READ INSTRUCTIONS & STUDY DRAWINGS CAREFULLY BEFORE STARTING CONSTRUCTION

The TYKE requires only basic modelling tools i.e. screwdrivers, spanners, drills, scissors, etc. Build the TYKE in the steps as shown and ensure each step is correct before moving onto the next stage. The TYKE has been rigorously tested over many months and will prove to be a very durable and practical model. However, this depends to a large extent on the amount of care taken during construction.

Helicopters are relatively complicated machines and there are no redundant parts; if something falls off or comes undone it will probably crash, so take your time. The 'that'll do' attitude during construction will inevitably lead to trouble later.

Do not fully tighten nuts and bolts during construction of the mechanics; when each stage is completed and you are happy that all is correct loosen each bolt in turn and apply 'threadlock' to the threads before final tightening.

NOTE: the numbers in brackets in the building instructions, e.g. (2xM3x12) refer to the size of the bolt to be used in that step; the first number, e.g. 2, indicates the number of that size of bolt required, the second number, e.g. M3 indicates the thread size and the third number is the length of the bolt in millimetres.

UNDERCARRIAGE ASSEMBLY (Figure 1)

Bolt the two angle brackets to the main chassis plate (2xM3x12). Fit the undercarriage (u/c) legs (4xM3x20) - note that the aerial tube guides go to the right. Fit the tank platform to the u/c legs (2xNo. 2x6 screws). Fit the skids to the u/c legs. The skids are a tight fit - place skid in a vice and press into place using a twisting motion. There should be approximately 50mm of skid projecting beyond the rear of the u/c leg.

Finally fit the cooling shroud bracket to the rear of the main chassis plate (1xM3x12).

Note - do not fit the canopy posts to the chassis yet, as these will get in the way during later stages of the building.

MAIN GEAR & PINION SHAFT (Figure 2)

The main gear shaft is the longest of the two provided and has a threaded hole in the top of the shaft.

Slide the main gear onto the main shaft with the main gear boss nearest to the end of shaft. Align the holes through the boss and shaft and tap the rolled pin into place using a suitable drift. Be careful to avoid damaging the gear teeth.

Slide both bearing housings onto the main shaft - note that the lower bearing carries the weight of the model and the shoulder of the bearing housing should be uppermost i.e. ball bearing towards the main gear. Bolt the main shaft assembly to the main chassis plate (4xM3x30).

Similarly slide the pinion shaft bearing housings onto the pinion shaft (the one with a plastic gear moulded onto the end). Ensure that the ball bearings face outwards and bolt this assembly into place (4xM3x30).

The meshing of the gears will seem tight at first: this is correct. Lubricate the gears with thick oil and use 'threadlock' on the bolts.

Finally fit the large toothed pulley to the pinion shaft ensuring the grub screws (2xM4x8) locate on the flats on the shaft (see Figure 7). This pulley should be as close to the main chassis plate as possible - just 1 to 2mm clearance.

CLUTCH & FAN ASSEMBLY (Figure 3)

Assemble the parts onto the crankshaft of your engine as shown. It may be necessary on some engines to enlarge the hole in the fan/flywheel; also some trimming of the fan blades may be required to clear the carburettor.

This is quite in order but trim as little as possible from the fan blades and when enlarging the hole to fit the crankshaft ensure that it is still a close fit and turns concentrically.

ENGINE MOUNTING (Figure 12)

The objective of this stage of the build is to have the engine firmly bolted to the main chassis plate such that the crankshaft is parallel to the pinion shaft at a distance of approximately 76mm, so that the drive belt is fairly tight, and that the two pulleys on the crankshaft and pinion shaft align.

There are several ways of achieving this but probably the easiest is as follows.

Drill the two engine mounting blocks to suit the engine fixing lugs on your engine; note that the smaller of the two blocks is used on the right of the engine to allow for the thickness of the angle brackets which fix the u/c to the main chassis plate.

Temporarily attach the engine mounting blocks to the engine by just slipping the bolts through the engine mounting lugs into the blocks; do not put the nuts on.

Lay the chassis assembly on it's side and juggle the engine assembly until it is in the right place - use a straight edge across the two pulleys to align them and use a rule to set the distance from the centre of the pinion shaft to the centre of the crankshaft to 76mm - ensure that the engine and pinion shaft are parallel.

