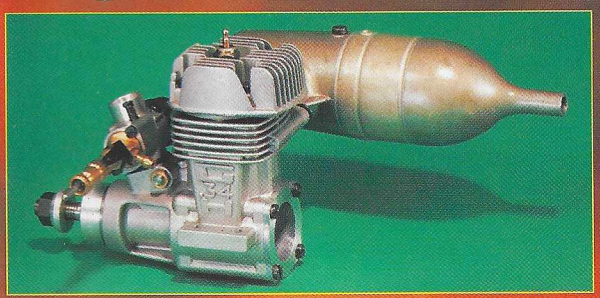
MODEL Helicopter WORLD

JANUARY 1994. PRICE: £2.95 (UK). $5.00 (USA). GDM 8.50 (FRG)

Win a Super Tigre G34-H



World Champs Exclusive

European Hirobo Cup '93

Robbe Schluter Moskito – On Test

A Traplet Publication

9 770953 788027 01

The World's Leading R/C Model Helicopter Magazine

THE ROBBE/SCHL

Moski

The Robbe Schluter Moskito was first seen at the 1993 Nurnberg Toy Fair when it was launched as an all new 40 to 50 sized model specifically designed to meet the needs of the newcomer to the hobby, but also capable of being set up for more advanced flying. The most striking features which caught the eye was the moulded-in pilot, tricycle undercarriage and the engine which is mounted across the model. Those who had the opportunity to give the model a closer inspection would also have noticed that the Moskito is the first 'plastic helicopter' to come out of the Robbe Schluter factory and represents a very large step away from their long standing approach of producing a predominately metal helicopter. When this fact is added to the transverse gear train and other options open to the builder, we have the most innovative model which has been seen for many years.

The Moskito is a compact model with a rotor diameter of 1200mm, tail rotor diameter of 225mm, overall length of 1100mm and overall height of 420mm. As mentioned it will accept engines in the 40 to 50. range which can be either aero or heli versions. Either four or five servos can be used although the use of five servos is to be recommended. (If four servos are to be used then one servo operates the throttle and collective pitch.) Another new feature for Robbe Schluter is that the tail drive is via a toothed belt which is no doubt there to reduce the common problem with newcomers of having a slipping tail drive wire plus it makes sense bearing in mind the drive layout. The model can be built either with clockwise or anti-clockwise rotation without any extra parts being needed. A choice of using a skid or a wheeled tricycle undercarriage is provided along with a choice in how the canopy is finished. Thus the Moskito gives the builder a number of choices both mechanically and in the final look of the model.

The majority of components are moulded in a high quality plastic material and a great deal of thought has gone into these to ensure a quick and easy construction which incorporates great strength. The mechanics are made up of three modules;

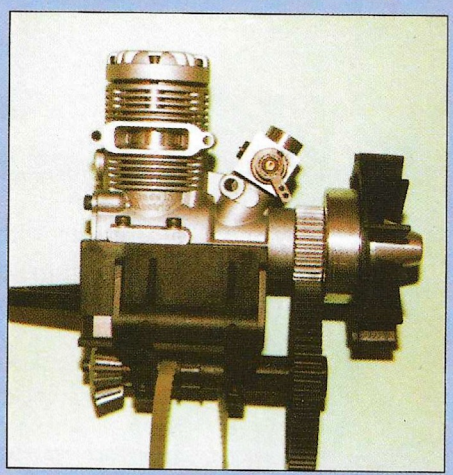
a) *The engine, clutch and drive assembly.*
b) *The upper section carry ing the mast, servos, tail mounting and controls.*
c) *The combined front and lower section which includes the integral cooling duct, tank location, undercarriage mounting and radio mounting areas.*

Assembly of these modules involves the engine section bolting into the upper section which is then added to the lower and front section. The two stage gear reduction used in the model makes the mechanics tall and narrow as the engine and clutch assembly is at the bottom, above which is a transverse lay shaft which takes the drive, via a crown wheel and pinion, to the mast. The tail drive is taken off the lay shaft via a toothed pulley. This layout puts the centre of gravity very low in the model which adds to the models marked stability.

