

ENGINE CLINIC

Clarence Lee

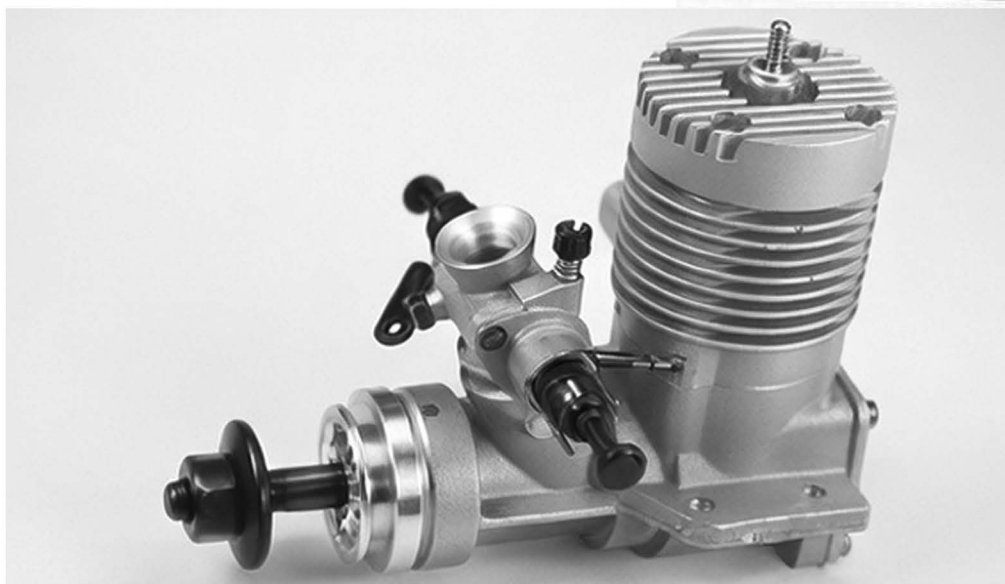


With nitro methane selling for \$28.00-\$30.00 a gallon at most outlets, the prices of model fuels are now taking a pretty healthy chunk out of the weekly paycheck. This is especially true for those fellows flying the gas gulping piped .60's. Some of the more powerful engines such as the Rossi and OPS require a 16 ounce tank for a 12 minute flight.

Being a fuel manufacturer himself and knowing that fuel prices could go only one direction — up, Duke Fox is now marketing a new no nitro fuel that he calls "Gold Star" and has either redesigned or is offering a new line of R/C engines to be run expressly on this fuel. Last month I reviewed the new Eagle III which is an updated and improved version of the older Eagle II. This month we will talk a little about the completely new Fox .19 Schnuerle port engine designed to be run on no nitro fuel.

The new Fox .19 is of lapped piston/sleeve design using a Meehanite cast iron piston and leaded steel liner. This is a combination Duke Fox pioneered many years ago and one that many other engine manufacturers have duplicated. This combination makes for a long wearing unit and one that has a tendency to even "heal" itself after lean runs and abuse. I used this combination initially in my Lee .45's many years ago but later went to a hard chrome piston for an even longer life expectancy. Due to costs involved in chroming the piston we went back to the Meehanite piston and leaded steel sleeve in the Veco .45. Lapped iron pistons do require a longer break-in period than the ABC types or ringed aluminum pistons; normally two or three tanks of fuel run through the engine on the test stand followed by half a dozen or so rich flights in the air being required. An engine can be broken-in in much shorter time by flying in the air where it is working rather than by trying to do so with the engine running static on the bench. A bench break-in will take two or three times as long.

