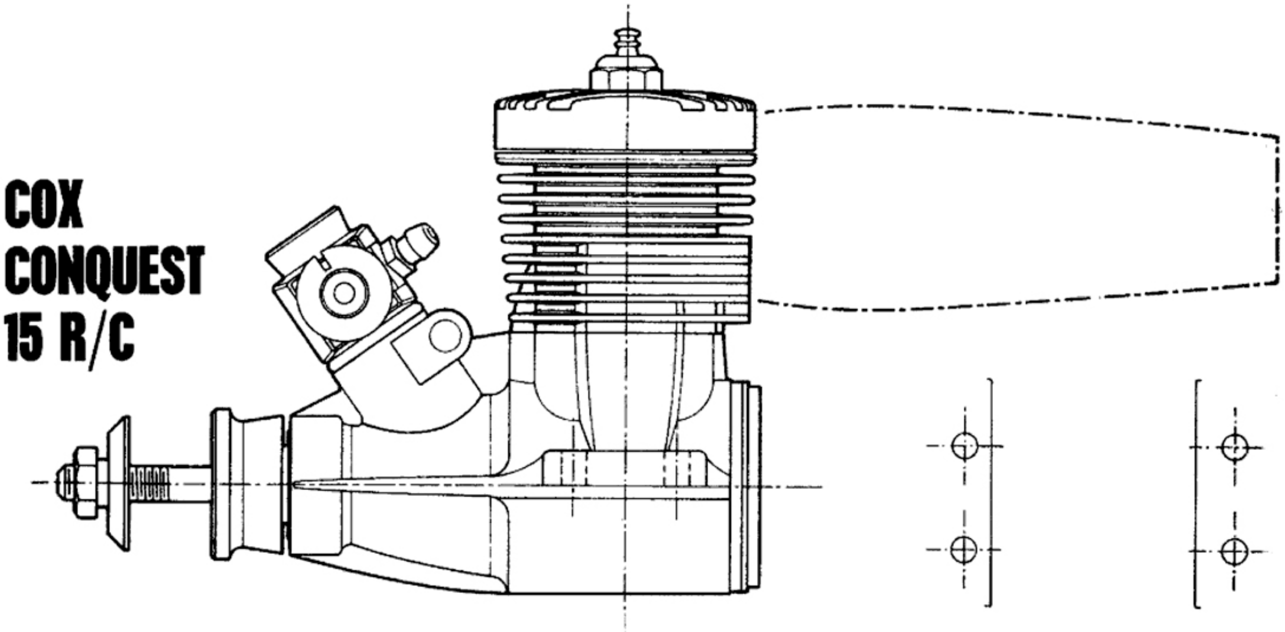
Cox Conquest 15 R/C

ENGINE TEST

by Peter Chinn



As Free Flight and control line enthusiasts are well aware, the Conquest 15 engine was first seen as an attempt by the American L.M. Cox Manufacturing Company to compete in the international 2.5cc contest engine class alongside the all-conquering Italian Rossi 15. The engine was announced more than a year ago and early models showed considerable promise in the hands of selected American FAI free flight experts, although, at that time, certain problems had still to be ironed out before the engine was put into full production. It now remains to be seen whether the 1977 season will prove that the Conquest can equal, or even improve on, the Rossi's very high level of performance.

However, Cox have also introduced a throttle equipped (radio control) version of the Conquest and it may well be that this will become more popular than the standard model.

Originally, the R/C engine used a different crankshaft and different piston and cylinder assembly, but more recent development has brought the two models much closer together. The 1977 free flight, control line engine now uses the same porting and timing as the R/C motor. The exhaust port is limed to remain open for 150 degrees of crank angle: the main transfers for 130 degrees and the third port for 124 degrees. The rotary valve opens at 35 deg. ABDC and closes at 60 deg. ATDC. Only the prop drive assemblies, carburettors and cylinder heads are different.

The R/C engine uses a conventional prop driver instead of the driver cum spinner assembly of the standard engine and a Perry carburettor replaces the machined intake venturi and tangential spray bar. The cylinder head, which, on the free flight, control line engine, consists of a plain outer component over a drop-in glow head insert with trumpet shaped combustion chamber, is replaced by an orthodox one-piece finned head with bowl and squishband combustion chamber and conventional glow plug.

Essentially, the Conquest 15 is a shaft induction, rear exhaust, twin ball bearing, motor of modern Schnuerle loop scavenged design but has one or two interestingly different features.

