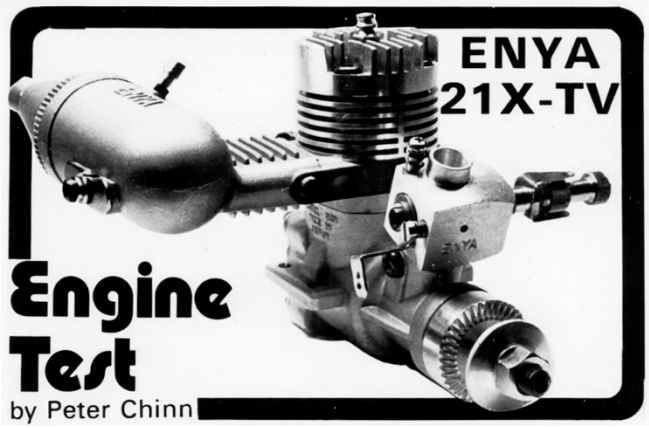
Enya 21X-TV R/C



Specification

Type: Single cylinder, glow plug ignition. Schnuerle scavenged two stroke with shaft rotary valve and side exhaust, Crankshaft supported in two ball bearings. Throttle type carburettor with automatic mixture control.
Bore: 16.6mm (0.6535m)
Stroke: 16.0mm (0.6299in)
Swept Volume: 3.463cc (0.2113cu in)
Stroke/Bore Ratio: 0.964:1
Measured Compression Ratio (full stroke): 8.5:1 1
Measured Compression Ratio (exhaust closed): 6 3 1
Checked Weights: 234 grammes 8.25oz (less silencer), 286 grammes 10.1oz (with silencer)

General Structural Data

Pressure die cast aluminum alloy crankcase front housing unit with beam mounting lugs and 12mm i.d intake boss. Detachable die cast aluminum alloy crankcase back plate, secured, with paper gasket, by four 3mm Allen cap screws. Detachable pressure die cast aluminum alloy cylinder block, aligned with crankcase by cylinder liner and secured, with cylinder head, by four long 3.5mm Allen cap screws. Joint between cylinder block and crankcase sealed with paper gasket Machined aluminum alloy cylinder liner, 1.85mm wall thickness, with hard chromed cylinder bore and located by flange at top. Cylinder head of pressure die cast aluminum alloy, with brass thread insert for glow plug, and 0.3mm soft aluminum gasket. Case hardened steel crankshaft with 12mm dıa main journal. 7mm dia front journal, 8.3mm bore gas passage and 7mm thick crank web counterbalanced by means of cutaways each side of integral 7mm dia solid crankpin Prop shaft length threaded M6 x 1.0 NSK-6901 12 x 24mm 10 ball steel caged rear ball bearing NSK-607Z 7-19 mm 6 ball steel-caged front ball bearing. Machined aluminum alloy prop driver keyed to shaft by two flats on end of front journal. Flat crowned ringless aluminum piston machined from special low-expansion, high silicon content aluminum alloy, with rectangular skirt cutaways fore and aft to avoid masking transfer channel entries. Fully floating 4mm dia solid gudgeon-pm retained by wire circlips. Forged aluminum alloy connecting rod with bronze bushes and lubrication holes at both ends. Enya G5.5 automatic mixture control type carburettor with machined aluminum alloy body and ground steel throttle barrel Enya expansion chamber type silencer (optional) with pressure die cast body and pivoted steel cover plate to allow exhaust port priming Silencer attached to engine with steel strap and two screws.

Test Conditions

Running time prior to test: One hour
Fuels used: (i) 80 per cent methanol, 20 per cent castor oil (running-in) (ii) 75 per cent methanol, 20 per cent castor oil, 5 per cent nitromethane (tests)
Glow plug(s) used: Enya No 3 platinum rhodium clement.
Silencer used: Enya expansion chamber, as recommended.
Air temperature: 16°C (60°F)
Barometric pressure: 758mm (29.8 in.) Hg
Relative humidity: 78 per cent

Test Results

Power output, gross: 0 57bhp at 18.500rpm
Power output, net: 0 49bhp at 16.300rpm
Torque, gross: 36oz in. at 11.000 rpm
Equivalent b.m.e.p.: 67lb / sq in.
Specific output, gross: 165bhp / litre
Specific output, net: 141 bhp / litre
Power/weight ratio, gross: 1.10bhp / lb
Power/weight ratio, net: 0.78bhp / lb