Last month, while testing the Eagle III, I also gave the Fox .19 a quick run to see what it was going to require in the way of break-in. The engine had been factory run but still felt pretty tight. Duke's advertising claims 18,000 rpm with an 8/4 Top Flite maple prop, which is a bit small for a .19



New Schnuerle ported Fox .19 BB-RC



Internal quality of the new Fox .19 is shown in this photo.

size engine, but I initially ran the engine with the 8/4 to check this out. When breaking-in a new engine on the bench it is generally a good idea to run the engine at, or near, the same rpm it will be running when broken-in, but during the break-in turning this rpm set very rich. The 8/4 accomplished this by letting the engine turn in the 15,000-16,000 rpm range barely breaking out of a four cycle. After a few short two minute runs allowing the engine to cool in-between, it was obvious it was going to be a real screamer but that it was also going to take quite a bit of bench running before it would hold a peaked out setting and its full power potential. Not wanting to spend a couple of hours breaking the engine in by bench running, I took

the easy way and loosened up the piston/sleeve fit on the Sunnen hone. This month when proceeding with the break-in it was only a matter of running two tanks of fuel through the engine at a rich setting (plus a dab of Fox Lustrax down the intake) before it could be peaked out and hold a lean setting. Even then the engine was not fully broken-in and would be expected to pick up additional rpm with additional running. I would like to caution that my method of break-in is not the recommended procedure nor one which will result in a long life expectancy. It is the quick and dirty break-in when you are pressed for time and cannot devote a long time period to bench break-in. As mentioned previously, the best method is to give the

engine enough bench time so that it will hold a rich two cycle setting and then install it in the aircraft and finish the break-in in the air. Although Duke's instructions recommend flying the engine out of the box, our engine was a bit tight to have done this.

Unlike the Eagle III, which has a longer stroke (.937) than bore (.907), the Fox .19 is the opposite. With a bore of .650 and stroke of .600, the engine is of "overbore" design. Duke evidently wanted the engine to develop its horsepower at higher rpm hoping to also get the engine into the R/C car and boat field — although no specific R/C car or boat versions are available at this time. Small displacement engines are always "happiest" when turning up so Duke has gone with a bore/stroke ratio that would favor higher rpm. This will not detract from the engine's ability to turn larger size props such as the 9/5 or 9/4 commonly used on .19 size engines. I imagine Duke was thinking of the high performance type aircraft using smaller diameter props for this engine — hence the 18,000 rpm with an 8/4 advertising. However, 8/4 is pretty small for a .19 and most high performance .19 size ships would do better with an 8/6. I flew a Phil Kraft Flea-Fli with a Veco .19 one season a few years back when the trend was to smaller ships and found the 8/6 to be the best prop for this combination. I later installed a K & B 3.5 in the ship still using the 8/6 prop and it would really haul. The Fox .19 should fall in the same power category.

Unlike the Eagle III that utilized a split two piece lower crankcase, the .19 uses a one piece lower crankcase but, like the Eagle III, a separate upper cylinder section. Whereas the upper cylinder section could not be rotated for a side or rear facing exhaust on the Eagle III, this can be done with the .19. The upper cylinder can be rotated so that the exhaust can face either side or to the rear. The cylinder is retained to the lower crankcase by four long screws that also hold on the head. This makes for a strong unit with a minimum of head/cylinder distortion. The head itself is of the two piece type using a separate combustion chamber "button." "Cup shaped" would best describe the combustion chamber which is surrounded by a wide, flat, squish band area.

The sleeve uses two transfer ports on either side of the exhaust in conjunction with a rather large boost port directly opposite the exhaust in the conventional Schnuerle port configuration. Actually the original Schnuerle port design used only two transfer ports on either side of the exhaust port directing the incoming fuel mixture upward and towards the rear

of the cylinder, opposite the exhaust. The addition of the boost port, or ports, is a modification of the original design that most engine manufacturers now incorporate. The exhaust port opens at 65° before bottom center and closes 65° after bottom center for a total open duration of 130°. The transfer ports open at 56° before bottom center followed by opening of the boost port 2° later. Although this port timing is rather conservative for a nitro engine it seems to work very well with the alcohol engine.

