MXA SPORT

SPECIFICATION

MXA - a model helicopter for sport flying.

Rotor diameter	45in.	1143mm
Main rotor rpm	approx 1200 - 1300	
Main rotor	Morley 'AT' collective head	
Engine	.40 -.45 cu.in.	6.5 - 7 c.c.
Radio	any four or five function proportional radio system is suitable.	
Functions	- fore and aft cyclic	
	roll cyclic	
	main rotor collective/throttle	
	tail rotor	
Fuel capacity	8fl oz (250cc) in tank supplied	
Flying weight	7lbs (3.25kg) approx	

Dear Customer,

Thank you for choosing 'Morley'. We hope you enjoy making a successful model.

A helicopter is a most fascinating machine and exciting to fly, but it does need care and persistence to become successful and enjoy the model's full performance and capabilities.

The MXA is a very versatile model, being able to accommodate almost any make of engine or radio and 'tuneable' into a stable beginners model or a highly aerobatic and agile flyer.

Because of this versatility you should plan your installation carefully, choosing the options open to you to suit your engine and radio.

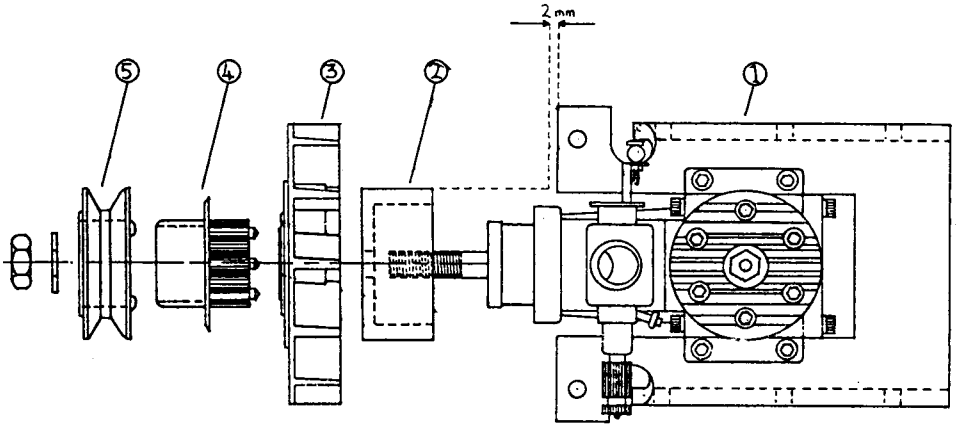
However you aim to fly your model, we wish you many happy landings.

