peak brake horsepower was lifted to 0.37 at around 21.500 rpm.

What all this means in terms of available performance on typical props is that if you are using anything larger than an 8 x 4 prop, it will make little difference which fuel you select or whether you use the muffler or not, since there will be only 200-300 rpm difference between the minimum and maximum speeds achieved.

For example, on Power-Prop 8 x 6 (11.500 rpm) and 8 x 5 (12.600 rpm) propellers, the 15BB was only 200 rpm faster on Missile Mist, less muffler, than on 5% nitro with muffler. In contrast, if you have a model that is small and light enough to fly on, say, a 7 x 3½ prop, you can expect rather different results. Checked on a Bartels epoxy-glass-fiber prop, our 15BB turned 17.700 rpm on 5% nitro with muffler, 18.700 rpm less muffler and 19.100 rpm on Missile Mist less muffler.

Fox 15 R/C Schnuerle

In practice it is probable that most users will opt for an 8 x 4 prop. We would suggest choosing one of the faster types i.e. those having low torque absorption. On 8 x 4 Power Prop (wood) and Taipan (nylon glass fiber) props we obtained speeds in the 13.500 (5% with muffler) to 13.800 rpm (Missile Mist, less muffler) bracket but on a Cox 8 x 4, these figures can be raised upwards of 1.000 rpm to the 14.700 - 15.200 rpm bracket. This will bring the engine closer to its peak output and, on the muffler equipped engine, peak power should just about be reached on one of these props when the model is airborne and the engine speeds up under the reduced load conditions of actual flight.

Incidentally, we agree with Duke Fox that wood props arc preferable in the interest of safety and although the Cox 8 x 4 seems quite strong enough to withstand the centrifugal loading of the speeds we recorded, the oft repeated warning to keep behind the whirling prop, when the engine is running at, or near to, full throttle, still needs to be borne in mind.

Other props tried on the 15BB included 9 x 4 Top Flite nylon (10.300 rpm). 9 x 4 Taipan nylon glass (11.300), 7 x 6 Taipan nylon glass (13.400), 6 x 7 Bartels epoxy glass (15.000), 7 x 4 Power Prop wood (17.300), 7½ x 3 3/4 Bartels epoxy glass (17.600) and 7 x 3 Top Flite wood (20.600 rpm). These figures were recorded, less muffler, on Missile Mist fuel.

In terms of sheer power output, this new engine is, as one would expect, the most powerful Fox 15 to date. For example, its gross power output of 0.37 bhp at 21.500 rpm on Missile Mist is 27% higher than our previous best for a throttle-equipped Fox 15 on Missile Mist (0.29 bhp at 15.000 rpm for the 1970 model 15 R/C with high compression head).

Handling qualities of the new Schnuerle 15 were very good overall. The engine started from cold easily and warm restarts were practically first flip irrespective of whether the throttle was open or closed. We found the needle valve adjustment a bit insensitive and it took a little time to find the optimum setting for each load but, as soon as this had been determined, the engine ran steadily and with a modest level of vibration. The throttle worked well. Straight out of the box, on an 8 x 4, the engine throttled down to a safe 2.800 rpm. This was combined with instant recovery and a good mid-range.

We used Fox short reach 1.5 volt R/C plugs for the tests. We changed them twice during the tests but all three survived. The engine itself also came through our rigorous test program in good shape.

Accompanying each of these new Fox 15's very informative notes on carburetors, which are well worth reading, incidentally, whether or not you arc a Fox owner.

SUMMARY OF DATA.
Type: Single cylinder, Schnuerle scavenged two-stroke cycle with shaft type rotary-valve and twin ball bearings. Throttle type carburetor. Manufacturer's muffler optional.
Checked Weights:
6.0 oz. (less muffler)
7.2 oz. (with Fox muffler)
Displacement: 0.1504 cu. in. (2.464 cc)
Bore: 0.590" (14.99 mm)
Stroke: 0.550" (13.97 mm)
Stroke/ Bore Ratio: 0.932:1
Measured Nominal Compression Ratio: 12.5:1
Specific Output (as tested):
1.88 bhp/cu.in. (5% nitro fuel, with muffler)
2.22 bhp/cu.in. (5% nitro fuel, less muffler)
2.46 bhp/cu.in. (Missile Mist, less muffler)
Power Weight Ratio (as tested):
0.63 bhp/lb (5% nitro fuel, with muffler)
0.89 bhp/lb (5% nitro fuel, less muffler)
0.99 bhp/lb (Missile Mist, less muffler)
Manufacturer: Fox Manufacturing Company, 5305 Towson Avenue, Fort Smith, Arkansas 72901. ■

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