The crankshaft is of one piece design, hardened and finish ground, supported by two 22mm (.866) O.D. x 11mm (.433) I.D. ball bearings. Both the rear and front bearing are the same size. The rear bearing is a little smaller than most .19-.21 size engines now in use but the front bearing is considerably larger. As a comparison, the Veco .19, K & B 3.5, and OPS 3.5 all use a 24mm (.944) O.D. x .2mm (.472) I.D. rear bearing which allows for a larger gas passage through the crankshaft. Evidently Duke felt that the smaller bearing would be adequate for this engine being run on alcohol. The front bearing being larger than most engines of this displacement use would lend itself well to the added loads a flywheel would impose, helicopter use, and electric starters. The crankshaft is timed to open 40° after bottom center and close 52° after top center.

The piston is machined from bar stock Meehanite cast iron and appears to be unhardened. Internally the piston has been relieved of excess material but a thin circular ring above the wrist pin helps to hold the piston round and keeps it from distorting under operating conditions. The wrist pin is solid steel and is retained by two wire cir-clips. This eliminates any scoring of the cylinder wall by the ends of the wrist pin or wrist pin pads.

The connecting rod is machined from barstock aluminum and is of rugged proportions for an engine of this size. Both the crank pin and wrist pin ends of the rod are bronze bushed assuring long rod wear.

Whereas most of the other engines in the Fox line use a bolt-on carburetor the carburetor on the .19 is of the slip-in type and retained by a single set screw. Similar to the Eagle III carburetor, the .19 carburetor uses a rotating barrel that moves in and out as it rotates. This, in turn, moves an idle mixture needle in and out of the main fuel jet regulating the idle mixture. A conventional needle on the opposite side of the carburetor regulates the high speed mixture. The carburetor has a fairly large venturi cross section for a .19 (.270) but also uses a larger than what might be cons-

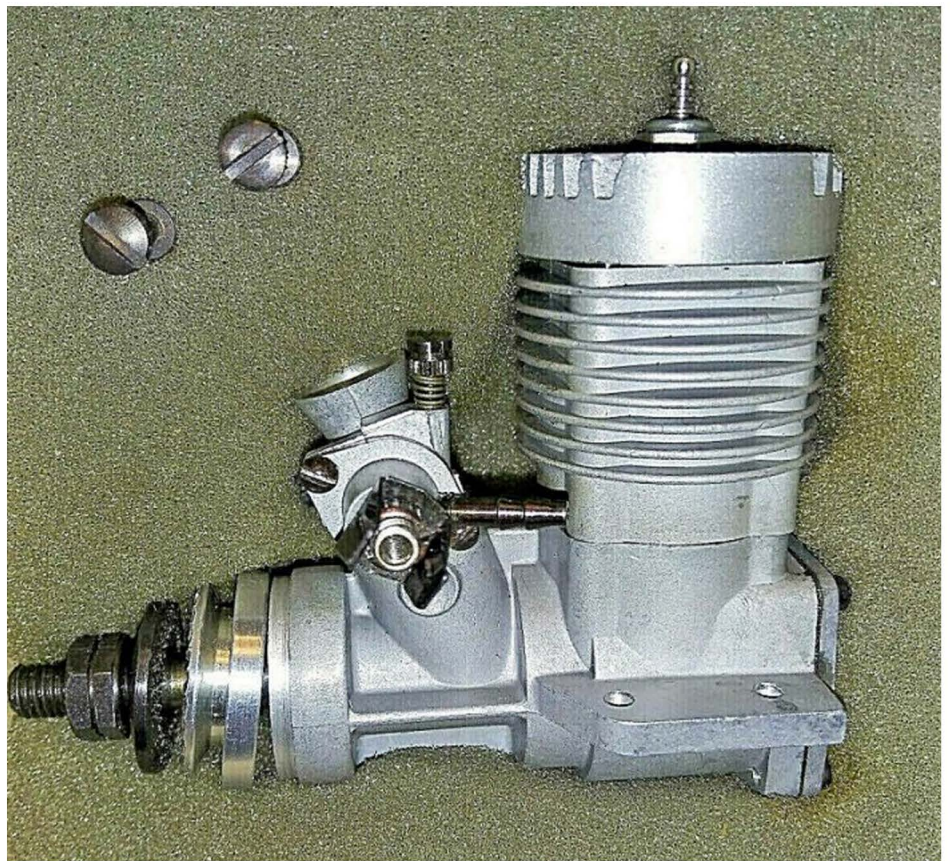
idered normal fuel jet or spray bar. The spray bar with a diameter of .180" reduces the intake area to about the same as used by most .19/.21 size engines.