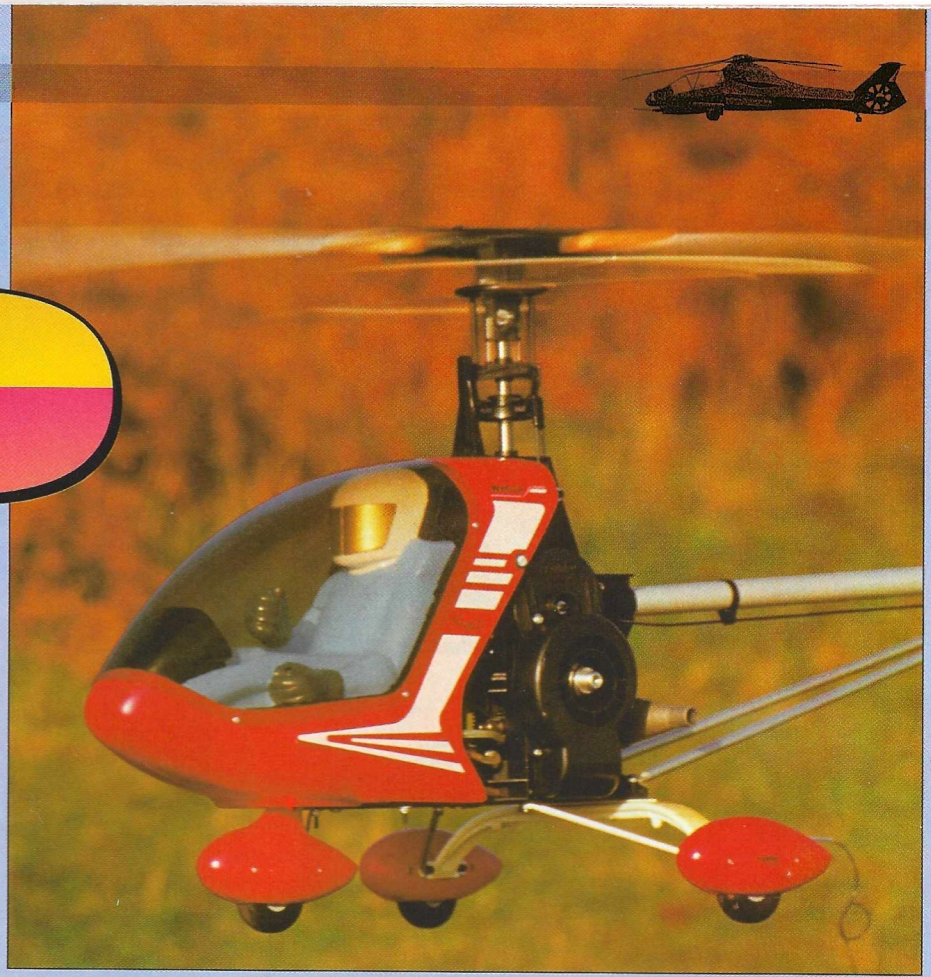
Packaging of the Moskito is also novel as the box comes with a built in handle which when unpacked you discover is in fact a skid! The model components are pre packed in plastic bags which are numbered to correspond with the building sequence. A 48 page Assembly and Operating Instruction Manual provides all the information required to build the model in German, English and French along with exploded views of the components. In addition to this is a large two part plan showing the model with exploded views which makes this one of the best sets of instructions I have ever seen.

The box lid shows the Moskito canopy without the screen but with the 'cyclic lever'.

Webra 40 fitted with the clutch and fan, gear mesh was perfect and the engine is adjusted to ensure the gears line up.



LUTER ito



Construction

Before construction starts a decision has to be made which is whether the model is to have a clockwise or anti-clockwise rotor direction. The instructions provide two sections with a large capital 'R' or 'L' to differentiate between the two. Thus each section covering this option has two diagrams and sets of written instructions and you use the appropriate one. It is important to note that the sign for the use of Locktite is a capital 'L' in a circle and is nothing to do with Left or Right hand rotation!

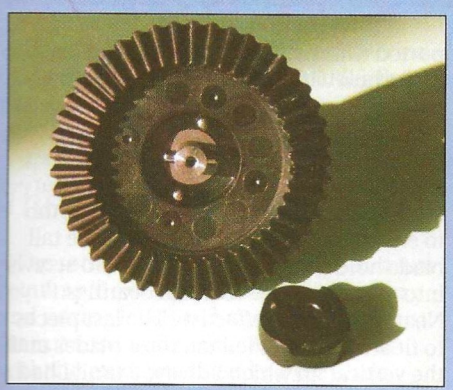
The way in which the direction of rotation is decided is simplicity itself. As already mentioned the lay shaft sits across the model and is driven by the gear on the clutch bell so it always rotates in the same direction. The pinion gear which drives the main gear can be fitted on either end of the lay shaft and it is this that reverses the rotation of the head. This method means that there is no problem with the direction of the drive to the tail rotor as it comes off the lay shaft. As clockwise rotation is more popular in the U.K., I decided to build the Moskito with this rotation.

