Fox 15 R/C

ENGINE ANALYSIS

NUMBER 124

By R. Warring

FOX 15 R/C

Duke Fox is one of those energetic engine manufacturers who has gone out to produce just about every type and size of engine modellers could want all glow, of course and at the same time appears never satisfied with a production design, for there are always new models, detail differences and redesigns coming out. The Fox 15 is one of the standard models which have survived unchanged since 1962 and in its straight or 'X' form offers high-revving performance at a very low price (S6.95 in America). Actually it is a little on the flimsy side for high speed work, and for such duties is made available with alternative (and much more expensive) crankcase, cylinder and piston and con, rod assemblies.

The Fox 15 R/C features the normal 'X' construction plus an original design of throttle unit and otherwise appears unchanged. A substantial aluminium spacer, approximately in. thick, is fitted under the head to increase the head volume and thus reduce the compression ratio, making it suitable for operating on low-nitro fuels (with, naturally, a loss of high speed performance). We found the 15 R/C ran smoothly and well on a straight fuel.

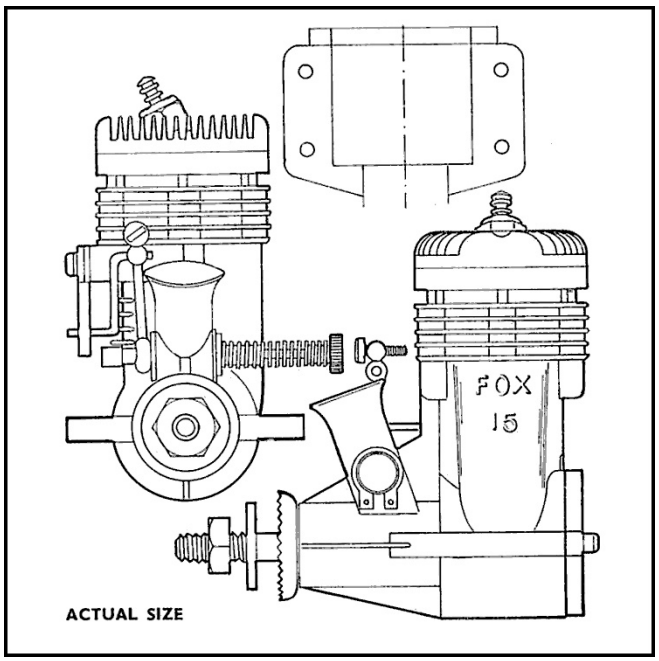
The throttle unit is interesting, not only because it is different from the usual barrel type but also because of its efficiency in providing positive progressive response and rapid pick-up from slow running to full throttle. We found it virtually impossible to 'beat' the throttle by even the most rapid movement, and pick-up was just as rapid after running at slow speed for an extended period. In fact, it is about the best functional throttle we have come across to date on an engine of this size and ideal for radio control.

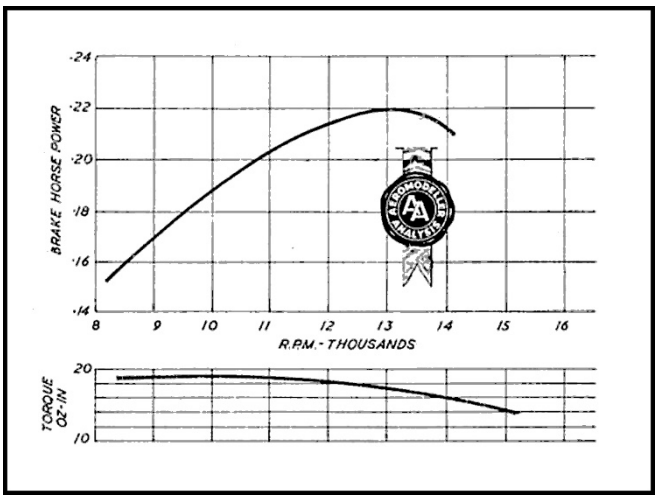
We originally thought that it would prove trouble-some through air leakage, since the moving throttle assembly is a very loose fit in the intake tube, with plenty of slack movement from side to side. This does not appear to have any effect on running, so can only be said to be advantageous in providing a very free throttle movement.

The throttle starts off life as a typical 'barrel' or cylinder which can rotate in the intake but the centre section is reduced by flats on either side to give what is, in effect, a rectangular spray bar with spray holes in each of the flats. In the normal (open) position, it docs present a normal thick spraybar appearance, in fact. Rotation of the throttle then turns the flats until they become angled to the airflow entering the intake, presenting progressively more and more restriction. The bulk of the intake area is closed in the 'slow' position, but with a compensating air passage provided by a groove at the top of one of the flats. This throttle movement more of a 'butterfly' than a barrel action is connected to a conventional exhaust flap by a wire link, producing a marked degree of silencing in the slow running position.