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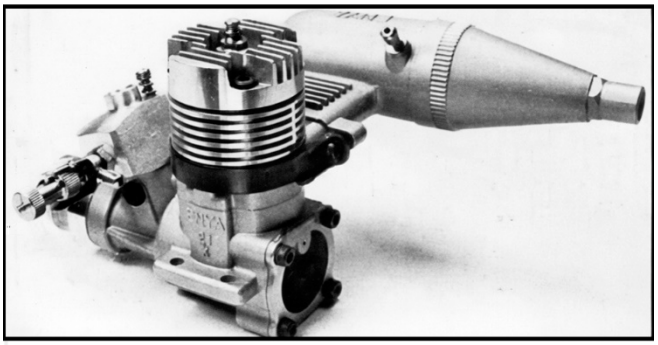


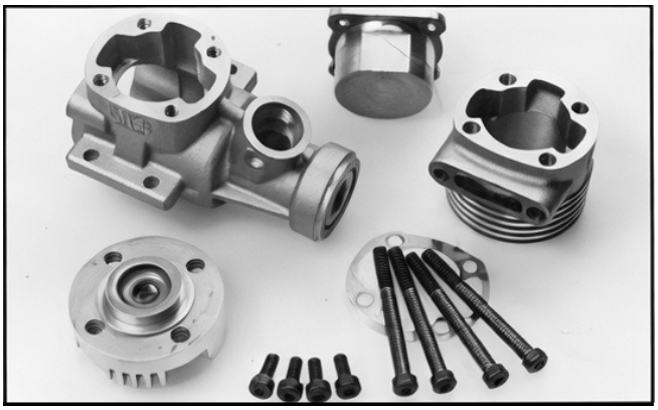
Good power output, yet docile handling characterised the Enya 21X-TV on ten Something of an Enya tradition is polished appearance of diamond turned cylinder fins. Engine is of sturdy proportions.

Few companies can have had so much experience in producing glow plug engines in the 20cu in. or 3.5cc classes as the Enya Metal Products Company Ltd of Tokyo. It was in the late 1940s that the Enya brothers began making model aircraft engines, initially the robust 10cc class Enya ‘60 and ’63' then, in 1950, the first of a long line of Enya ’19’ models Currently, the Enya range is one of the world’s largest It comprises no less than 43 throttle equipped models, ranging from 0.8cc to 10cc. some of which are also available in standard non-throttle control line or free- flight versions and or in water cooled marine units Included m the range are three baste ’19' models (plain bearing and ball bearing crossflow scavenged, plus a ball-bearing Schnuerle scavenged unit) and seven '21' models and it is the standard 21X-TV version of this group that is the subject of our report this month.

Like all the 'X' series Enya engines (the ’X’ identifies them as modern Schnuerle scavenged designs) the 21X-TV is a well built and nicely finished engine. In addition to having a twin ball bearing crankshaft and Schnuerle porting, it features an Al Chrome’ piston/cylinder assembly: that is to say, it uses a ringless aluminum piston running in an aluminum cylinder liner having a hard chrome plated bore. This, like a ringless piston in a chromed brass liner (ABC), combines the advantages of a light piston, a cylinder sleeve whose thermal expansion is closely matched to that of the piston, thereby maintaining good piston seal without risk of seizure over a wide temperature range and finally, giving better heat conductivity to the surrounding metal of the cylinder block.

The cylinder block is, in fact, another unusual feature of the 21X in that it is separate from the crankcase proper. The channels for the three transfer ports are cleanly cast into the two components which are then aligned by the cylinder sleeve, the whole assembly, with cylinder head, being clamped together with four long cap head screws The cylinder porting consists of an unbridged exhaust port, flanked, each side, by a transfer port that is angled to direct gas both away from the exhaust and slightly upward, with, diametrically opposite, a third port inclined sharply upward to carry the charge well up into the combustion chamber The exhaust is timed to remain open for approximately 150 degrees of crank angle, while the mam transfers are open for 128 deg and the third port for 122 deg As is usual with ringless piston engines, the cylinder bore is tapered slightly towards the top to improve piston seal The actual reduction m bore is of the order of 0.001 in. The cylinder head has a shallow (2.6mm deep) bowl shaped combustion chamber surrounded by a 2.5mm wide annular squish area

In common with most other current .21cu in. motors, the 21X has a 12mm crankshaft running in twin ball bearings. It has a rectangular valve port. 13mm long, which uncovers a parallel sided intake port for 195 degrees of shaft rotation. Nominal timing is 35 degrees ABDC to 50 degrees ATDC



Below: stightly unconventional it use ot separate cylinder block Note transfer channels.