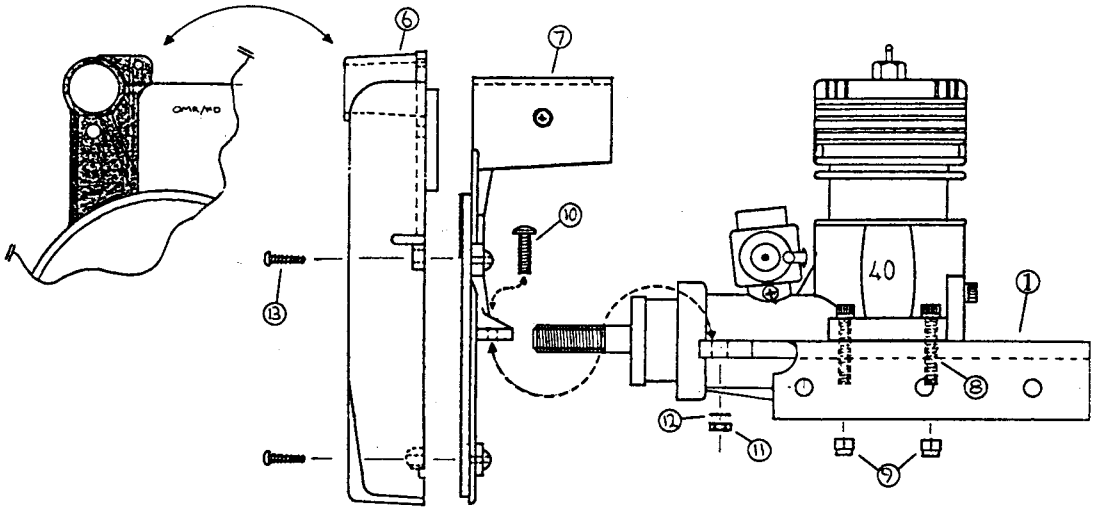
Morley Helicopters Ltd

ENGINE MOUNT

STOCK CODE	Diagram key				
MXA/MOUNT	(1)	MXA Engine Plate			
0MR/FLY	(2)	Flywheel	(8)	M3 x 16 skt cap screw	(4)
0MR/FAN	(3)	Fan	(9)	M3 nyloc nut	(4)
0MR/P14T	(4)	14 tooth pulley	(10)	M3 x 10 Pan head screw	(2)
0MR/SP	(5)	Starter pulley	(11)	M3 nut	(2)
0MR/FD	(6)	Fan duct	(12)	M3 star washer	(2)
0MR/FDB	(7)	Fan duct backplate	(13)	No 2 x 3/8 self tapper	(3)

Users of the Irvine 40 will need to drill the centre hole of the flywheel to 3/8" (10mm) for clearance, or return it to Morley Helicopters with £1 for replacement.





Temporarily fit the flywheel (2) to the engine so that it's inside face is properly seated against the engine prop driver. Sometimes the centre hole in the flywheel will require opening up to achieve this. (See box).

The engine should be positioned on the centre line of the engine plate (1) cut out so that the rear edge of the flywheel is 1 - 2mm away from the engine plate. Mark and drill for the M3 x 16SC (8) fixing screws, and fit the engine using nyloc nuts.

Fit the fan duct backplate (7) to the engine plate using M3 x 10 screws (10), star washers (12) and nuts (11). Fit a brass ball from the controls pack onto the engine throttle lever using M2 x 12mm screw and nut, and position so that it may be operated from below. Also fit a brass ball with M2 screw and nut on the left side of the duct backplate for the swashplate drag link.

Refit the flywheel (2), fan (3) and pulley (4) using loctite between the surfaces, especially on the prop driver, since a backfire on starting will undo this assembly unless it is properly tightened and locked.