When you are satisfied that the engine is correctly aligned then carefully mark the position of the engine mounting blocks on the main chassis plate.

Remove the engine assembly, remove the mounting blocks from the engine, re-align the mounting blocks on the chassis and mark the chassis for the mounting holes. Drill clearance holes in the main chassis plate and bolt the engine assembly in place (4xM3x35).

Take care with this operation and remember the adage - "think twice, drill once".

It has been found that the tension of the belt is not critical but it must be fairly tight to start with as it will stretch slightly in use.

FAN SHROUD (Figure 1)

Cut the fan shroud to the moulded trim-line - warming the plastic will prevent splitting.

Position the fan shroud over the engine/fan assembly - note that the moulded 'pip' should align with the bracket bolted to the main chassis plate in the first step (U/C ASSEMBLY).

Cut out a hole to clear the fan and trim as necessary to ensure that the shroud is a close fit around the cylinder head and fan.

Using a 1.5mm drill, drill through shroud and mounting bracket and also through shroud and u/c leg to accept two No. 2x6 screws. Remove fan shroud and drill remaining two 2mm holes. Offer the fan shroud up to the backing plate, align and drill four corresponding holes in the backing plate.

Bolt the shroud and backing plate together (2xM2x10) as shown. Position shroud assembly and insert and tighten the two No. 2x6 screws. Fit drive belt.

TAIL GEARBOX ASSEMBLY (Figure 4)

Fit the two bronze bushes into the boom using epoxy adhesive; do this with the tail rotor shaft in place to ensure correct alignment. Fit the remaining two bushes into the input shaft bracket noting that the flanges of both bushes face rearwards. These bushes are a tight fit and should be fitted using a vice or 'G' clamp.

Fit input shaft in bracket - note the washers on the shafts and also the tube between the bushes on the input shaft. Fix the input shaft bracket to the boom not forgetting the fin (2xM3x30). Adjust the bracket fore and aft to obtain a tight gear mesh and tighten the bolts using 'threadlock'. Finally lubricate the bushes and gears using thick oil.

Screw the ball joint sockets to the pitch slider (2xNo. 2x) and also the balls to each blade holder (2xM2x10). Fit the blade holders to the hub (2x4BAx19) - note that the arrows on the hub indicate the correct holes. The blade holders pivot on the threads and there should be a small gap between the blade holders and the hub and also between the blade holders and the bolt head.

Slide the pitch slider and then the hub assemblies onto the tail rotor shaft and nip the grub screws (2xM4x8); do not tighten them yet as the pitch slider assembly will need to be adjusted after radio installation.

Fit the bellcrank bracket to the boom (1xM3x20) as shown - do not over-tighten! Fit the bellcrank to the bracket with the pin engaged in the slot of the pitch slider (1xNo. 2x12 + washer).

Fit the rear tail drive coupling to the input shaft (1xM4x6) and finally screw the stabiliser in place (2xNo. 2x6) on top of the boom.

The stabiliser and fin should be painted before fitting if required.

BOOM & TAIL DRIVE

Temporarily bolt the two boom fixing brackets to the main chassis plate - see Figure 2 (4xM3x30). Slide the two tail drive supports onto the boom, the smaller one first, and position them approximately 300mm and 520mm respectively from the rear end of the boom. Ensure that the tail rotor snake lugs on the drive supports are to the right.

Fit the boom to the chassis plate with approximately 10mm of the boom projecting forward of the front bracket - do not tighten the bolts yet.

Fit the tail drive tube in place through the two support brackets; slide a 3mm or so length of silicone tubing over each end of the tube against the support brackets to hold it in place.

Bend the forward end of the drive wire as shown in Figure 7; slide the front coupling over the drive wire and slide the drive wire through the tube towards the tail.

Slide the forward end of the drive wire into the slot in the pinion shaft and slide the centring disc onto the rear of the drive wire. Mark the wire to correspond with the large hole in the rear coupling and bend to fit.

Remove the front of the drive wire from the pinion shaft. Fit drive wire into rear coupling, push the centring disc well into the coupling and screw a No. 2x6 screw into the coupling to stop the disc coming out.