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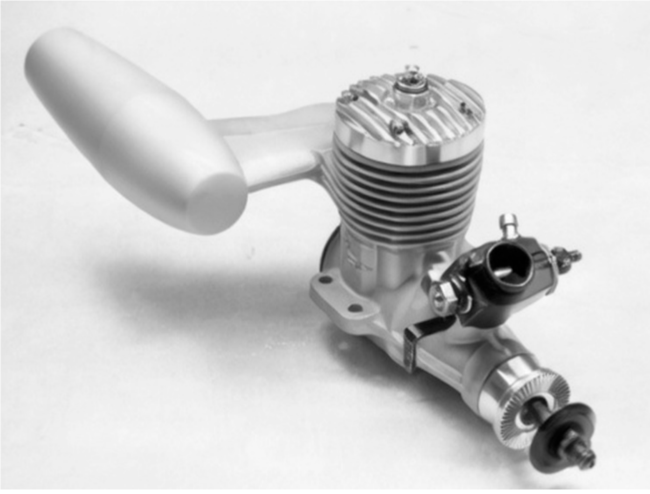

A special rear ball bearing has enabled an extra large (11 mm o.d.) crankshaft main journal to be used which, in turn, has permitted the use of a large valve port and gas passage. The latter is also unusual in that it is tapered, beginning at 6mm i.d. at the front of the valve port and opening up to 8mm i.d. at the rear. A unique feature of the shaft is that it is counterbalanced not only by asymmetric milled cutaways each side of the crankpin but also by three sintered carbide counterweights that are inserted in the front of the web opposite the crankpin and held captive by a machined aluminum cover.

A special silencer is available for the Conquest I5. It is made in front and rear pressure die cast shells with a screw-in outlet tube. The latter has six entry slots totalling 80sq.mm into which gas must pass. Effective outlet area is 72sq.mm.

Performance

Whereas the free flight control line version of the Cox Conquest 15 is normally set up for operation on FAI fuel, with the option of running on high nitro (50-70 per cent I racing fuels by adjusting head clearance and compression ratio, the R/C engine is intended for operation on standard R/C fuels containing between 5 and 15 per cent nitromethane. Our tests were therefore carried out on a 5 per cent mix, since this is the blend normally used in our tests of R/C motors. The Cox ran perfectly on this fuel and, in fact, the extra power gained by increasing the nitro content to 15 per cent was very small indeed only about 3 per cent in bhp or I per cent in prop rpm figures that are only just measurable.

Our lest motor came direct from the Cox factory's design and development department, where it had been run for thirty minutes and confirmed as being up to standard performance levels. It was given our normal running in check but was obviously quite free and some prop rpm readings were therefore taken immediately.

Hand starting presented no problems with the Conquest. When the silencer was fitted and one could not prime through the exhaust port, it was sufficient to prime the intake only and then for a cold start, to simply invert the engine briefly to direct the prime into the cylinder, after which an instant start was usually obtained w it h the engine upright. The recommended props for normal R/C are 8 x 4 or 8 x 3 ½ in. With the silencer fitted we obtained 15.500 rpm on an 8 x 4 Taipan and 16.900 on a Cox 8 x 4 but it was clear that the Conquest needed a good deal more 'unloading' to really show its paces. At a cost of ½ in less diameter, i.e. by substituting a Bartels glass fiber epoxy 7 ½ x 3 ¾ prop, revs were boosted to 19.400. Further, as a static indication of the performance that one might expect in a 'Quarter Midget', or equivalent racing type R/C model, running on a 7 x 5 prop in the air, we obtained 19.000 rpm on a 7 x 4 Taipan glass fiber nylon and 22.100 on a 7 x 3 ½ Bartels glass fiber epoxy.

It was clear from these figures that the Conquest, even with the breathing restrictions imposed by its R;C carburettor (its carb choke area is large by

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R/C standards at 17sq.mm but the FF/CL version venturi choke is 135 per cent larger) would peak at very high revolutions indeed. The torque tests showed this to be so, the peak of the power curve being reached at approximately 24.500 rpm without the silencer and only about 1,500 rpm lower with the silencer. The respective power outputs determined at these speeds on 5 per cent nitro were 0.58 bhp and 0.50 bhp.

