

Enya 49X

By Mike Billinton

This latest mid-size engine from Enya is as powerful as some currently available 60's.

Enya Metal Products latest Schnuerle ported offering in the medium/large capacity range is certainly a handsome engine, and, visually alone, looks to be a desirable acquisition.

Based on the 1978 40X case, the new 49X is yet a further successful stretching of an engine which had already been uprated to a 45 size a year after the first appearance. Strangely, though, we now have 3 engines based on the same case, but each of the piston/ring/liner set-ups differ. The initial 40X having a Dykes ring and alloy piston running in a hard steel liner; the 45X converting (in keep-

ing with times) to AAC; and, now, the 49X reverting to a ringed piston in hard steel liner, but jettisoning the Dykes in favor of a single standard compression ring at the normal below-crown position.

Together with the "big brother" 60X (also AAC), these 3 engines represent a creditable push by this manufacturer into the top performance bracket for large capacity R/C sports motors.

As to the purpose of all this stretching, the resulting power units often form attractive alternatives to the more usual 60 sized motors, and they are frequently found to have supe-

rior power/weight ratios, as well as having smaller overall dimensions.

Strictly, this reasoning can apply at any capacity point, with, say, 60's being uprated to 80's to provide a smaller, lighter, alternative to the typical .90 cu.in. (15cc.) motor. Undeniably so, but, the 29 to 40 size has seen much of this uprating activity, with the 49 traditionally being held in particular esteem by modelers. The McCoy 49, for example, had a considerable following in the early post-war years.

Anyway, the Enya 49X continues this long line, and at some 5 ozs. lighter than its 60 brother, is bound to find favor with those for whom the big, beefy 60 is just too much.

Mechanical points

Crankcase — this attractive one piece unit is a smoothly finished pressure die-casting, having, one imagines, a clear sales appeal when allied to the very highly finished cylinder fins and head.

Points of interest, internally, are the turned groove providing clearance for the conrod's big-end and the fairly restricted lower entry heights to the 2 main transfer passages.

Silencer or tuned pipe fixing to the exhaust stack is an optional bolt-on or strap-on.

Piston — of high-strength aluminum alloy, and runs at a clearance of .003" on the skirt with an extra 1 1/2 thousandths above the piston ring to accommodate the crown's thermal-expansions. Enya clearly does not approve of aluminum alloy as a bearing surface, because all reciprocating parts are bronze-bushed, which usually includes the gudgeon pin bosses in this piston.

Ring — this single pinned compression ring is set down .030" from piston top, is of hardened steel, and in combination with the hardened liner, is a long time a-running-in.

Liner — of hardened steel, finely honed with no taper. Exhaust port timing is a nominal 145°, but it's likely the exhaust gas "sees" the piston ring as its only obstacle (because of the overall clearance of the top land), in which case the real exhaust timing is 155°. Transfer timing lags behind the exhaust by almost 20° (at 116° total period) with boost timing even lower at 113° total. These liner intake timings are shallow by some standards and are, in any case, a reduction compared with the original 1978 40X's timings. All other timings are, however, unchanged. The transfer ports in the liner are angled up 12°, whilst boost is up 54°.

Connecting-rod — in high-strength aluminum alloy; it's .165" thick and .285" wide, and sensibly proportioned around the big and little ends. It neatly side steps all arguments about style/number/size of lube holes or slots by providing none at either end. The big end bush, though, has been reamed in what appears to be a deliberately 'harsh' way and which has, therefore, left random grooving. The resulting surface is considered quite satisfactory. In practice this proved so during this test.

Crankshaft — appears to be the 45X's crank, and certainly has same crank pin throw, timings and induction bore. The uprating to the .49 capacity has, therefore, been accomplished by cylinder bore increase of .028" (over the 45X). Prop drive is via 2 flats

PHOTOGRAPHY: MIKE BILLINTON



The 49X is typical of the kind of craftsmanship for which Enya is well known. This new motor features a ringed piston with a steel liner. The carburetor is the standard machined aluminum Enya model.

on the crank nose and matching slot in the driver. The 6mm. crankpin is solid, one piece with the web.

Cylinder-head — has usual flat squish (but set at a large .038") and with fairly shallow hemi-combustion chamber, gives an effective compression ratio of 8.6/1.