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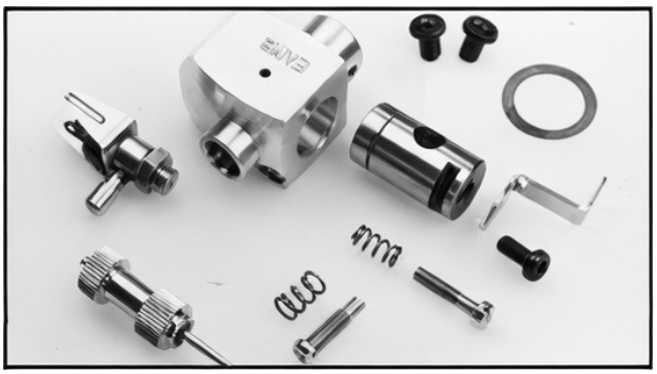


Above: parts of Enya G5.5 carburettor. Tapered groove, on surface of throttle barrel, meters fuel according to throttle opening.

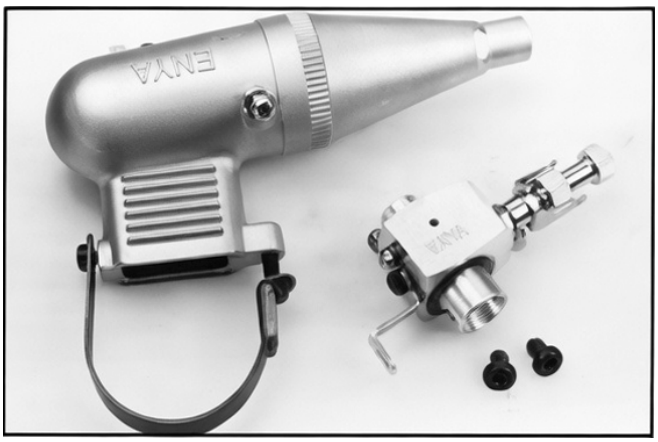
The 21X-TV is fitted with an Enya G5.5 carburettor. This is of the fixed automatic mixture control type. From a conventional needle-valve assembly, fuel enters the carburettor body and then, via a short internal transfer channel and a tapered groove on the surface of the throttle barrel, is admitted to the fixed jet tube within the barrel. The tapered groove meters the quantity of fuel relative to the amount of air admitted at different throttle openings. This takes care of mixture strength at part- throttle settings.
For fine tuning the idle mixture, a separate airbleed adjustment is provided.

The carburettor has a 5.5mm i.d choke and an effective area of 18 sq.mm.

The silencer for the 21X-TV is of typical Enya design and is of the non-baffled expansion chamber type, with a pivoted cover which permits exhaust port priming to assist cold starting The silencer has a volume of 40ml and its 7.6mm id outlet nozzle gives a fairly generous outlet area of 45sq. mm A nipple is fitted to the silencer tor pressurising the fuel tank where assisted fuel delivery may be desirable.

Performance

As an indication of the type of fuel best suited to the Enya 21X, the manufacturer lists three simple mixtures, each based on a 20 per cent lubricant content the first a straight blend of methanol and castor oil; the second containing 5 per cent nitromethane and the third containing 10-20 per cent nitromethane Our motor was run-in on the straight mix, after which all tests were carried out



Right: silencer is of simple expansion chamber type. Carburettor incorporates fixed automatic fuel metering, phis adjustable air bleed.

on the 5 per cent nitro blend as this is similar to the standard fuel used for most of our tests of two-stroke R/C engines. Typical commercial equivalents are Model Technics GN-5 and GX-5. The glow plug {not supplied) used for all tests was the Enya No. 3.

From the very beginning, the Enya 21X was found to be a pleasant engine to handle. It started instantly with an electric starter, was docile when being hand started and ran smoothly and evenly on a wide variety of props. Some engines having ringless pistons in chromed non-ferrous cylinder liners can be more difficult to hand start from cold, when new, due to excessive tightness in the piston/cylinder fit at the top of the stroke. This was certainly not so with the 21X which plopped over TDC smoothly and started easily by hand, when cold, from the very beginning Hot restarts were usually obtained with a single flick of the prop Only when the engine had cooled down, but was still warm enough to reduce compression seal and needed to be primed, did hand starting become less positive Quicker response was then obtained by applying an electric starter.