Duke recommends an 8/4 or 8/5 propeller be used on the engine. As mentioned previously, this is more of a .15 size prop but if you like to hear an engine really scream, the Fox .19 will do just that. I tached the engine at 18,200 with a fuel mixture of 22% Klotz oil, 2% propylene oxide, and balance methanol, and 18,400 with 10% nitro fuel. Actually FAI fuel does not call for the propylene oxide but since Duke recommends this in the fuel for the engine and uses it in his "Gold Star" fuel I also mixed it in the test fuel. The fact that this engine runs and handles just as well on no nitro fuel as with 10% is quite astounding. The needle setting was not touchy as is often the case with FAI fuel and the top end adjustment is quite broad. The engine idled and accelerated very well although with the 8/4 prop I had to keep idle speed above 3,000. With a little more break-in time this would probably drop down. The engine was also run with an 8/6 Top Flite which it turned 14,200, a 9/4 which it turned 14,400, and a 9/5 which it turned 13,300, all very respectable figures — especially when considering this was using no nitro fuel. I was able to get the engine to idle somewhat lower with the larger diameter 9/4 and 9/5 props as is to be expected. Although the engine would idle at 2,500, it would stumble and occasionally die, so 2,700 was a safer figure with no idle problems encountered. With 10% nitro fuel the engine would hold a safe 2,500 rpm idle and accelerate with a minimum of hesitation.

In the instruction pamphlet that accompanies the engine Duke recommends using an 8/4 or 8/5 prop and cautions that if larger sizes are used the fuel draw will suffer and the carburetor should be replaced. No recommendation is made for another carburetor but by strange coincidence the neck size of the Fox carburetor is the same as the Perry carburetor used on the K & B 3.5. This also being the same neck size as the Perry carburetor for the K & B .40. So should you wish to replace the carburetor, several options are available. However, when testing the engine with the 9/5 prop I gave it the fuel draw test of raising and lowering the fuel tank about 6" above and below the carburetor center line. There was a minimum of richening with the high tank position and the engine did not lean out excessively with the low tank position, i.e., the needle valve setting was not changed to compensate for the raising or lower-

ing. This would lead me to believe that there should be no fuel draw problem when using a 9/4 or 9/5 prop providing the fuel tank is placed close to the engine and no larger than a 6 oz. tank used. Some fellows like to use a 12 oz. tank with a .19 and hog the air with 30 minute flights. They also write me letters wanting to know why they have to set the engine off slobbering rich and it still leans out at the end of the flight. So do not use a tank any larger than is required for a 12 or 13 minute flight. Your fellow fliers will also appreciate this.

To sum it up — the new Fox .19 is a very well-made good running engine. It handles easily with no bad characteristics. Hand starting with the 8/4 is a bit touchy until the engine has had a little running time. After that no problem. The use of a 9/4 for the first runs will aid hand starting due to the increased flywheel action. The big selling feature of the engine is its ability to perform as well on no nitro fuel as with nitrated fuels. That's money in your pocket. And — it's American made!



More: https://flyinghsat.com/search.php?search_keywords=Fox-Engines