The first part of the assembly is to fit the lay shaft and associated parts into its moulding which is also the engine mount. This incudes the toothed tail drive pulley and of course the drive belt. The next job is to fit the engine and clutch assembly and it here that I came across a limitation of the model that surprised me. It transpired that the choice of engine for the Moskito is very limited as the engine mount will only accept a crankcase that is 34mm or less in width and the crankshaft has to be correct as well. A stepped crankshaft is needed (the prop driver is not used) from 9mm to 1/4" and the crankshaft thread needs to be 1/4 UNF as the starter cone is used to lock the drive assembly onto the crankshaft. The Moskito is designed around the Webra 40 and 50 and fitting other engines (other than possibly the Enya SS40 or SS50) is likely to cause problems either in fitting the engine into the engine mount, bearing in mind that the mount is designed for 3mm fixing bolts spaced at 42mm, or fitting the clutch to the shaft. I therefore purchased a Webra Speed 40 aero engine which not surprisingly fitted perfectly.

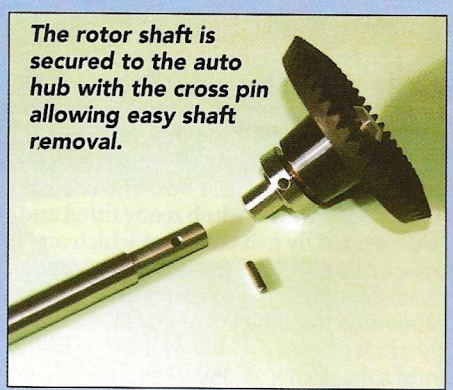
Care is needed to shim the clutch assembly correctly to avoid interference between the clutch gear and the front of the crankcase. The clutch centres automatically on a split tapered collet and the clutch bell runs on a needle roller ensuring that the clutch will run smoothly and cleanly. The engine is adjusted fore and aft in the mount to ensure a perfect line up between the clutch bell gear and the lay shaft gear.

The main gear and auto rotation assembly is next on the list and the mast is locked into this with a steel pin held in place with a grub screw. This system is better than the original design as it means that the mast can be removed very quickly, holes are provided in the upper moulding to allow the removal of this locking pin. The auto clutch is the ratchet type using two steel pins which are spring loaded in the base of the main gear hub. These pins engage onto a special double sided drive ratchet where you choose which face to use appropriate to the direction of rotation. The mast is supported with two ball races in the upper moulding and held in place with a ring clamp. Once the mast has been installed in the upper section, the engine assembly is bolted into ►

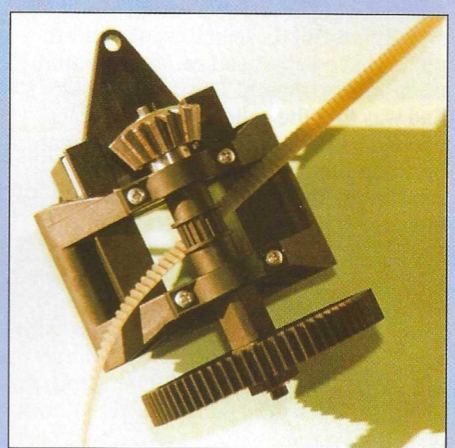
Ratchet auto clutch, the ratchet is double sided for both rotations.



The rotor shaft is secured to the auto hub with the cross pin allowing easy shaft removal.