Carburetor — is the 'G-type' rotating steel barrel style as fitted to the 40X and 45X, and even retains the same choke size, .280" diameter. So, when fitted to this 49 engine it becomes more of a restriction to sheer power, but has resulted in greater ease of handling when on suction fuel tanks. Fuel mixture strength at the mid-range area is automatic and cannot be altered. This is achieved by a machined, tapered groove around the throttle barrel. The only adjustable fuel settings, therefore, are the main needle and the idle setting needle which operates air-bleed style. Proximity of the propeller to throttle stop and idle needle almost made adjustments impossible whilst engine was running. Though not a vital matter, it did take some of the joy away!

Power Tests

The main purpose here was to ascertain whether what lay beneath that exterior would match the initial visual impact. Test 1. There wasn't long to wait, because on open exhaust/5% nitromethane/22% Castor oil/suction fuel feed, and Enya opened its torque account with a high 99 oz.ins. at 9K, with a final BHP resultant of 1.36 at 17.1K. That was nice, because it was learned later that this was only just above the manufacturer's claim. Nice, because it's not always so simple! This figure puts the Enya in the same performance area as the other top Schnuerle R/C motors.

This first torque reading had been preceded, naturally, by a combined amount of running-in and initial prop RPM checks. In total, around 3/4 hr. was accumulated in this way. Clearly, the Enya piston/ring/liner style does not allow avoidance of a sensible and firm running-in period. At the end of the test actual wear on the piston-ring face was still extremely small, with the majority of the running-in process having occurred on the liner. The ring surely looks likely to outlast the rest of the engine. Its fit, though, was sufficiently good and accurate to provide easy hand starting right from the word go. Test 2. Adding to the above equipment the Enya standard 40 sized silencer (9mm. outlet dia.), caused torque to drop to a maximum 91 oz.ins. at 9K., with BHP now just over 1 at 14,500 rpm.

The only comment to make about the general manner of performance is that the results are not surprising due to the piston/ring/liner style. Hot running was the norm throughout the test when compared to the frequently encountered ABC or AAC type engines. The fact that the liner is ferrous, and is a push fit in an aluminum alloy crankcase, all must lead to a smallish rate of heat dissipation via the liner and cylinder wall. Secondly, and a little unexpected, was that the medium heat range Taylor idle-bar glow plug used throughout, did not prevent (in spite of the relatively hot running) slightly irregular running when glow leads were removed at low/medium throttle openings. This means that cool ignition was always present with the compression ratio

FLYING MODELS



Enya 49X shown with silencer. The muffler is fitted with pressure tap for use in pressurized fuel systems. Note spring type needle valve which allows settings to be made away from prop arc. Four bolt rear plate.

and equipment used in this motor. This is not a fault, rather, proof that this particular set-up and plug was just about right for full throttle operation. Certainly erring on the safe side.

Throughout the tests, atmospheric conditions were such that air density (more particularly oxygen content) was slightly below standard, so a correction factor of 1.02 has been applied to the BHP figures to compensate.