Replace the drive wire in the pinion shaft, slide front coupling over end of pinion shaft and tighten with grub screws (2xM3x4).
Adjust the boom fore and aft so that the drive wire is neither under compression nor tension and so that the drive wire supports provide as straight a drive as possible.

Tighten the boom fixing brackets, ensuring the fin is vertical. Use 'threadlock' on the bolts and a drop of 'cyano' (CYA or Superglue) on each drive wire support to stop them rotating on the boom.

SWASHPLATE (Figure 5)

Assemble the swashplate as shown - there are 29 balls in each track. Adjust the bolts (4xM2x10) to obtain smooth operation with no slop - apply a little thick oil. Tighten each bolt until the swashplate becomes stiff and then slacken the bolt half a turn.

Insert the 'O' ring into the top part of the swashplate and apply a little oil to the 'O' ring to help with the next operation.

Ease the swashplate onto the main shaft ('O' ring to top) and then slide on the swashplate driver - see Figure 6 - do not tighten the swashplate driver screw yet!

ROTOR HEAD (Figure 6)

Fit the rotor hub to the teeter plate (4 x large self-tapping screws) - note that the pips on the hub indicate the holes for the steel pin which must be oriented along the length of the teeter plate NOT across it.

With a flybar held in a vice screw on the flybar ring until the end of the flybar just protrudes on the inside of the ring. Insert the teeter plate/hub assembly and continue screwing until the threaded portion of the flybar just protrudes, the end of the flybar entering the hub through one of the holes which is not identified by a pip. Repeat for the other flybar. Adjust the flybars so that the rotor hub and flybar ring are concentric with a small amount of end float.

Make the paddles as shown in Figure 9: round off the leading edge and cover with plastic film as shown in Figure 11. Hold flybar in a vice and screw on paddles ensuring they are equidistant from and parallel with the flybar ring.

Drop the assembled head over the main shaft. Fit steel pin through the hub and shaft sliding the two pieces of silicone tube over the steel pin between the shaft and the hub on each side as you go. Fit the top bolt to lock the steel pin (1xM4x12): this should be TIGHT - use 'threadlock'.

Make two links as per Figure 6: the length is not critical but they must be identical. Connect the two links between the flybar ring and swashplate. Use two opposite balls on the swashplate and ensure one link passes through the swashplate driver.

MAIN ROTOR BLADES (Figures 10 & 11)

Glue the two plywood pieces to top and bottom of each main rotor blade root using 'epoxy' glue. Position the steel blade holders as shown.

Mark and drill the three holes in each blade. Also drill (2mm) the blades, as marked by '+', for the blade adjusting screws - do not drill the steel plates, only the blades. Paint the root and tip of each blade and leave to dry. Finally cover the blades as shown (Figure 11) with plastic film.

TAIL ROTOR BLADES (Figure 4)

The tail rotor blades are constructed in a similar fashion but note that they have plywood pieces on the flat side only; again use 'epoxy' glue. Paint and cover as for the main blades.

Each is held by a single M3 bolt and 'nyloc' nut for which a hole must be drilled in the blade as shown in Figure 4. Ensure that they are fitted the right way round and that they are not tight in the blade holders but only just 'nipped': this is to assure that they will fold up in case of impact and have the ability to centralise under centrifugal force but are not 'sloppy'.

RADIO TRAY (Figures 8 & 2)

Bolt the two spruce rails (W1) to the left side of the main chassis plate at the front; ensure they are at 90 degrees to the edge of the plate and parallel to each other (3xM3x20 + 1xM3x45 for upper rear mounting which also carries the two bellcranks).

Glue parts W2, W3 & W4 in place to suit your servos; glue W5 in place, offset on the spruce rails, so that the centre line of W5 is in line with the main shaft. When the glue is set remove the complete assembly from the chassis plate and fuel-proof - you may also paint it if required - re-fit when dry.

The upper rear bolt (1xM3x45) carries the two bellcranks - see Figures 2 & 8 - ensure that the bellcranks move freely but without slop.