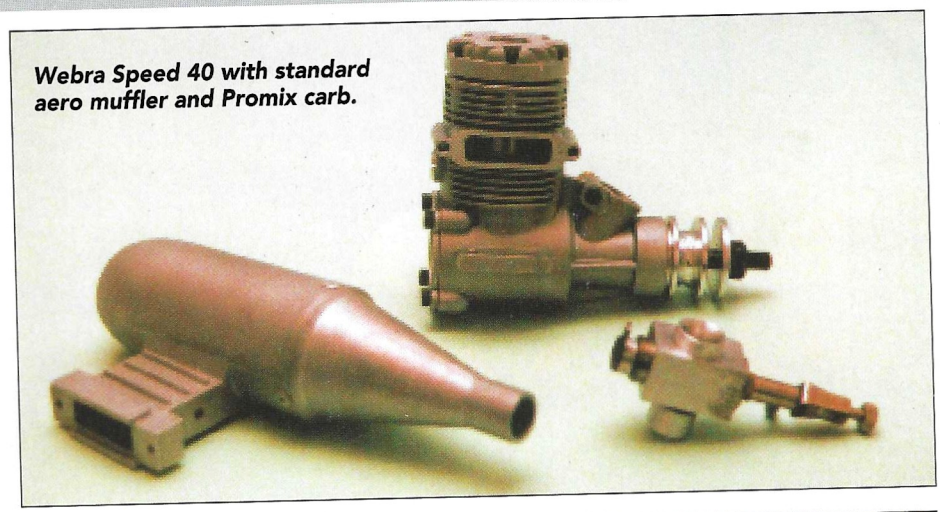


Lay shaft fitted with the toothed tail drive belt. The steel pinion gear is fitted behind the reduction gear for anti-clockwise rotation.

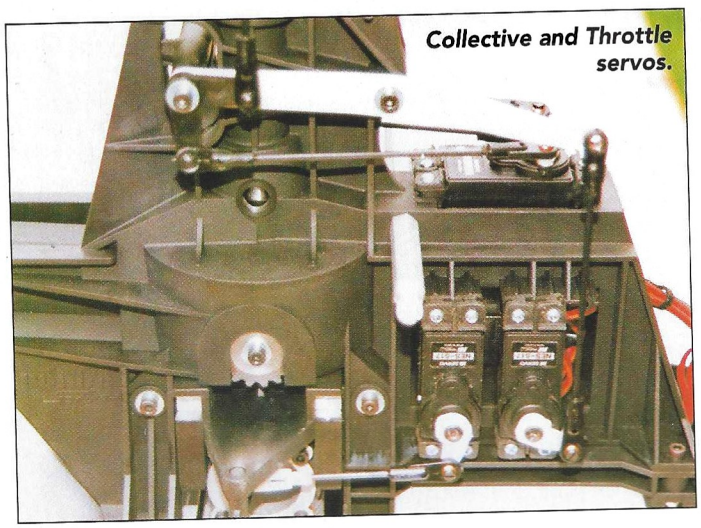


place although the clutch and intermediate gear have to be removed to achieve this. The standard aero silencer is fitted next as access to the forward fixing bolt is nigh on impossible later.

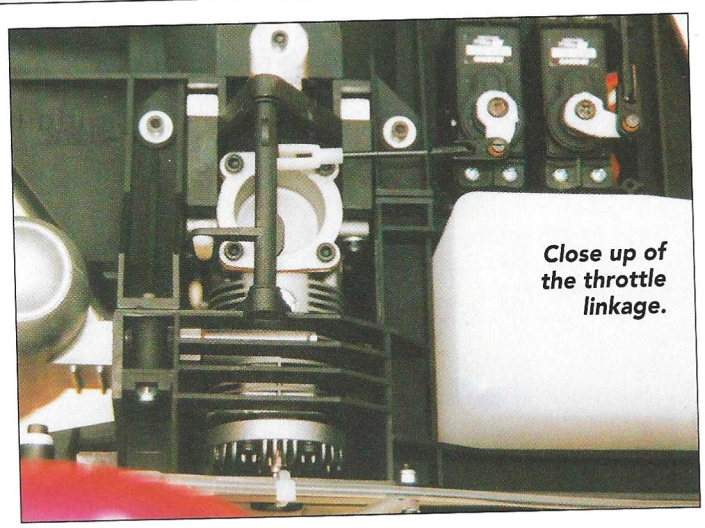
The fuel tank fits into the lower section which can then be bolted to the completed upper section. A special throttle linkage has to be installed at the same time which takes the linkage from the radio tray at the front, down and across the rear of the mechanics to the carburettor. The top and bottom sections only use four bolts to hold them together which in practice has proven to be perfectly adequate. The clutch etc is then refitted along with the gearbox cover and fan housing.



Webra Speed 40 with standard aero muffler and Promix carb.



Collective and Throttle servos.



Close up of the throttle linkage.