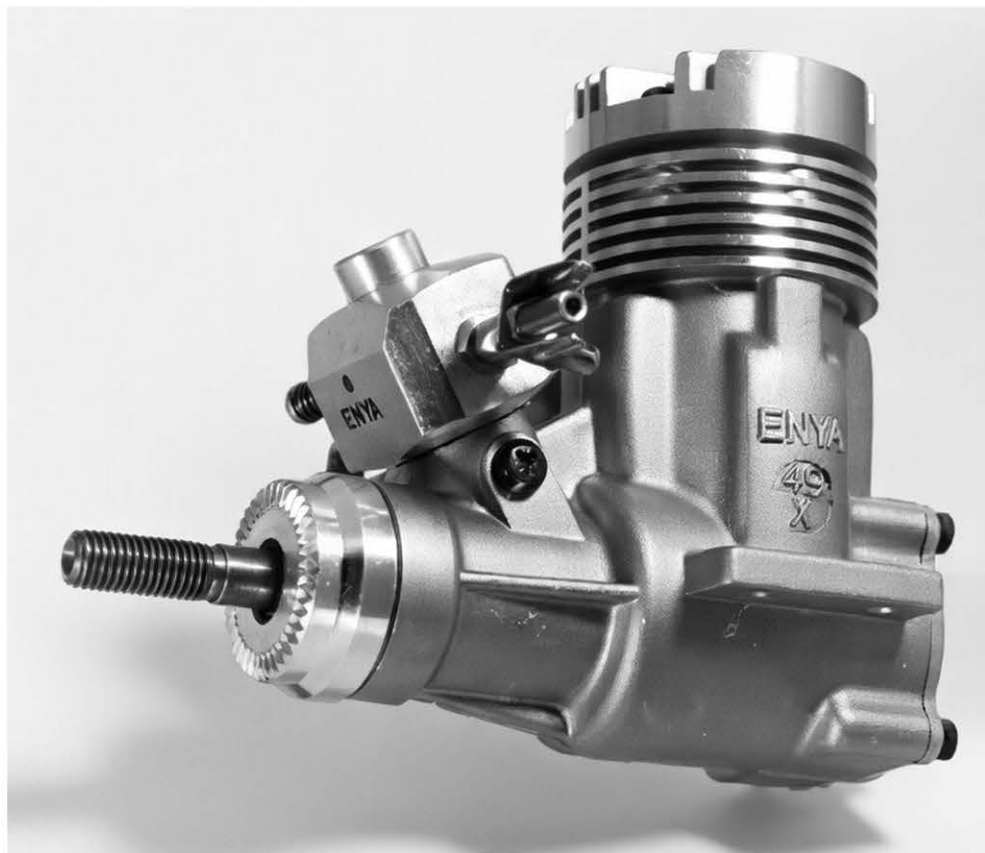
Final R.P.M. Checks

These followed the Power Tests and showed an average increase of 200-400 RPM over the

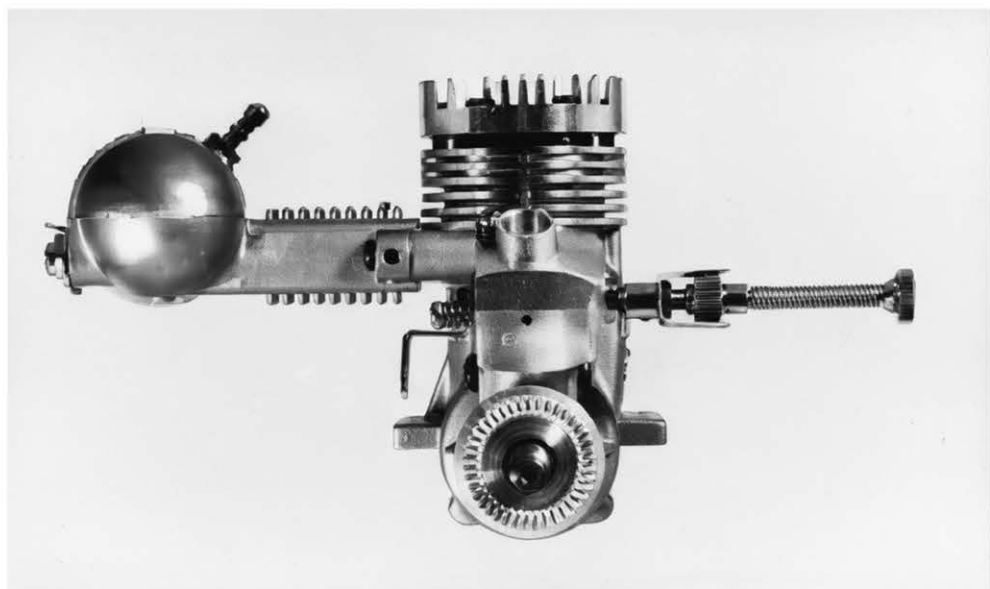
initial checks of the new engine. Nine different propellers were used, with and without silencer fitted. Reductions in RPM resulting from use of the silencer ranged from around 300 at the 9K area to 1,200 at the 16K area.

It's worth commenting at this point about the matter of RPM figures. Whilst they are certainly of value for comparative tests in known weather conditions, RPM figures can benefit from a little interpretation on occasion. To mention just some of the points where anomalies can occur will indicate to readers some of the problems.