Although the Conquest is at its best, so far as sheer power is concerned, when allowed to have its head, it will pull larger props, if required, considerably faster than most other 2.5cc R/C motors. For example, among the 9x4 props, our test motor (with silencer) turned a Tornado nylon at 11.100, a Top Flite nylon at 11.400 and a Taipan glass fiber nylon at 12.500. It has to be admitted, however, that the occasions when it is necessary to have a 2.5cc engine turning a 'big' prop as fast as possible are few and far between and it would be rather a waste of a good engine to use a Conquest in a model that would be adequately served by a less expensive product.

As already stated, cold starting qualities were good. Hot restarts were less prompt but, overall, the Conquest was easy to handle. Throttle response was also good; propped for 17.000, the Conquest idled at around 3.200 rpm after the idle adjustment had been set slightly rich.

The Conquest 15 R/C emerged from our tests as the most powerful 2.5cc R/C engine tested to date and. incidentally, with the highest specific power output of any throttle equipped engine, irrespective of size.

Power/Weight Ratio (as tested): 0.98bhp/lb (with silencer)
1.45bhp/lb (less silencer)
Specific Output (as tested): 202bhp/litre (with silencer)
235bhp/litre (less silencer)

SPECIFICATION

Type: Single cylinder, air cooled glow plug ignition. Schnuerle scavenged two-stroke with crankshaft rotary valve and twin ball bearings Throttle type carburettor Silencer extra
Bore: 0.591 in (15.01mm)
Stroke: 0.550in (13.97mm)
Swept Volume: 0.1509cuin – 2.472cc
Stroke Bore Ratio: 0.931:1
Measured Nominal Compression Ratio: 11 0:1
Checked Weights: 180 grammes 6.4oz (less silencer)
232 grammes 8.2oz (with silencer)

GENERAL STRUCTURAL DATA

Pressure die cast aluminum alloy crankcase with integral front housing Internally counterbalanced crankshaft with three captive sintered carbide counterweights opposite crankpin, plus web cutaways each side of crankpin and cup type aluminum sealing rim Crankshaft has 11mm o.d. main journal, 3/16 in o d. crankpin and 6mm i.d gas passage at valve port diverging to 8mm i.d at outlet Shaft supported in one 8 ball 11x22x5 mm steel caged PNB ball journal bearing at rear and one 9 ball 14x7x3 5 mm steel caged ball journal bearing at front Pressure die cast aluminum alloy

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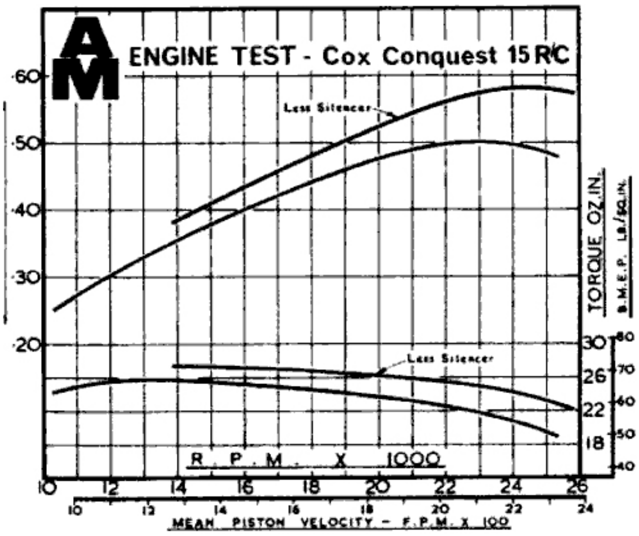
finned cylinder jacket with close-fitting hardened steel cylinder finer located by flange and pin at top Finned aluminum alloy cylinder head fitted with .003in. soft cooper gasket Complete cylinder assembly tied to crankcase with four long screws and paper gasket (.002in. or .005in.) between cylinder jacket and crankcase. Lapped reflectorless flat crown sintered iron piston with 4mm o.d hollow gudgeon pin retained by wire circlips Forged aluminum alloy connecting rod with plain eyes Screw in machined black anodised aluminum alloy crankcase back plate with O ring seal Machined aluminum alloy prop driver mounted on shaft via split tapered collet. Perry Micro barrel throttle type carburettor with enlarged (5.3mm) choke

TEST CONDITIONS

Running time prior to test: Approx 45 minutes (see text**).**
Fuel used: 5 per cent pure nitromethane, 20 per cent Duckhams Racing Castor oil 75 per cent methanol
Glow plugs used: Cox long reach bar type as supplied
Air temperature: 11 C (52 F)
Barometric Pressure: 989mb (29.20in Hg)
Silencer used: Cox baffled expansion chamber as sup plied.



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