RADIO INSTALLATION (Figure 8)

Fit the four servos as shown and also the receiver and battery which should be protected from vibration with foam rubber. A neat way of doing this is to glue suitable lengths of rubberised pipe lagging to each side of the radio tray and to retain the receiver and battery with thick rubber bands (as used to retain model aeroplane wings).

With the radio switched on (both transmitter and receiver) ensure trims are centred and servo arms are square to the servo bodies.

Fit fixed-length wire pushrods, with simple 'Z' bends at both ends, between 'aileron' and 'elevator' servos and their respective bellcranks - bellcranks should be square at neutral.

Fit the two pushrods between the swashplate and bellcranks - note that the 'aileron' pushrod has to be bent to clear the main gear.
The 'elevator' pushrod goes through the slot in the top main shaft bearing block.

The swashplate should be square to the main shaft in both planes (fore/aft & side to side) at neutral; adjust the lengths of the pushrods to obtain this.

The swashplate driver should be positioned as low as possible on the main shaft without it fouling the ball joints at full swashplate travel. Also ensure the links to the flybar are in line with the main shaft before tightening the swashplate driver screw.

Make up a throttle linkage from 16swg wire with a 'Z' bend for the servo end and a soldered adapter & clevis at the engine end.

Connect the throttle linkage ensuring that the carburettor lever does not foul the fan at full throttle. Don't worry if you cannot obtain full throttle movement when the servo is at full travel as the last few degrees of throttle movement has very little effect on engine power.

The tail rotor snake outer should be fitted in the tail drive supports and secured at each end with a cable tie and drop of 'cyano' (CYA or Superglue). Adjust the length of the snake so that the bellcrank is square. Note that the angle between the the wire pushrod and the servo arm should be 90 degrees at neutral; the servo arm may need to be removed and rotated on the servo output shaft to obtain this.

The final adjustment of the tail rotor blade pitch can only be determined after flying but we have found the following gives a good starting point. Switch on the radio and, while holding full left rudder, position the tail rotor hub on the shaft such that there is zero pitch on the tail rotor blades; tighten the grubscrews (2xM4x8).

If a gyro is to be used (recommended if this is your first model helicopter) fit this to W5.

CANOPY (Figure 1)

Assemble the canopy posts onto the main chassis plate as shown in Figure 1.

The amount of time and trouble spent on joining the two canopy halves and painting is entirely up to you. The simplest method is to trim the two halves leaving a 6mm flange, hold the two halves together using clothes pegs or similar and pour 'cyano' into the joint from inside the canopy; drill two holes, fit grommets to the holes and there you have it. However, we feel most builders would prefer to take a little more trouble to obtain a better finish.

An excellent adhesive can be made by dissolving off-cuts of canopy material in cellulose thinners to obtain a thin, smooth paste. Leave the flange in place for the time being and join the two halves using this mixture on the inside of the joint; leave overnight to dry. When dry, reinforce the inside of the joint with strips of canopy material and more of the mixture; leave to dry thoroughly.

Trim away all of the flange and make good the outside of the joint using car body filler and suitable grades of sandpaper; finish sanding using 600 wet and dry to remove the gloss on the canopy and brush or spray with your favourite paint.

The canopy is fitted by simply springing it in place over the posts. A wad of foam inside the canopy at the front so that it is compressed against the front of the radio tray will stop any up an down movement during flying.

MAIN ROTOR BLADE BALANCE & FITTING

The rotor blades must be balanced in order to reduce vibration to a minimum. This is not difficult but does require some care.

The aim, obviously, is blades of equal weight but also it is important that the balance point of each blade is the same.

There are many ways to achieve this but we use the following method which works well ...

Make a simple balance using a knife blade and a length of wood approximately 25mm by 6mm by 1 metre long. With a plastic container (an aerosol can top will do) fixed to one end and a rotor blade on the other, add water to the container until it balances. Carefully substitute the other blade in exactly the same position; you now know which blade is the heaviest.

Start again - empty the water from the container and accurately balance the heaviest blade.

Carefully replace the heavy blade with the lighter one and add PVC tape until the lightest blade is the same weight - do not stick the pvc tape to the blade yet.

Find the balance point of the heavy blade by balancing it on a knife edge and mark it where it touches the knife edge. Stick the PVC tape to the lighter blade (in the same manner as the final covering - see Figure 11) such that it balances at the same point.

