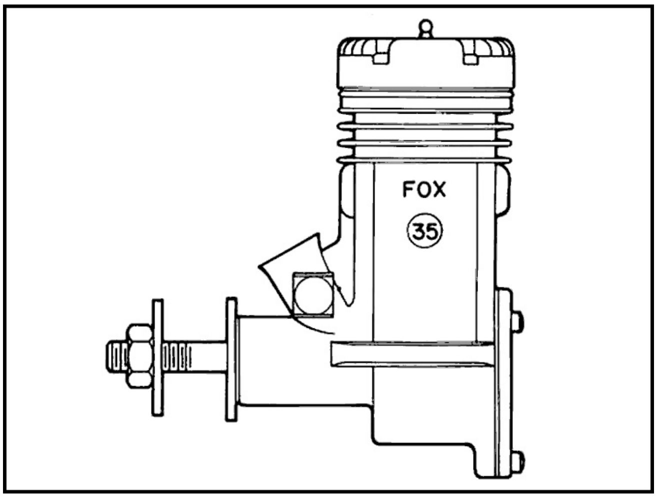
Fox 29



An authoritative discussion of the many factors that have made the .29 and its .35 brother so successful as stunt model power plants.

By Ted Martin

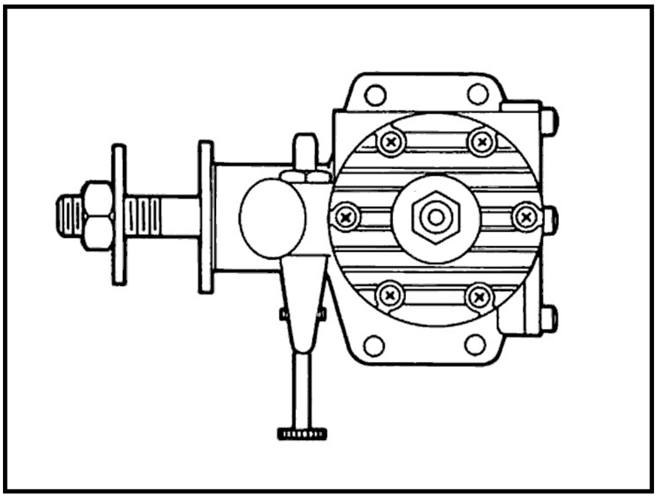
► The Fox .29 and its overbored companion, the .35, are aimed at stunt U control the fact that they are Spartan engines with no luxurious plated fittings and eye catching color schemes means nothing when you see them perform. In common with its full size counterpart, the modern model engine has to be specifically aimed at some particular application. The days of the general purpose power unit are now but happy memories. As a stunt engine, the Fox is renowned. Why?

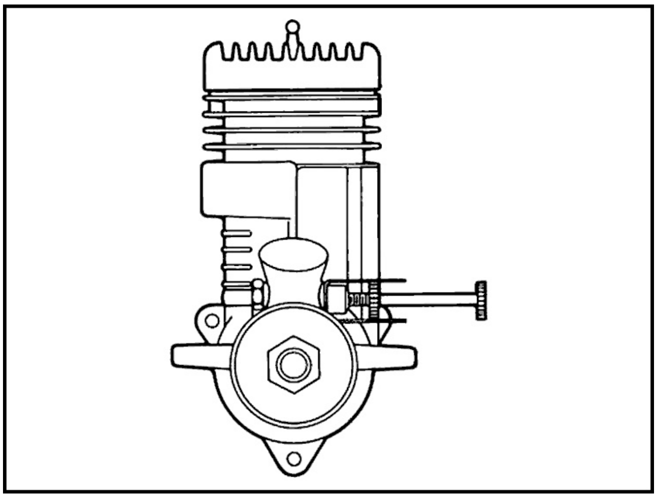
The Fox is very lightweight for its displacement and this permits a light model. This saving in weight offers the alternatives of a smaller wing area to achieve a pre-determined wing loading and, reduced drag and increased speed, or instead, retain a normal wing area with the advantages of the most exceptional maneuverability, owing to low wing loading.
To realize this advantage demands rock steady carburation so that power output remains constant, regardless of the variable head of fuel occasioned by changes of attitude and therefore tank position in violent maneuvers. The Fox has this important property, while to the casual eye, it just looks like any other front rotary setup, there are actually a number of important small details which make the difference. When one considers that the ideal fuel/air in an alcohol burning engine is around one part fuel to eight of air by weight (in other words, about 5000 times as much air as fuel by volume), it is understandable that minute details in carburetor design can have a vital effect on overall efficiency. However, the main requirement of a stunt carburetor is that it should exert a powerful suction sufficient to overcome fuel inertia set up by the 'G' effect of violent maneuvers.

