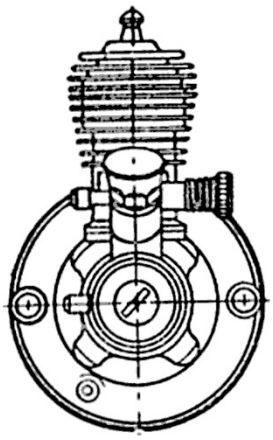
Cox Tee Dee .020



Engine Analysis

Number 97

by R. H. Warring

The tremendously popular

COX Tee-Dee ·020 (·327c.c.)

Front rotary valve, glowplug engine

Basically the Cox Tee Dee .020 (.327c.c.) glow motor is geometrically scaled from the TD .010 (see AEROMODELLER, October 1961) and is thus identical in general description. It is again a high revving motor but not to the same fantastic speeds achieved with its smaller brother and requiring special sizes of propellers to operate at peak r.p.m.

If the instructions arc followed explicitly, starting is perfectly straightforward and easy needle 5 turns open, choke, prime through the exhaust with the port fully open, then flip or use the spring starter (the latter is recommended with the small sizes of propeller used). We did not find it fussy on nitromethane content of fuel either as regards starting or running, but a fuel with a fairly high nitro content is best for easy adjustment and smooth running.

Fuel residue

One possible trouble with different fuels, applicable to all very small motors in general (and the Cox Tee Dee in particular, it seems) is gumminess or sticky-ness caused by residual fuel remaining in the engine after use. When it comes to starting the engine again after a few days idleness it feels “horrible” and reluctant to flip over a condition which is not immediately relieved by flooding with fresh fuel.

Another thing these very small glow motors seem to develop is a lacquer like coating over the inside of the cylinder after some running time, again imparting drag and detracting from performance. The recommended procedure for cleaning this is to “scour” the bore lightly with fine steel wool after about an hour’s running time, which can remarkably improve performance on a subsequent run.

Cause of non-starting is usually simply either the engine flooded or low battery for the glow plug (or both, the low battery not getting the element hot enough to fire the mixture anyway). The Cox element is definitely for 1.5 volts only and the life of even large 1.5 volt dry batteries can be unexpectedly low, especially under flying field conditions. Perhaps we do not make such good dry batteries in this country as America.

Starting tip

Even partial flooding will cool the clement to the pot where the mixture will not fire on a fresh 1.5 volt battery and further flicking of the propeller from then on only makes things go from bad to worse. We found a “workbench” solution which worked very well. Using a 2 volt accumulator and a standard 2 volt glow plug in series in one lead to the Cox head, the element temperature was just right for normal starting. If flooded, (we were investigating how quickly these small engines flood and how they behaved as a consequence), temporarily shorting out the “resistance” glow plug produced enough heat to dry the engine element rapidly.

The main causes of flooding we found were (i) weak batteries (by far the most common cause); (ii) excessive finger choking instead of choking to

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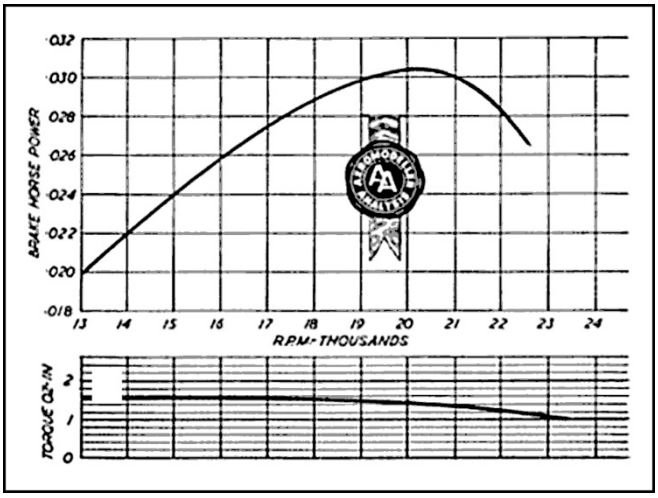

fill the fuel line and then priming through the exhaust with the port open; (iii) trying to start the engine in an inverted position as fitted in a model (the remedy here being to turn the engine to an upright or horizontal position for starting).

For smoothest running we would prefer a fuel with a minimum 10 per cent, nitromethane content, although performance was comparable on Frog “Red glow”. Cox’s own fuel now available in this country seems excellent for the Tee Dee engines and has a 15 per cent, nitromethane content. It seems a far “cleaner” fuel than many, with less tendency to “gum” or shellac formation. With no fuels tried, however, was needle valve adjustment critical, nor could consistency of running be faulted.

The only criticism we have with regard to the Tee Dee .020 is in the manner of mounting via a moulded hard nylon tank. Designed for radial mounting the engine attaches to the tank moulding with four screws through the front of the tank, and the lank secures to the firewall of the model via two diametrically opposed mounting bolts. Possibly due to the fact that plastic is not a completely rigid material this does seem to give undue flexibility to the mount. As a result the propeller must be meticulously balanced if excessive engine vibration is to be avoided.