Finally stick equal amounts of different coloured tape to each blade tip: this will aid dynamic blade tracking adjustments later when you have an expert to help you with initial set-up and flying.

Bolt the steel blade holders in place as shown (Figure 6): the two bolts (2xM3x20) towards the trailing edge of the blade should be tight but the bolt towards the leading edge of the blade (1xM3x20) should be left out for the time being.

Bolt the blade holders to the teeter plate (2xM4x12): ensure that the blades are at 90 degrees to the flybar and the two blades are in line. Tighten the bolts fully.

Check the static tracking of the main rotor blades by measuring the height of each blade above the boom: bend a blade holder if necessary to achieve this.

Screw in two adjusting screws to each blade (2xNo.4 x 15). Attach the pitch gauge to the underside of one blade tip (thin end to trailing edge of blade) and hold in place with a small rubber band. Screw in the adjusting screws until the underside of the pitch gauge is parallel with the flybar. Tighten the M3x20 bolt towards the front of the blade. Repeat for the other blade.

Finally check the centre of gravity (CG) of the helicopter. With the main rotor blades for and aft, balance the model on the flybar. It should be slightly nose heavy.

Add lead to W5 to achieve this. This will almost certainly be necessary if you have not used a gyro.

CONGRATULATIONS - YOU HAVE FINISHED CONSTRUCTION - CHECK THAT YOU DON'T HAVE TOO MANY BITS LEFT OVER!

FLYING TIPS

The best advice we can give you is to join the local club and enlist the aid of an experienced model helicopter pilot. At the very least take your completed model to your dealer and ask him to check it over.

If help is not available it is possible to learn on your own but be very careful and make haste slowly.

First, start the engine and set the mixture needle on your engine so that it runs a little rich (smoky) but smoothly.

Engines on model helicopters should always be set to run on the rich side, possibly even 'four-stroking' at idle, but breaking into a clean two-stroke just before lift-off. This is to ensure that the engine does not 'lean-out' and die under power.

Note - with a new or awkward engine it may be advisable to remove the drive belt whilst getting it running.

Carry the model well away from your box and place it heading into the wind. Stand behind and to the left of the model. Slowly increase the throttle until the model becomes light: the tail will probably swing to the left or right, close the throttle and adjust the rudder trim on the transmitter.

If the trim is insufficient you will have to adjust the trim on the model by moving the tail rotor hub on the shaft to increase or decrease the blade pitch: if the model swings to the left increase the pitch and vice versa.

Similarly if the model persistently tilts left or right, forwards or backwards adjust the swashplate linkages to correct.

At this time you should also check the dynamic main rotor blade tracking. If the model has been built well then the main rotor should spin smoothly; if it does not, but vibrates severely, then it is likely that the rotor blades are not spinning in the same plane, i.e. one is running higher than the other.

This is where the different coloured tape on each rotor tip is a great help. Hold the model down so that there is no danger of it taking off: this can be done easily by pushing a long, heavy plank of wood between the u/c legs.

Increase the throttle until the rotor is spinning at a moderate speed and observe the rotor blades from the side: do this from a safe distance! You will see the blade tips quite clearly and will be able to tell which blade is running higher than the other by the colour of the tip.

Once the model is properly trimmed the rest is simply practise, practise and more practise.

Make small hops always moving forwards, away from yourself, and gradually increase the length of these hops. When you can do this reasonably well try to slow down the forward speed but do not let the model come backwards. Once you have mastered the hover and can hold the model over a particular spot, gradually let the model drift off to the right and back again, progressively letting the model go further and faster.

The subject of learning to fly a model helicopter would fill a book of it's own and like learning to ride a bicycle is very difficult to put into words. There is no easy way, just practise and more practise. When first starting you will probably think you'll never master it but don't worry; like riding a bike, once you can do it you'll wonder what all the fuss was about.

It really is best to get experienced help if possible, after all, you wouldn't climb into a full size helicopter and try to fly solo first time, especially if it was also the helicopters first flight!!