Three factors in the Fox contribute towards this ideal condition. First, rotary valve timing gives early opening and early closing without the degree of overlap featured in racing engines. This means that, regardless of rpm, there is no tendency to blowback as in the case of later timing. This is a great aid to setting the needle valve prior to launching; suction remains fairly constant in relation to engine speed at all times so that needle can be set near maximum revs on the ground. Fuel feed will remain satisfactory at increased revs developed in flight and also just when you need it during the reduced speed in a tight maneuver. With racing timing, however, there is a tendency to suck the mixture in and then blow some of it out again at low revs, making it necessary to set needle rich on the ground so that it will lean out to the best mixture at speed in the air. Thus, in a tight maneuver, when the racing engine slows down, mixture may go haywire giving a power sag which every stunt flier has experienced.

The next factor which regulates suction is the cross sectional area of intake at the point where jet is located.

Fox 29





This, in conjunction with displacement of the engine, governs the velocity at which air passes over spray-bar, and in turn determines amount of turbulence created underneath the spray-bar where, in the Fox, jet is located. It is this turbulence or area of low pressure which actually sucks fuel from the tank. It is a useful tip to bear in mind that, for maximum suction in any engine fitted with a spray-bar, the best location for the jet hole is on the underside. You can vary this suction as desired simply by rotating the spray-bar. Incidentally, a very common source of erratic running is an air leak where the flexible fuel line is hooked up to the engine and also the tank, since it is a source of trouble that can easily be eliminated when there are so many other complex bugs to deal with in engine operation, it is a good idea to make sure of these connections by binding them with wire. Pinhole vents are another fallacy. Air has to go into the tank to let fuel out. The easier it can get in the better. It pays to keep tank vents on the generous side to avoid blocking.

The third contributing factor towards effective carburation in the Fox is location of the jet in the closest possible proximity with crankshaft port. This means that almost as soon as the rotary valve begins to open fuel laden air will enter. In engines, large and small, which employ any length of plumbing between jets and inlet port, there is always a tendency for neat air to enter first because, while valve is dosed and mixture is not moving, fuel droplets deposit themselves on intake walls. This obviously upsets mixture strength, a variable amount depending on engine speed.

In practically all other respects, the Fox is a compromise between performance giving features and weight economy. To achieve adequate strength with the least amount of metal, the entire engine, with exception of working pans, let assembly, cylinder head and end cover, is pressure die-cast in aluminum alloy with a cast- in crankshaft bearing bush. For rigidity, heat dissipation and trouble free simplicity, this arrangement is hard to beat and might well be studied by, full size designers.

The cylinder is fitted with a drop-in floating liner whose ports line up with gas passages cast in the block. It is retained by the cylinder head with a self-bonding gasket between the joint. This gasket, incidentally, should always be renewed when an engine is reassembled. The head is retained by six Phillips head screws on a good rugged flange which no amount of overtightening will distort. The drop-in type liner is superior to the shrunk type if properly fitted because it is less prone to heat distortion and is easily removed for replacement. Unlike most high performance engines, where piston is relieved on the skirt to minimize drag, the Fox features an almost fully lapped piston and has the bore relieved from the port belt downwards. There is very little to choose between the two methods on the score of piston alignment and slap as the amount of extra clearance is only about two ten thousands of an inch.

The bypass and exhaust ports are of the large cross sectional area usually associated with racing engines but are not so high, with the result that the effective stroke is longer, which makes for higher torque at low rpm. The Fox therefore breathes well with consequent high maximum output without unduly handicapping its pulling power when loaded down to slow speeds.

The piston is of conventional design for an opposed port engine but in common with the wrist pin, has been kept as light as possible consistent with adequate strength. The piston baffle is slightly higher than usual for an engine of this size and contributes in no small measure to ease of starting and high volumetric efficiency, because it ensures that as little mixture as possible escapes through exhaust port during bypass phase. An old rule of thumb for two-cycle design is that baffle should be at least as high as bypass port. In the Fox, it is slightly higher than the exhaust with proportionately greater efficiency, though probably any further increase would begin to have an opposite effect because of pocketing in combustion chamber with a straight fence baffle.