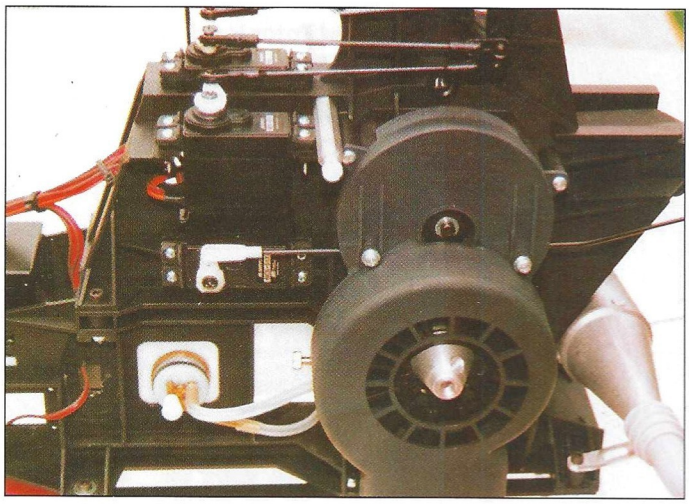
Control system

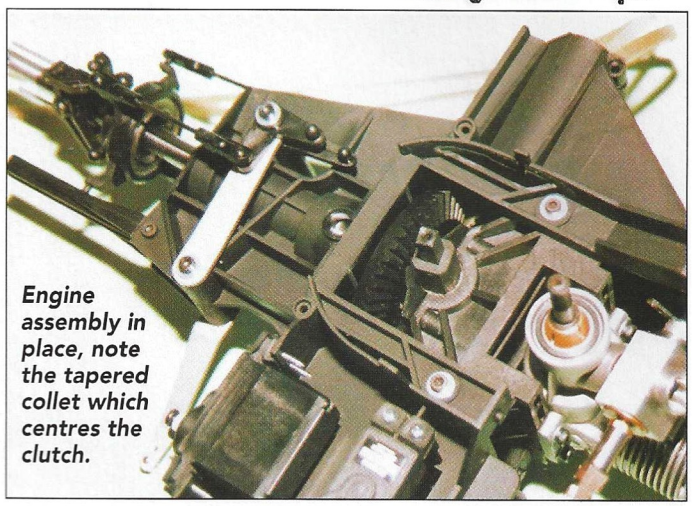
It is at this point that the builder has to decide on whether four or five servos are going to be used. Detailed instructions are provided for both and as mentioned five servos are to be recommended. Standard ball raced servos are quite adequate for the Moskito. The cyclic inputs to the swashplate are via special bell cranks which are mounted on a cross shaft behind the mast. This cross shaft is supported by two collective pitch levers which pivot on a second cross shaft in front of the mast and the collective servo is linked to the longer of these brackets, thus the collective servo moves the rear cross shaft up and down which moves the swashplate. All these bell cranks etc are plain bushed and need careful assembly to minimise friction. The only difficulty I had was that the collective pitch levers needed a little tweaking to bring the gap between them to the right size. The swashplate then fits over the mast and is connected to the cyclic levers with push rods. This is followed by the collective pitch compensator which had been previously assembled. I found that the compensator was rather tight on the mast and needed to be eased to achieve a smooth and slop free movement. The resulting assembly felt a little tight but was without any slop.

The tail

At this stage the toothed tail drive belt has already been fitted to the lay shaft and is hanging out of the rear of the mechanics. The belt is fed through the tail boom using a hooked wire that is supplied in the kit for this very purpose. The slotted boom locates into the top moulding and is pushed all the way in to allow for the assembly of the tail gear box. The tail rotor shaft comes with the hub ready fitted and is supported by two ball races which are pressed into the tail gearbox halves. The assembly of this is easy (provided you remember to fit the tail pitch slider onto the shaft first) with the toothed gear fitting onto a flat on the shaft avoiding the use of grub screws in the drive chain. The only possible problem would be of a twisted drive belt but that is almost impossible to achieve as any twist in the belt would make the assembly almost impossible.

The one piece tail blade holders are supported with twin ball races that are fixed to the hub with 2.6mm cap head bolts that must be secured with locktite. These bearings are fitted to the hub first with a spacer between them and the blade holder then slides the lot. I found that the inner bearing needed to be held away from the hub to ensure that it seated properly. The tail blade holders are retained with two screws into the spacer between the bearings. Neat, simple and effective. The last pieces to fit are the moulded tail rotor blades and the vertical fin which I delayed until I had





Engine assembly in place, note the tapered collet which centres the clutch.

The starter cone also secures the clutch assembly to the crank shaft, easy starting!

painted it. Tensioning the belt is again simple, all you do is hold the model vertically nose down by the tail, add a 2-3kg weight to the nose and tighten the clamp bolt. The resulting tail is simple effective and slop free.