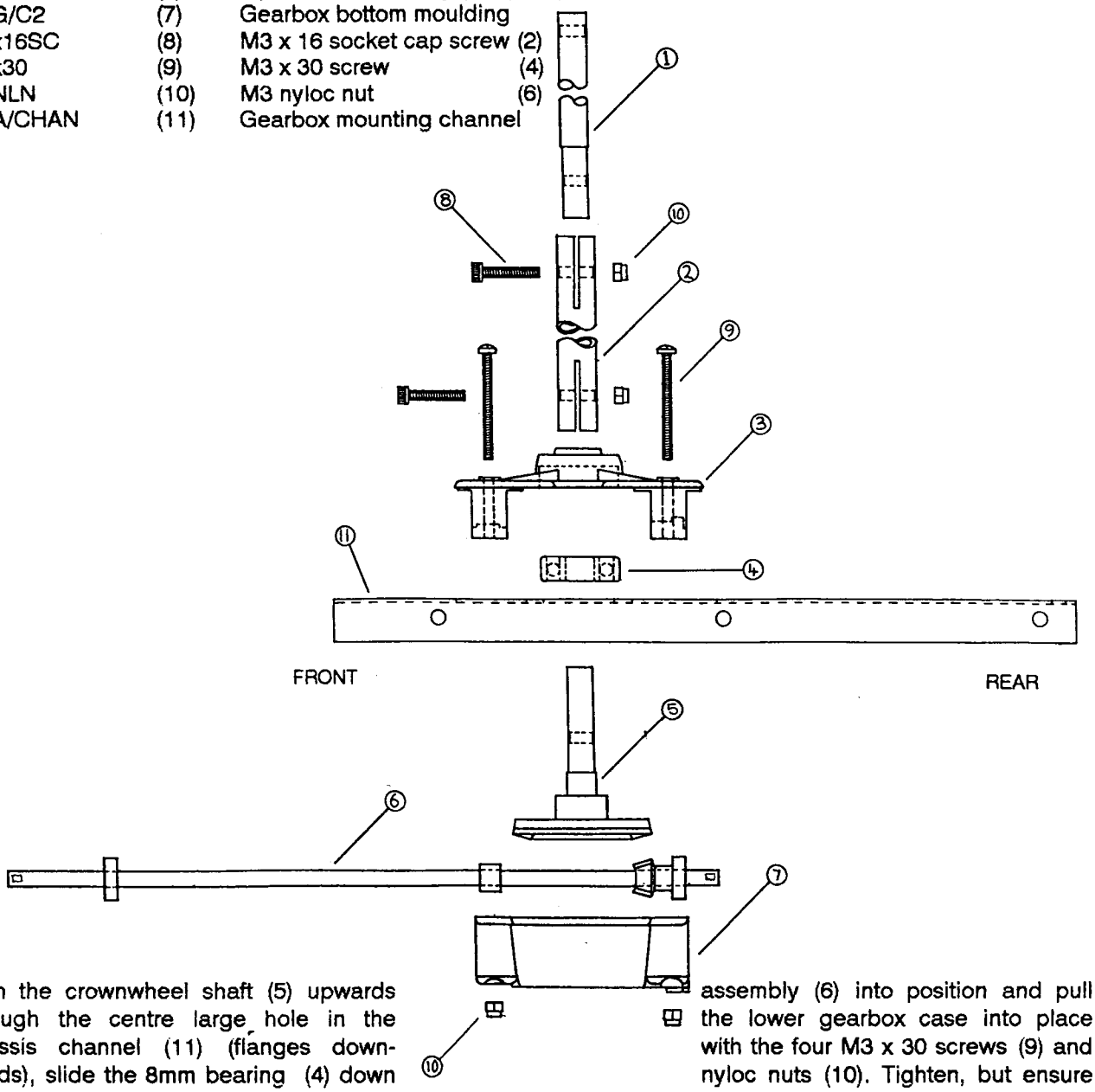
Fit the starter belt 'V' pulley over the engine pulley using epoxy or super glue.

Fit the fan duct (6) onto the backplate, using small No 2 x 3/8" self tap screws, making sure it clears the fan and that the throttle lever operates freely.

The shaded section shown on the diagram can be cut away if desired as it is not used on the MXA.

MAIN GEARBOX

STOCK CODE	Diagram key	
0MG/MAST	(1)	Rotor mast
0MG/CPL	(2)	Mast coupling
0MG/C1	(3)	Gearbox top moulding
0MG/BB	(4)	8mm ball bearing
0MG/CWS-DC	(5)	Crownwheel & shaft (deep cut)
0MG/ISA-DC	(6)	Input shaft assembly (deep cut)
0MG/C2	(7)	Gearbox bottom moulding
M3x16SC	(8)	M3 x 16 socket cap screw (2)
M3x30	(9)	M3 x 30 screw (4)
M3NLN	(10)	M3 nyloc nut (6)
MXA/CHAN	(11)	Gearbox mounting channel



With the crownwheel shaft (5) upwards through the centre large hole in the chassis channel (11) (flanges downwards), slide the 8mm bearing (4) down the shaft until it is seated. The gearbox top moulding (3) is also slid down the shaft over the ballrace, and through the chassis. Make sure the small ballrace seating in the moulding is at the rear, to take the input shaft (6).

Fill the lower gearbox case (7) with light grease, up to the crownwheel level. Place the input shaft assembly (6) into position and pull the lower gearbox case into place with the four M3 x 30 screws (9) and nyloc nuts (10). Tighten, but ensure that rotation is reasonably free. It will loosen under load.

Assemble the mast (1) to the gearbox using the tubular coupling (2) and secure with M3 x 16SC (8) and nyloc nuts.

☞ N.B. No other type of bolt or nut should be used with the coupling.