The standard Cox 3 1/8 in. diameter by 2 ½ in. pitch three bladed propeller particularly recommended for this engine is way out of balance, as moulded and, being three bladed, is difficult to rework to exact dynamic balance.

Two bladed propeller are better since they can be balanced closely without much trouble. But without a properly balanced propeller on the .020 you can lose an awful lot of power. First figures on the 3 1/8 in. diameter propeller (unbalanced) were, for example, 15.000 r.p.m., as against the 22.750 r.p.m. figure quoted by the manufacturers. This we improved to 21.000 plus on reworking the propeller, during which the length of one blade, at least, was appreciably reduced.

In fairness to Cox, we must point out that they specifically state on their instruction sheet that the propeller to be used should first be trimmed and balanced.

Our test figures, we feel, may be a little unflattering to the true capabilities of the Tee Dee .020 because of the presence of vibration on the very high speed runs. However, .031 B.H.P. is still an exceptional figure for a .33 c.c. engine, which puts it in a class of its own. Peak power, as measured, was developed at 20.500 r.p.m. but the torque is fairly constant over quite a wide range down to the lower speeds. To use the Tee Dee .020 properly, however, it needs small diameter propellers to let it rev. fast nothing bigger than 4 in. diameter preferably. The engine gave consistent running on larger propeller sizes, but at such speeds was not doing a lol of work. It was, however, easier to hand start on larger propellers.

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Workmanship

On the workmanship side we can only say that Cox engineering represents the highest standard in the model world today; and they combine this with first class styling and presentation. Their advertisement agent responsible for publicising Cox Tee Dee must have an easy time of it. Merely to sec one is to want to own it and there is nothing to criticise on power performance either!

DATA

PROPELLER R.P.M. FIGURES

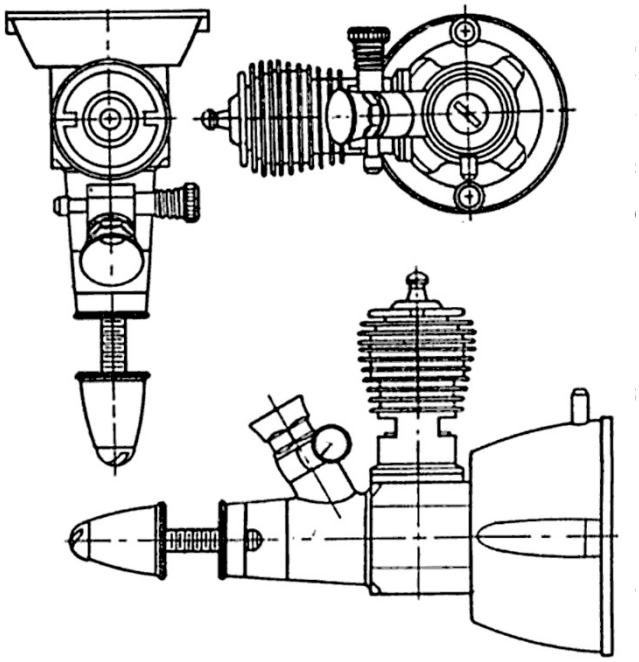
Propeller		R.P.M
3 1/8 x 2 ½	Cox three blade plastic	21.000 plus
5 ¼ x 3	Top Flite	11.200
5 ¼ x 4	Top Flite	9.500
5 x 4	Keil kraft nylon	10.200

Fuel used: nominal 20 per cent, nitro methane, 25 per cent, castor, 55 per cent. Methanol.

NOTE: These propeller r.p.m. figures are largely of academic interest. No standard commercial propellers available in this country are a "match" for the .020 other than the Cox 3 1/8 in. dia. Three blade and Cox 4 x 2 ½ plastic (two blade).
Displacement: .3266 c.c. (.0199 cu. in.)
Bore: .300in.
Stroke: .282in.
Bore/stroke ratio: 1.16
Bare weight: .85 ounces
Max. power: .0304 B.H.P. at 20.500 r.p.m.
Max. torque: 1.6 ounce inches at 15-16.000 r.p.m.
Power rating: .093 B.H.P. per c.c.
Power/weight ratio: .036 B.H.P. per ounce

Material Specification:

Crankcase: machined from light alloy bar, "gold" finish overall
Crankshaft: hardened steel, 1/16 in. diameter steel screw propeller shaft
Piston: hardened steel Cylinder: soft steel
Connecting rod: machined from dural (ball and socket little end)
Intake body: moulded plastic, located by screwed dural collar
Venturi: turned aluminium
Spray bar housing: steel
Cylinder head: turned dural, integral 1.5 volt glow clement.
Crankcase back cover: moulded plastic
Rear cover tank: moulded plastic, with plastic end
Main bearing: plain
Manufacturers: L. M. Cox Mfg. Co. Inc., Santa Ana, California, U.S.A.
British Importers: A. A. Hales Ltd., 26 Station Close, Potters Bar. Middlesex.



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