Dense, oxygen rich air, compared to stand-



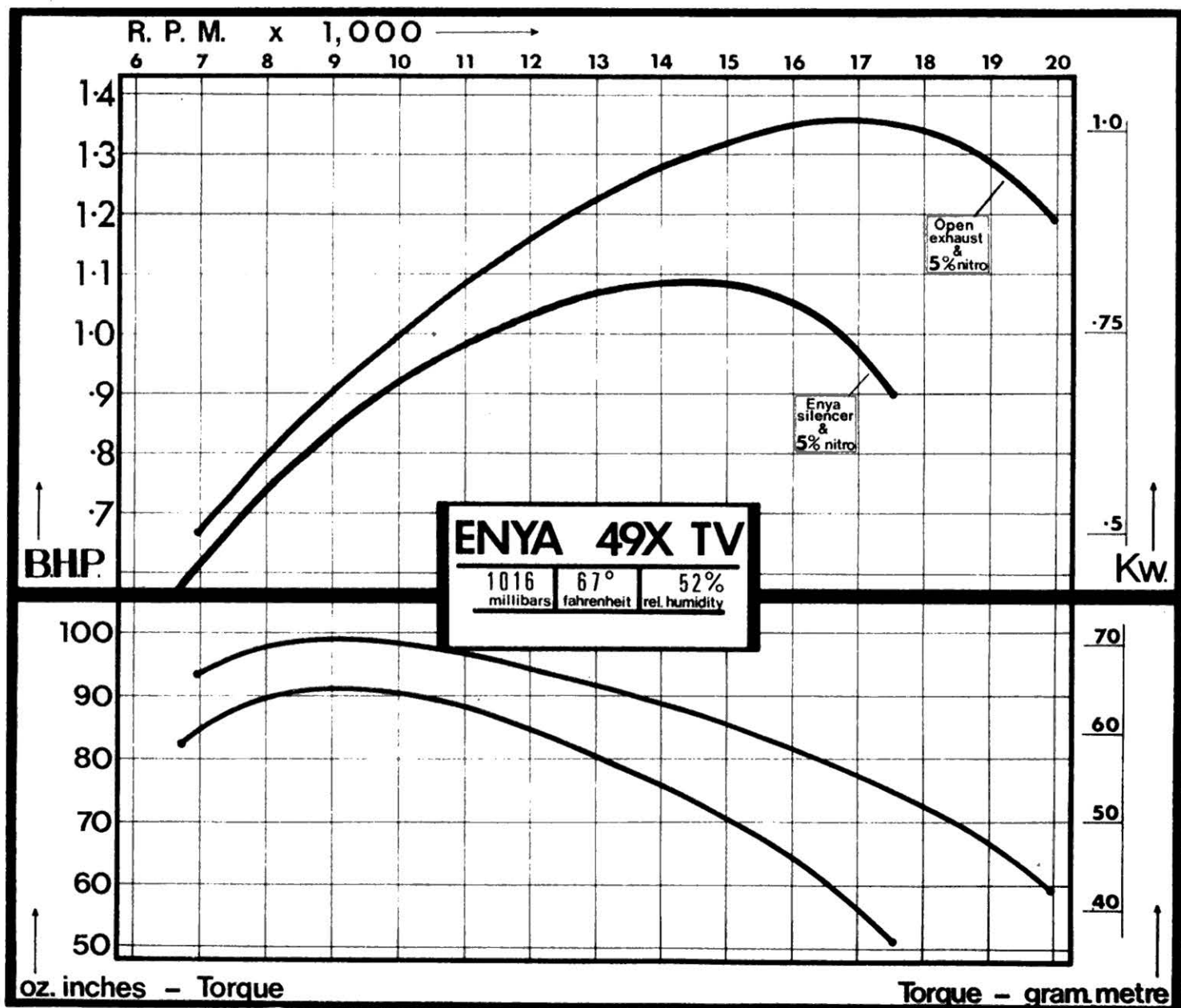
Motor features hefty casting, but still weighs almost five ounces less than most 60's. That should make it popular with budget conscious modelers. Carb choke size is .280", the same as the Enya 40X and 45X.



Front view of the Enya 49X with silencer in place. Cylinder head features usual flat squish and fairly shallow hemi-combustion chamber. The 49X has an effective compression ratio of 8.6/1. Good power.

ard, will both increase power and increase air resistance on propellers, with the likely resultant that no RPM increase will be achieved. Sometimes, even a small reduction in RPM will occur, and this is further confused by the fact that some props will be completely stalled due to high (static) pitch, and this can lead to yet further differing results.

Alternatively, a dense atmosphere may be such, largely because it contains a lot of water vapor, that the specific reduction in oxygen content gives a reduction of power, whilst the prop itself is still having to contend with a thick medium. In this case, RPM reduction could be considerable compared with "average" weather conditions. That's when conditions are static. If one then adds to these points the effect of air density changes on the aircraft itself (it could be flown on a smaller area prop when density is high, or vice versa), plus another known fact that, all things being equal, increase of RPM allows smaller area props to be used, then it can be seen that the potential problems are large. The actual problems are usually much smaller, and only of



interest where high performance is sought. It should be clear, though, that severe atmospheric changes can lead to suspect RPM results when comparing engine performances.