CHASSIS

STOCK CODE	Diagram key	
MXA/SIDE	(1)	MXA sideplate
MXA/CHAN	(2)	'U' channel
MXA/CF	(3/5)	Chassis crosspiece (flat)
MXA/CR	(4)	Chassis crosspiece (raised)
MXA/PYLON	(6)	Cabin mounting pylon
MXA/EDGE	(7)	Fuel tank edging rubber
M4 x 10	(8)	M4 x 10 screw (6)
M4 x 8	(9)	M4 x 9 screw (6)
ST3	(10)	No 8 x 3/8" self tapper (22)
0MG/OIL	(11)	5/16 oilite bearing (1)

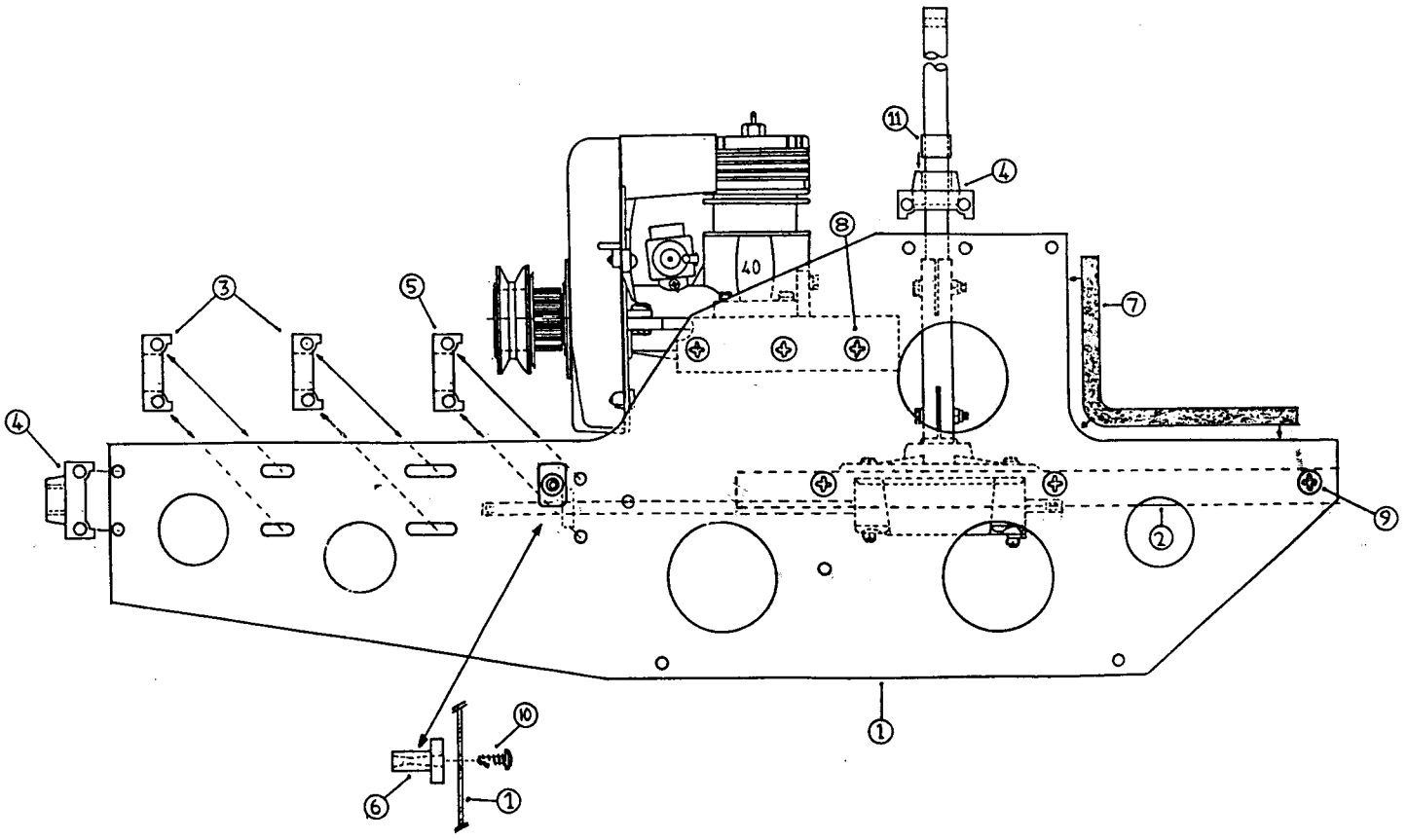
Using the large taptite screws (10) fit the cabin support pylons (6) to the side plates (1) and tighten securely. Assemble the side plates together using taptites and the two cross piece mouldings which have raised housings (4), placed at the extreme front and at the top of the assembly.