SAFETY

Statistically, flying model helicopters is not a dangerous pastime but there have been one or two nasty accidents. It does not take much imagination to appreciate the forces involved in a spinning rotor and if this rotor comes into contact with any part of your anatomy, or worse, someone else's - the helicopter will not feel a thing!!

Always fly well away from other people; the public in general and children in particular, have no appreciation of the potential hazard and think of model helicopters as toys. Remember that you are responsible for the model and any damage it may cause - if spectators will not keep away then DON'T FLY. Never be persuaded to fly against your better judgement. If in doubt - DON'T.

If the radio shows the slightest sign of malfunction or any other part of the model is not 100% get it fixed before flying.

REMEMBER - SAFE FLYING IS NO ACCIDENT

MAINTENANCE

Maintenance of the TYKE is very basic ...

Before each flying day lubricate the gears, tail rotor bushes, ball bearings and rotor head using a thick gear type oil as light sewing machine type oils will get thrown off almost immediately.

Check that all nuts and bolts are tight.

Check for excessive wear in linkages, particularly ball joints, and replace as necessary.

Change the glowplug periodically; they don't last forever and the TYKE does not glide very well!

HAPPY FLYING

TYKE SPARES PRICE LIST AND ORDER FORM

MAIN CHASSIS AND U/C

* Chassis Plate	£8.95 each
Ali Angles	.95 each
Shroud Bracket	.45 each
U/C Legs	£1.95 each
Skids	£1.45 pair
Canopy Post (Complete)	£1.95 set
Tank Platform	.75 each

CLUTCH AND FAN ASS.

Fan/Flywheel	£3.45 each
Brass Sleeve	.75 each
Clutch Shoe	£3.75 each
Clutch Drum	.95 each
Starting Cone	.65 each
Belt	£2.25 each
* Fan Shroud & Backing Plate	£3.95 each
Engine Mounts	.60 pair

MAIN GEAR & PINION SHAFT ASS.

Main Shaft	£2.45 each
Main Gear (Inc. pin)	£4.75 each
Mainshaft Bearing Housing	£1.10 pair
Mainshaft Bearing	£2.95 each
Pinion Shaft	£1.95 each
Pinion Shaft Bearing Housing	£1.10 pair
Pinion Shaft Bearing	£3.25 each
Large Pulley (inc. Grubscrews)	£2.95 each

MISC.

* Canopy (inc. Grommets)	£9.75 each
Tank	£2.15 each
Bellcranks	.75 pair
Ball Joints (8)	.95 set
Control Rods	.45 pair
* Radio Tray (Complete)	£2.95 set

FASTENERS

		Qty
M2 x 10	£0.95	10
M3 x 12	.80	10
M3 x 20	.95	10
M3 x 30	.80	4
M3 x 35	.95	4
M3 x 45	.95	4
M3 Nuts	.45	10
M3 Washers	.45	20
M3 Nylock Nuts	.45	4
4BA x ¾	.45	4
M4 x 12	.55	4
M4 Nylock Nuts	.45	4
M4 Washers	.45	10
No 4 x ½	.45	4
No 6 x ¾	.45	4

BOOM AND TAIL GEARBOX

* Boom	£4.25 each
Input Shaft Bracket	£1.10 each
Bronze Bushes	£1.45 pair
Brass Tube	.45 each
Tail Gears	£2.95 pair
Bellcrank & Bracket	.95 set
Pitch Slider	£1.10 each
T/R Hub	.95 each
Tail Blade Holders	.95 each
Tail Blades	£1.25 pair
Fin & Stab	£1.50 set
Snake	£1.25 each
Boom Supports	£1.10 pair
Tail Drive Supports	£1.15 pair
Front Coupling (inc. Grubscrews)	.95 each
Rear Coupling (inc. Grubscrews)	.95 each
Tail Drive Tube	.45 each

ROTOR HEAD

Swashplate (Complete)	£6.25 each
Swashplate Driver (with Screw)	.75 each
Teeter Plate	£3.45 each
Hub (inc. Pin)	£1.25 each
Flybar Ring	£1.45 each
Blade Holders	£1.10 pair
Flybars	£2.45 pair
Paddles (with Covering)	£1.10 pair
* Main Blades (with Covering)	£5.25 pair
Flybar Links	.80 pair

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