Undercarriage and servos etc

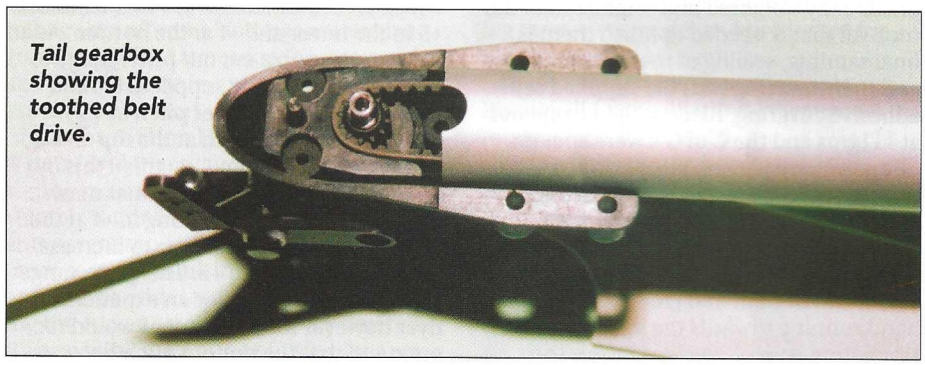
As already mentioned two undercarriages are supplied, a traditional skid set or the wheel and spat tricycle set. For the beginner I would recommend the skids while for those who want something which looks a little different (me) the wheels are the thing to go for. All parts are supplied including the wheels and the spats just require painting.

A pair of tail boom supports are fitted which are longer than the pre-production example and the mounting includes fixing points for the tail plane.

The head and set up

The rotor head is pre-assembled and just requires the one piece Hiller ring, flybar and mixing levers to be added. The instructions again cover both rotations with the pitch levers leading the blade holders. I was pleased to find that the blade holders are thrust raced and the flybar carrier ball raced. The links from the flybar to the mixing levers and from the Hiller ring to the swashplate are fixed length leaving only the mixer to swashplate links adjustable which makes setting up as simple as it can be.

A 'U' section is supplied which acts as a spacer for the swashplate so that when connecting up the servos the rods can be set exactly ensuring that the various bell cranks and the pitch lever are all set horizontal with the servo arms at right angles to the servos. No guidance is given for the distances that the links should be from the centre of the servos. I opted to use standard servo arms with the links connected on the outer hole, 12mm from the centre on all the servos. Again for the setting up for each rotation, two distances are given for the tail off set on the tail pitch slider. The tail pitch rod is a two piece affair and runs through the cooling shroud and so has to be carefully bent to the shape shown, three supports are used along the boom for a friction and slop free installation. With this set up the adjustable pitch links are adjusted for 5 degrees of pitch on the rotor blades.



Tail gearbox showing the toothed belt drive.

The receiver gyro and battery are all mounted on the front tray although the gyro can be installed behind the mast however I preferred to have it out of sight under the canopy. The battery is housed underneath the tray and so needs to be the right size (50mm max. width including packing) to fit properly. Provision is made ►

Neat tail gearbox and double ball raced blade holders.

Completed Rotor Head, Mixer and Swashplate.

in the mouldings for both the radio switch and gyro box if needed.

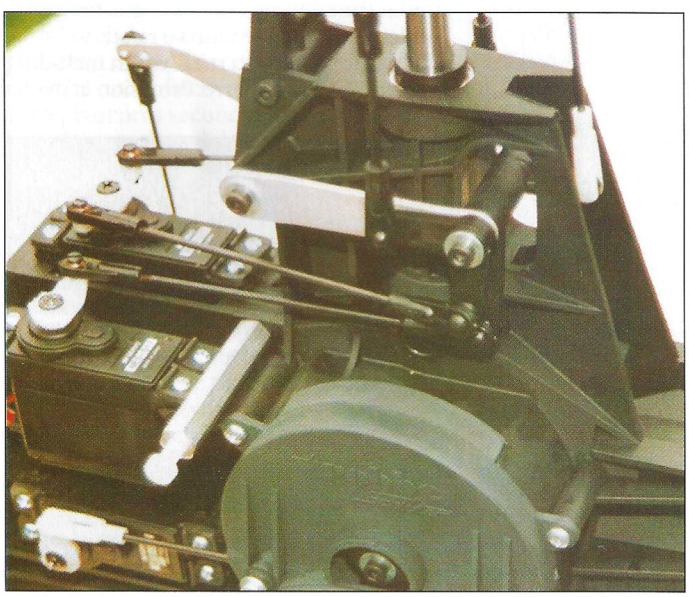
The symmetrical rotor blades are supplied ready weighted and reinforced at the root. All that is needed to finish them is final sanding, sealing at the roots and tips and then covering with the supplied self adhesive covering. Blade weight came out at 111gms and the C of G's were spot on.