Being quite free, even when new, the Enya obviously needed little running-in and. from an early stage, shower! none of the tendency, frequently encountered in other engines, to lose power as it warmed up from cold Typical prop rpm readings obtained on 5 per cent nitro fuel, without the silencer fitted, included 9.400 on a 10 x 6 Top Flite maple. 10.000 on a 10 x 5 Top Fine maple,

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Crankshaft is orthodox: cylinder finer, of chromed aluminum alloy, is not. Note: hefty forged conrod.

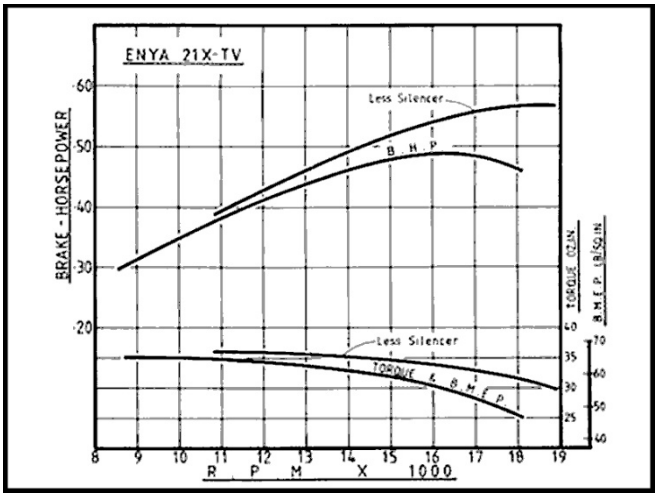
11.000 on a 9 x 6 Power Prop maple, 11.600 on a 9 x 5 Zinger maple, 11.600 on a 10 x 4 Top Flite maple. 12.300 on a 9 x 4 Top Fine maple, 13.500 on a 9 x 4 Zinger maple, 14.200 on a 9 x 4 Power Prop maple, 15.000 on an 8 x 5 Zinger maple, 15.800 on an 8.5 x 4 Zinger and 16.300 on an 8 x 5 Power Prop maple.

On test, a maximum torque of 36oz in. was recorded. The torque curve was relatively flat, as a result of which, maximum power was reached at high rpm (between 18.000 and 19.000) where a gross output (i e. less silencer) of 0.57bhp was determined This is a very good figure for a 3.5cc engine fitted with a standard R/C carburettor and tunning on mild fuel, but the 21X is perfectly happy on higher nitro content mixtures and. where the user wishes to boost output. 20 or 30 per cent nitromethane can be expected to raise peak output well beyond 60bhp, along with an improvement in torque for increased performance on the more useful prop sizes

Fitting the silencer did not cause excessive power loss on the sort of props that most owners would be likely to use. On 10 x 4 and 9 x 5 props, for example, the rpm loss (static) was of the order of 200-300 Under much lighter loads (e.g. 8 x 5) aimed at getting the engine up to its bhp peak, losses are somewhat greater, but unless one is thinking in terms of a very small, fast aeroplane, we have to call into question prop efficiency and whether it is not better to forgo peak power in the interests of the possibly greater thrust of a larger prop turning more slowly. For the majority of models using an engine of this type, a 9, or even 10 in dia. prop will probably lie the most appropriate.

As the performance curves show, fitting the silencer did not have a very great effect on maximum torque, but the torque curve fell off more sharply as load was reduced, resulting, finally, in a maximum power output of just under 0.5bhp at approximately 16.300rpm

Controls were good. The needle valve was just about right as regards sensitivity, while the response to the throttle was equally satisfactory Safe, continuous idling at 2.600 rpm was obtained on a 10 x 4 prop.
In all, a very pleasing motor.
Manufacturer: Enya Metal Products Co. Ltd. Nerimaku, Tokyo, Japan
U.K. Distributor: Ripmax Ltd. Ripmax Corner. Green Street. Enfield EN3 7SJ
U.K. Service: John D. Haytree. The Haven, Rixey Park, Chudleigh, Newton Abbot.
Devon TQ14 OAN



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