Fix the engine mounting assembly (sheet page 2) into position using six M4 x 10 screws (8) and nuts with star washers under.

Similarly fit the gearbox assembly (sheet page 3) with the mast through the top bearing moulding. Slide the oilite bush (11) down the mast and epoxy it into the moulding. Push one of the three cross piece mouldings (3/5) over the input shaft ball bearing and secure the moulding in place with taptite screws.

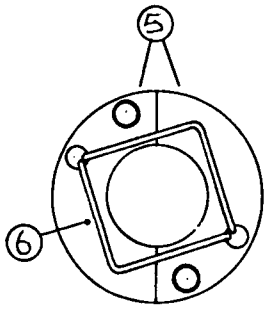
The two remaining cross pieces (3) may be placed in position but do not finally tighten the screws until fixing the servos in position later.

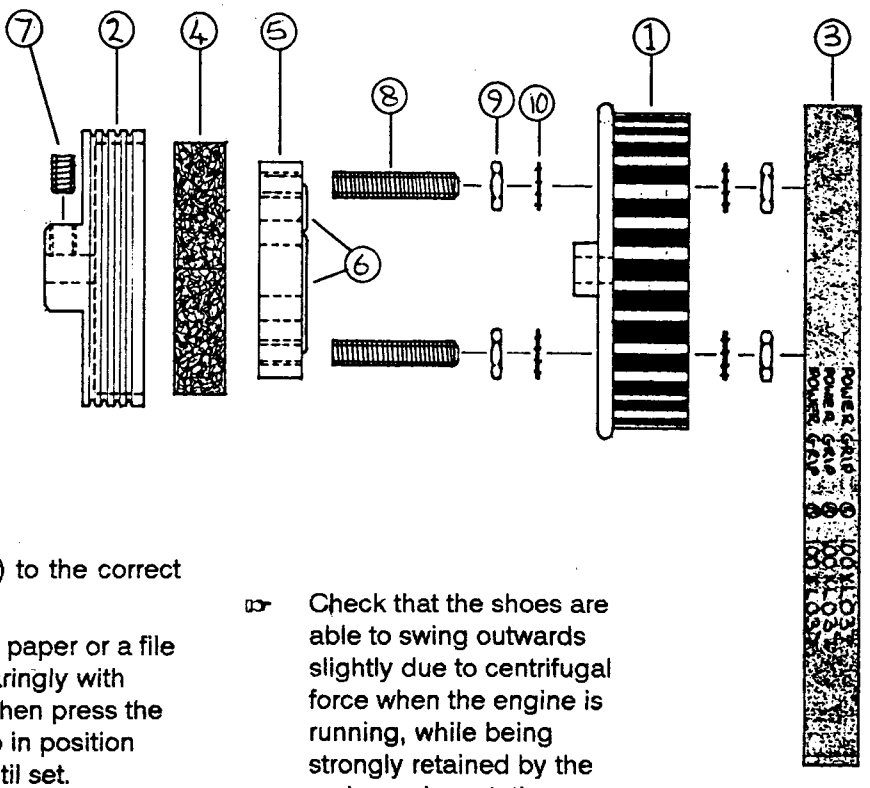
Fit the rubber edging (7) to both chassis sides.