Finally there is a choice of how the canopy can be finished, either with or without the ready cut to size smoked screen. If you decide not to fit the screen then a piece of plastic rod is supplied which can be bent and glued to the pilots hand running towards the swashplate simulating an early cyclic control. The canopy is very cleverly designed as it completely covers the radio equipment and you can really go to town in painting the pilot to contrast with your choice of colour for the rest of the model!

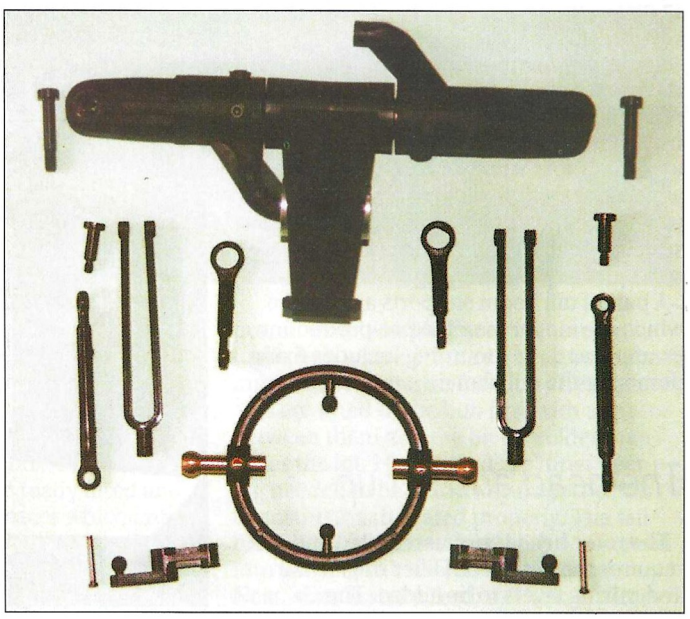
Before rushing off to the flying field I checked the pitch range on the model which is recommended at +10 maximum, +5 in the hover and -4 at the bottom. As an aid to setting up a cut out pitch gauge to set the hover pitch is supplied. I found that by setting the hover pitch at +5 degrees I had too much at the top and not enough at the bottom. I rectified this by shortening the pitch rods so that maximum pitch was +10 resulting in -4 at the bottom and I used the radio to increase the hovering pitch to +5. This pitch range is perfectly adequate for an experienced flyer however for a beginner I would recommend that the bottom pitch be brought up to about -1 degrees. I also expected to find that the model would be over pitched with only a 40. Lastly I did the obligatory check that all the controls including the gyro were working in their correct sense.

Out to the flying field

Supplied with the kit is a starter adapter that plugs into a standard starter rubber because the starting cone is a smaller size. This makes starting very easy, a hand on the head to both steady the model and to hold the blades leaves the right hand free to use the starter. The instruction show a remote glow socket which is not supplied and I didn't bother with one as the glow plug is easily accessible from underneath with a standard glow clip. The tank was filled with Model Technics 2% Duraglow



Here you can see the cyclic bell cranks and cross shaft plus the tail pitch wire.



Rotor head and associated parts.

and once a failed glow battery had been sorted out the Webra started very easily after a prime by momentarily putting a finger over the exhaust (exhaust pressure was used).

The first tank was used to run in the engine which as it is an ABC does not need extended running in, just a rich two stroke and not over stressing. With the second tank the model was sitting happily in a very steady hover showing very little sign of wanting to do anything else! Right from the first hover it was clear that the Moskito is very stable and the low centre of gravity is very apparent in its handling. As expected the model was over pitched and bringing the top end pitch down to +8 degrees gave a consistent engine run during climb out which was quite acceptable. Also apparent was that the cyclic controls were pretty sharp and that the -4 degrees at bottom stick was not needed as the collective was also pretty responsive.

By taking the full negative back to -2 and adding in 30% exponential to the cyclic the Moskito became one of the most stable and forgiving models I have ever flown. By the fourth tank everything had bedded in and as it was a calm day I tried a hands off test. It just stayed there requiring only very small cyclic inputs to keep it where I wanted it. In fact, for well over five minutes I didn't touch the collective or tail, in the end the model started to climb very gently due to the reduced fuel load and all I did then was to ease off the collective a little and down it came again very gently.