Idling performance

Lowest RPM reached down to 2,600 using the idle-bar Taylor plug, but 3K is more satisfactory for more certain long term running. Possible air bleed settings were relatively so broad that they could be called vague. Consequently, aiming for consistent, quick pick-up, from that idle to mid or full throttle, proved to be the only method giving a quick easy result.

Other Carb points

The particular style of main needle valve used allowed some escape of fuel past the threaded section, and this is likely to be more of a problem in the event of a pressure fuel system being used. Apart from this, and the difficult running adjustments mentioned earlier, the carb worked well and consistently, with main needle settings being securely held steady.



Enya 49X broken down into its component parts (above). Note porting of sleeve at center of photo. Polished head and streamlined muffler makes for an attractive engine (below). Carb bore just visible.

Enya 49X TV

Dimensions & Weights:

Capacity - 486 cu.in. (7.97 cc.)
 Bore - .878 in. (22.3 mm.)
 Stroke - .8037 in. (20.4 mm.)
 S/B ratio - .917/1
 Timing periods - Exhaust 155°
 Transfers 116°
 Boost 113°
 Front Induction opens 35° ABDC.
 closes 48° ATDC.
 Combustion volume - .78 cc.
 Compression ratios - Theoretical 11.2/1
 Effective 8.6/1
 Ex. port height - .280 in.
 Cyl. head squish - .038 in.
 Squish band width - .15 in.
 Squish angle - 0°
 Overall height - 3.4 in.
 Length - 3.35 in.
 Width - 2.05 in.
 Mounting Holes - .7 in. x 1.7 in. (hole dia. .13 in.)
 Frontal area - 4.96 sq.in.
 Carb. bore - .282 in. (7.1 mm.)
 Effective choke area - .062 sq.in. (40 sq.mm.)
 Crankpin dia. - .236 in. (6 mm.)
 Mainshaft dia. - .590 in. (15 mm.)
 Induction bore - .448 in. (11.4 mm.)
 Induction port opening - .58 in. x .4 in. wide.
 Con-rod centres - 1.36 in. (34.5 mm.)
 Gudgeon pin dia. - .1968 in. (5 mm.)
 Weight (bare) - 12 3/4 ozs. (.36 kilos)
 Weight (with silencer) - 15 1/4 ozs. (.44 kilos)

Performance:

Max. BHP: 1.36 @ 17,100 RPM. (Open Ex./5% Nitro.)
 1.08 @ 14,500 RPM. (Silencer/5% Nitro.)
 Max. Torque: 99 oz.ins. @ 9,100 RPM. (Open Ex./5% Nitro.)
 91 oz.ins. @ 9,000 RPM. (Silencer/5% Nitro.)

Performance Equivalents:

BHP/cu.in. - 2.79
 BHP/cc. - 17
 Oz.in/cu.in. - 203.7
 Oz.in/cc. - 12.4
 Gm.metre/cc. - 8.9
 BHP/lb. - 1.7
 BHP/Kilo. - 3.77
 BHP/sq.in. frontal area - 27

Manufacturer:

Enya Metal Products Co. Ltd.
 Tokyo, Japan

U.S. Distributor:

Model Rectifier Corp.
 2500 Woodbridge Ave.,
 Edison, NJ 08817, U.S.A.



Summary

This test of the Enya 49X was one of the very few occasions where the writer has come to grips, in a serious way, with an Enya product. Consequently, there was some uncertainty as to what to expect. In fact, there should have been no need for concern. This manufacturer has been around for a long time, and, being one of the major Japanese mass producers of model engines, it was hardly likely that this latest offering in a quite competitive area would be other than very good. (Which is how it turned out.) The motor is

bound to find favor in the new smaller breed of R/C aerobatic aircraft, and, being almost 'fully bored and stroked' is likely to be successful in that area. The combination of a large motor inside a small case, and the piston/liner style, both mean that heat output and dissipation may get out of phase with each other unless quite generous air-cooling is always provided. Used as a standard sports motor it would quite dole, and has a useful spread of power enabling use of large propellers at lowish RPM's. Equally it would seem to have a long life expectancy.