CLUTCH UNIT

STOCK CODE	Diagram key	
0CL/LP	1	large pulley
0CL/DRUM	2	clutch drum
0CL/XL100	3	100 XL 037 toothed drive belt
0CL/LINER	4	cork liner
OCL/SHOES	5	clutch shoe (2)
0CL/SPRING	6	clutch shoe spring (2)
M4X6SS	7	M4 x 6 socket set screw
M4X20SS	8	M4 x 20 socket set screw (2)
M4N	9	M4 thin nut (4)
M4SW	10	M4 star washer (4)
		Set screw key





Carefully cut the cork clutch lining (4) to the correct length to fit inside the clutch drum (2).

☞ Roughen the drum with emery paper or a file and cover it and the lining sparingly with slow setting epoxy adhesive, then press the lining tightly into place. Clamp in position with clothes pegs or similar until set.

Thread the M4 x 20 socket set screws (8) into the clutch shoes (5), with the key end of the screw just level with the surface of the shoe. Fit an M4 thin nut (9) at the rear, one turn clear of the shoe. Locate clutch springs (6) in clutch shoes and add star washers (10) onto screws.

Place the assembly into the large pulley (1) as shown in diagram and secure with star washers and thin nuts. Adhesive tape across the shoes is a help while doing this.

☞ Check that the shoes are able to swing outwards slightly due to centrifugal force when the engine is running, while being strongly retained by the springs when stationary.

Fit the toothed drive belt round the engine pulley and slide the clutch assembly onto the gearbox input shaft, followed by clutch drum. Align large and small pulleys, using spacer washers if needed (not supplied) and tighten clutch drum grubscrew (7).

Excess length of the M4 x 20 screws may be removed with a small hacksaw if desired. Hold the screw against rotation while this is done, by fitting the Allen key into the slot.

SWASHPLATE

STOCK CODE	Diagram key	
0SP/TOP	1	top moulding
0SP/BALL	2	centre ball
0SP/RING	3	small alloy ring (2)
0SP/BRG	4	bearing balls (12)
0SP/CAGE	5	ball cage
0SP/CENTRE	6	centre plate
0SP/BOTTOM	7	bottom moulding
0SP/DRIVER	8	s/p driver assembly
ACC/BJ	9	ball eye
ST1	10	2 x 3/8 self tap screws (2)
M4X6SS	11	M4 x 6mm set screw
M2X12	12	fixing screws M2 x 12 (6)
ACC/BJ	13	brass ball (2)
M2N	14	M2 nut (2)

Any flash on the mouldings should be removed with a sharp knife.

Drill a 2mm hole in the swashplate top (1) as shown in the diagram, and fit the brass balls with 2mm screw and nut.

☞ Novice pilots are advised to fit the ball to the inside of the cup to reduce rotor sensitivity. (Shown dotted in the diagram.)

Wipe all the alloy parts clean to ensure smooth running. Fill the groove in the centre plate (6) with a light grease then place on a flat clean surface.

Insert one of the two small alloy rings (3) into the centre plate ensuring that the chamfered side is uppermost.

Next insert the grey plastic ball cage (5), and using tweezers insert each of the 12 bearing balls (4) into the ball cage. It may be necessary to lift the centre plate slightly the let the balls seat in the centre groove. Once this is done the second of the small alloy rings can be inserted, this time with the chamfer facing down.

Insert the bottom moulding (7) into the centre plate from the underside then place the large plastic centre ball (2) with some grease in the seat on the bottom moulding.

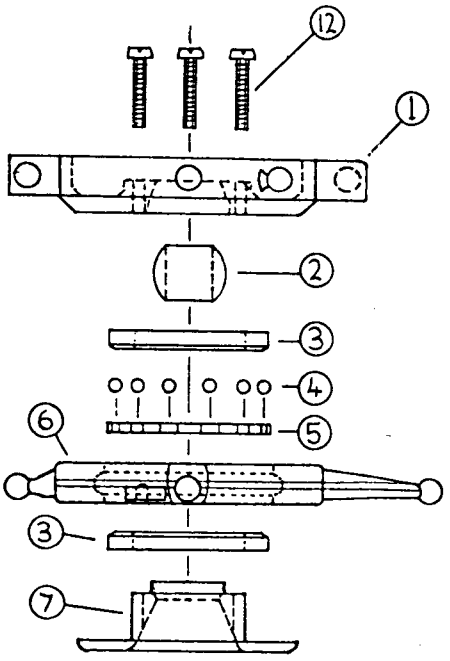
The top moulding can then be placed over the ball and the whole assembly secured together with 4 M2 x 12mm screws (12). It is important not to overtighten these screws - however, there should be no free play in the bearing, so careful fitting is required.