Crankshaft is one of the heaviest ever seen on a .29, being 7/16" diameter, with a 5/16” diameter gas passage and a square rotary valve port. Conversely, however, the crankpin is rather on the small side, being only 5/16" diameter, whereas experience has shown that a 1/4" diameter pin is none too large for this size of engine. The large shaft is of course excellent as it provides great rigidity, a low bearing load per unit area, and allows a highly efficient gas passage. As to the crankpin, one considers that this bearing is just as heavily loaded as the main bearing and also works under less favorable conditions of lubrication and variable rotational loading in relation to the rod. A little more metal than is absolutely necessary for adequate strength could be left around the small diameter rod bearing. Actually, there is enough clearance in the crankcase to accommodate a larger bearing; the explanation that comes to mind for not using it is that a small diameter may have lower frictional losses when lightly loaded. However, there were no signs of rod bearing wear

in these tests which usually show up any weaknesses an engine may have.

The minor details that are thoughtful and noteworthy on the Fox include a spray-bar design which is unusual in that overtightening the needle merely tends to tighten the spray-bar retaining nut instead of loosening it, as on most engines. Also, the needle is formed in such a way that, although situated close to the prop, it can be easily adjusted without danger to knuckles. The mounting lugs arc strong and unlikely to get damaged in a crash, and lugs provided for retaining the back-plate arc substantial enough for use as radial mounts if necessary. The prop driving disc is made of steel and is strong and foolproof, fitting onto a substantial and positive taper. The prop is retained by the good old-fashioned and practical 1/4” nut.

Starting from cold is improved by priming the bypass through exhaust ports with a few drops of fuel. Hot starting is easily accomplished by choking intake for one flip.

Needle control is smooth and positive with a running tolerance on nitrated fuels of about four turns. The .35 is if anything slightly easier to handle than the .29, though both engines are extremely manageable.

In conclusion, it is evident from performance figures that the extra displacement of the .35 shows to most advantage at lower speeds, on engines tested, output was almost the same at

Fox 29

peak power. The .35 will therefore accommodate really tight aerobatics more easily.

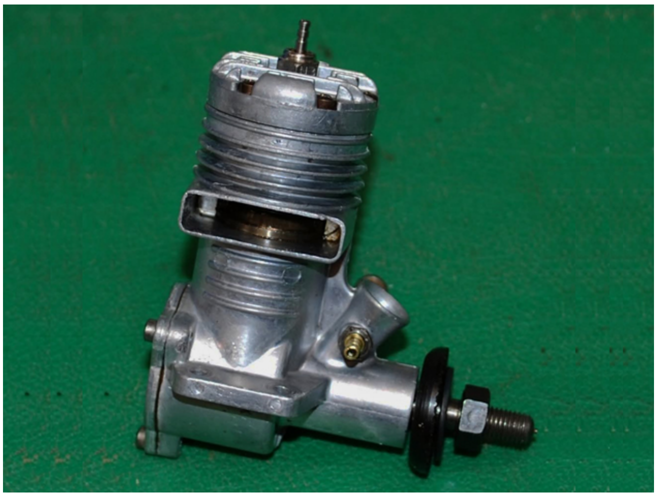
It is necessary to stress particularly in the case of these light weight stunt engines that, owing to there not being much mass to absorb vibration produced, it is vitally important to use really solid mounts.

Plug Ohlsson Std. long reach, as supplied (1-1/2 volts to start), Fuel Supersonic 1000

Running time prior to test seven hours per engine (NOTE: Makers guarantee full power as purchased.), Bore (.29) .758", (.55) .800"; Stroke (Both) .700, Weight 5-3/4 ozs. approx.

Power Prop	**RPM (.29)**	**RPM (.35)**
10x8	11.500	11.900
10x6	12.400	12.750
9x8	12.600	15.050
9x6	15.700	14.100
8x8	14.050	14.500
8x6	14.800	15.250
7x10-1/2	15.900	14.500
7x9	14.650	15.100
7x8	15.000	15.500

Top Flite	**RPM (.29)**	**RPM (.35)**
10x8	10.400	10.850
10x6	11.500	11.900
9x8	11.650	12.200
9x6	12.700	15.150
8x8	15.100	15.600
8x6	15.900	14.500



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