Taking the Moskito into forward flight proved uneventful with slow, low level circuits giving the opportunity to get used to the slightly unusual shape and 'sit' of the model. The slightly upswept tail combined with a canopy giving the appearance of being slightly tilted up, plus the very tall mast produces a model which looks very different. This of course is not a problem and the newcomer wouldn't have anything else to compare it with! These features are not there just for looks though, the upswept tail gives greater ground clearance for the tail rotor (useful on rough grass) and the tall mast keeps the main blades well away from the boom in fact the rotor blades would have to flex over seven inches before getting anywhere near the tail boom, both good safety measurers for the newcomer.

A sedate training model cannot be expected to perform precision aerobatics and so it was going to be interesting to see what I could press the Moskito into. In faster forward flight the Moskito showed itself to be fairly sedate in terms of speed which is not surprising with a model weighing some 7lb 8ozs powered by a 40 engine. Roll cyclic is very powerful making rolls surprisingly fast however they take some work to make them tidy as once upside down that low (now high) C of G accelerates the last half of the roll, in other words it tends to fall off the top. Loops are possible although the relatively slow entry speed makes them rather a strange shape as it runs out of vertical climb very quickly. I tried various head speeds and found that the head handled 1800 RPM without problem and the blades stayed perfectly in track. The high head speed made surprisingly little difference to the performance and so I settles it back to about 1600 RPM at which it is very happy.

Conclusions

This model builds easily and accurately, the instructions and drawings give the complete newcomer every possible encouragement and guide to produce the model as the designers intended. There really are very few areas to go wrong. As a trainer it is superb, forgiving but with a control response that gives you confidence. The low centre of gravity produces a marked 'pendulum effect' so that if a brief and sharp cyclic input is given the model wobbles and quickly returns to a steady hover and this gives confidence. The same effect is also noticeable in forward flight where in a turn there is a tendency to return to level flight. The overall feel of the Moskito urges you to make use of the wheels with 'touch and goes' and rolling take offs and landings although a good flat surface is needed for these tricks and you could be tempted to push this aspect a bit too far!.

One observation I have about the model is that I find it hard to understand the reasoning behind making the Moskito only suitable for one range of engines. As an entry point model, it would perhaps make more sense to think in terms of the model accepting a wider range of engines including the current crop of economy engines. By providing the option of using four servos and hence an aero transmitter it would be logical to expect the model to be attractive to fixed wing flyers who might be tempted to try the Moskito on the basis that they could use their existing aero radio and .40 engine whatever the make when in fact they can only do this if they have a Webra 40 or 50. A bit short sighted?

All in all for the beginner it makes an excellent choice and for the more experienced modeller who wants something a little different, you will have a lot of fun with it. Without doubt there is the capability in terms of control response and collective range for the Moskito to be made into a pretty wild machine, I have heard that one of the pre-production models was put through a pretty extensive 3-D schedule. To achieve that sort of performance it will most likely require very high head speeds as the gear ratio of 6.92:1 keeps the engine speed low, at a head speed of 1600 RPM, the engine is only turning at 11,072 RPM which is well below its maximum power output. This ratio for normal head speeds takes full advantage of the engines torque curve but if you want maximum power then the engine will need to unwind to higher revs and so the head revs will get very high, 15,000 on the engine produces 2,168 on the head indicating that the model was not designed for this sort of treatment. The standard blades perform well but being pretty light and symmetrical in section, auto's will be limited. Crash 'survivability' hasn't been tested yet (I hope it won't be!) but as mentioned it should withstand quite a bit of misuse.

The Webra 40 is performing very well and throttle control with the Promix Carb is excellent, I would thoroughly recommend the use of this carburettor as opposed to the standard TN item. The only irritating point I have found is that with the standard aero exhaust it is rather noisy and the exhaust tends to get everywhere including being sucked into the very efficient cooling fan so that oil drips from the duct after use and clean down. The solution is to fit a 'dumpy' type of silencer with the exhaust pointing rearwards or alternatively fit a tuned pipe, (a specific pipe and various header pipes are available from Robbe) however the beginner should take the former option.

In due course we will be fitting a Webra 50 which should improve the aerobatic performance and give us the opportunity to further explore the Moskito's potential.

Our thanks go to Ripmax PLC for supplying the review model and to Modtec for assisting with the engine.

The Robbe Moskito is available via Ripmax PLC who distribute through all model shops for £299.99.

Webra Engines are distributed by Modtec again through all model shops, the Webra Speed 40 costs £136.66 while the Webra Speed 50 H costs £28.78. □

Jon Tanner

P.S.

Ripmax have informed us that Robbe are aware of the limitations in engine choice and are developing fitting kits for other engines which should be available by the time you read this review. We have also heard that the OS 46SF can be fitted with some modifications to the engine mount.