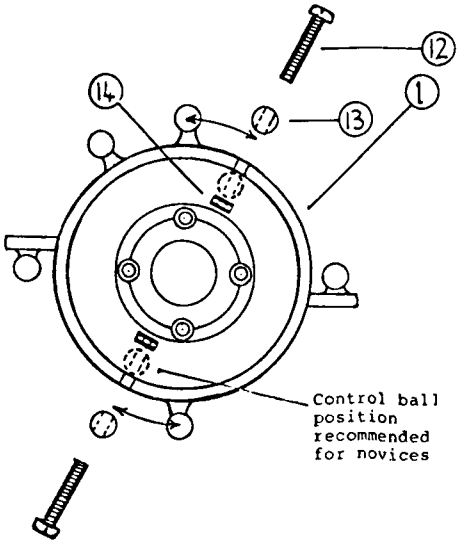
Any future wear in the bearing can be taken up by re-tightening the four fixing screws.

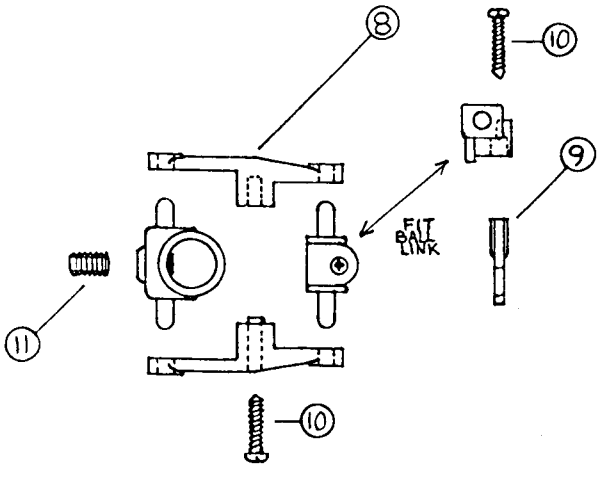
Slide the completed swash plate on the rotor mast with the long arm to the rear (except Bell 47 when the long arm goes to the front).

Assemble the swashplate driver using No 2 x 3/8" self tapping screws (10). Cut 5mm from the end of the ball eye (9) and fit to the small pivot. using No 2 self tapper.

☞ Swashplate rocking movement must be free and the assembly should slide easily up and down the rotor mast. Slide the swashplate driver over the mast before fitting the rotor head but do not clamp tight until later when the correct position has been found.







CONTROLS

STOCK CODE	Diagram key		
0CON/BELL	(1)	Bellcrank (cranked)	
0CON/BELL	(2)	Bellcrank (straight)	
0CON/CA	(3)	Collective cradle arm	
0CON/BRKT	(4)	90 degree angle bracket (small)	
MXATB/IDL	(5)	tail control rod idler	
MXA/TRAY	(6)	receiver/gyro mounting tray	
ACC/BJ	(7)	ball eyes	
0CON/SH100	(8)	100mm pivot shaft	
ACC/BJ	(9)	brass control balls	(21)
M2x12	(10)	M2 x 12 screw	(21)
M2N	(11)	M2 nut	(21)
M3x20SCP	(12)	M3 x 20 plain shank screw	(1)
M3x8	(13)	M3 x 8 pan head screw	(5)
M3N	(14)	M3 nut	(7)
M4x30PS	(15)	M4 x 30 plain shank screw	(1)
M4x16	(16)	M4 x 16 pan head screw	(2)
M4N	(17)	M4 thin nut	(6)
M4SW	(18)	M4 star washer	(3)
ST1	(19)	No 2 x 3/8 self tapper	(1)

Control rods from separate pack:

0CON/ROD50	(20)	50mm threaded stud
0CON/ROD65	(21)	65mm control rod
0CON/ROD90	---	90mm control rod
0CON/ROD135	(23)	135mm control rod
0CON/ROD190	(24)	190mm control rod
0CON/ROD240	(25)	240mm control rod
0CON/TUBE	(26)	200mm alloy tube
0CON/ROD340	(27)	340mm control rod (taped to skid pack)

Fit the brass control balls (9) to the bellcranks using M2x12 screws (10) and M2 nuts (11) ensuring that they are fitted on the correct side of the bellcranks (See (1) & (2) in diagram A).