AeroModeller Magazine July 1964 by Hlsat

Fox 15 R/C





A simple adjustable stop is provided by a screw in the top of a wire arm for the slow running setting, this screw bearing against the front of the stub exhaust casting. There is no forward or high speed stop, which is a bit disconcerting for bench running since the throttle can be advanced past the full speed position and start again to act as a throttle by richening the mixture once more. If pushed too far forward the top of the arm carrying the 'stop' screw can foul the propeller. In a model installation, of course, it would be a simple matter and necessary to arrange for a high speed 'stop' on the actuating linkage to position the throttle correctly for fast running. This position is not critical, nor is the slow speed running adjustment. Whilst it is possible to adjust the latter to give bare 'lick-over' revs of the order of 3,000 r.p.m. or less, we found that this did to some extent modify the instant response of the throttle, especially when using a small propeller. It was found best to sacrifice some speed at the slow end and adjusting to drop the normal flat-out speed by about one half. This should still result in sufficient loss of thrust for most R/C applications.

Constructionally the Fox 15 R/C is fairly orthodox American practice as far as a Fox engine is ever orthodox with a very light, thin-walled crank-case casting incorporating cylinder and intake tube. A stub exhaust is cast integral with the cylinder with a pillar in the centre which is tapped for the screw holding the pivoted exhaust flap (also a pressure die casting).

Component materials

The cylinder liner is of soft steel, with thin walls with a narrow flange at the top to locate the liner for depth when inserted in the crankcase unit. Transfer and exhaust ports are rectangular in shape and cut directly in the liner walls. The corresponding transfer passage is of generous proportions and formed in the casting.

The piston is of cast iron, again unhardened, and is of plain form, thin-walled, with a relatively tall and thin deflector on the crown, are-shaped at the top to match the contours of the head. Connecting rod is a light alloy pressure die casting or forging, and the gudgeon pin is press fitted. The finned head is a pressure die casting and is relatively deep with a considerate mass of metal. Head shape is contoured with the plug offset to one side and angled. The head attached via four Phillips head screws extending down into the crankcase unit with the aforementioned spacer fitting a machined groove in the bottom face of the head and resting on the flanged top of the liner. If this spacer is removed there is virtually no clearance between the piston deflector and head at top dead centre.

Crankshaft is of hardened steel 3/8 in. diameter, stepping down abruptly to a .189 in. diameter threaded length immediately in front of the journal. Intake port is 5/16 in. x ¼ in. cut square, opening into a ¼ in. diameter central hole in the shaft. The crank web is circular in form with a machined crescent shaped

Fox 15 R/C

counterbalance weight. Crankpin diameter is .155 in. The shaft runs in a well fitted bronze bush, journal length being only 1 in. If anything the shaft appears to be slightly 'waisted' giving a slightly tight, but by no means excessively tight fit.

Immediately in front of the journal the shaft is keyed to take the prop driver, which is a simple and very light alloy casting with a good serrated gripping face. We feel that the protruding length of shaft is on the vulnerable side, and another minor criticism here is that the prop retaining nut could have been a full nut to advantage, rather than a half (thin) nut.

A sportsman's engine

The test was made on the basis that here is an R/C engine designed to run on the cheapest possible fuel. No attempt has been made to extract absolute power in the accompanying figures. We have used the engine just as would an average sports flier. Reducing the thickness of the spacer under the head to increase the compression ratio would undoubtedly improve performance, although possibly it the expense of needing nitrated fuel to promote smooth running at high speeds. On straight fuel we took test running up to 15,000 r.p.m. and beyond with propellers and running remained quite smooth.

Summarising, we would rate the Fox 15 R/C high as a radio model engine, especially for smaller models where power requirements are not so critical and light weight is useful. It scores particularly on having a very good throttle and a low level of vibration when running. It is also an 'extremely light engine for its displacement and therefore suits many 1.5 c.c. designs.

Specification

Displacement: 2.42 c.c. (.1476 cu.in.).
Bore: .590 in.
Stroke: .540 in.
Weight: 3 ½ oz.
Max. power: .22 B.H.P. at 13,000 r.p.m.
Max. torque: 19 oz.-in. at 10,000 r.p.m.
Power rating: .091 B.H.P. per c.c.
Power/welght ratio: .059 B.H.P. per oz.

Material specification

Crankcase unit: pressure die cast light alloy.
Crankcase back cover: pressure die cast light alloy, attached by two screws.
Cylinder liner: Leaded steel (unhardened).
Piston: cast iron.
Cylinder head: light alloy pressure die casting.
Connecting rod: light alloy.
Crankshaft: alloy steel, hardened and ground to finish.
Main bearing: bronze.
Throttle: rotating spray-bar .in brass; unit retained by spring circlip.

Propeller - R.P.M. Figures

Top Flite (nylon)	8x6	10.200
	9x4	10.500
	8X4	13.200
	7x4	14,900
Trucut	8x4	13.000
K-K (nylon)	9x4	10.800
	8x4	12.800
	7x6	12,400

Fuel used: Mercury 45.