Lightly grease the 100mm pivot shaft (8) and slide the bellcranks onto it. Pass this assembly through the chassis side frames and fit a cradle arm (3) to each end of the pivot shaft. Check that the two arms are parallel before tightening the set screws moulded into the ends of the arms. (Do not overtighten these screws or you may strip the thread).

The entire cradle and bellcrank assembly must pivot up and down on the M4 x 16 screws (16) which are fastened with M4 nuts (17) and a starwasher (18) either side of the sideframe. This action provides collective pitch control.

Fit a brass ball to the small right-angled bracket (4) then drill a 3mm hole in the chassis so the bracket can be installed above the ball on the collective bellcrank. Link the balls with a short control rod made from two pieces of threaded stud (20) and two ball eyes (7) screwed back to back. Set up the cradle assembly so that the arms are horizontal when the collective bellcrank is at right angles to it, as in Diagram B.

Diagrams B & C show a 5 servo installation. This is the easiest set up to use even with a four function radio - simply connect the collective (27) and throttle (31) servos to the throttle output of the receiver, using a 'Y' lead.

Place all the servos in the chosen position, slackening the taptite screws in the mouldings to allow the gap to be adjusted to suit your servos. Drill the mouldings to take the servo fixing screws and secure the servos in position. Always use rubber grommets when mounting servos, and do not overtighten. Retighten the taptites

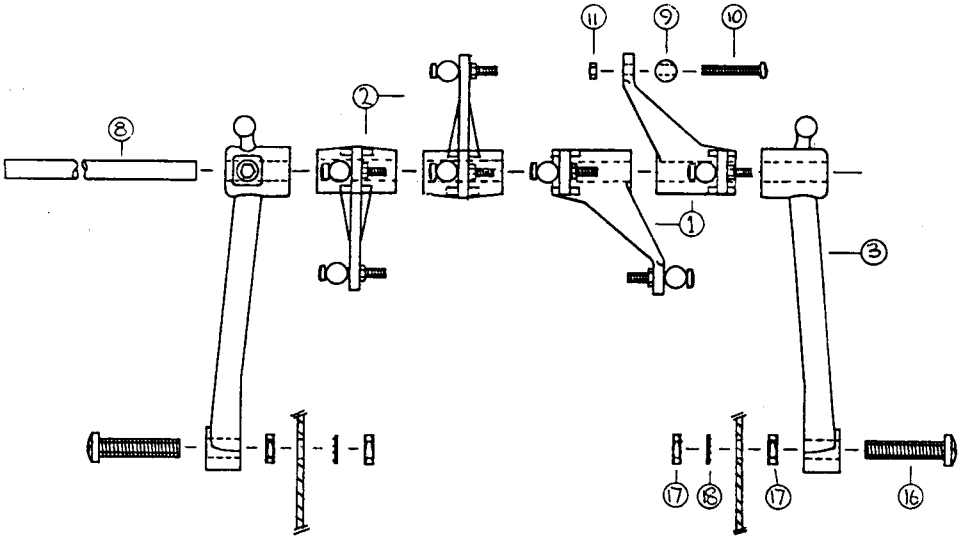
Make up the control rods by screwing an eye onto each end. Note that the long collective operating rod (240mm) (25) is stiffened by epoxying the alloy tube (26) over it.

Check that the 135mm (23) rods (between the bellcranks and swashplate) and 190mm (24) control rods are matched for their respective lengths.

Install the engine throttle bellcrank on the M4 x 30 plain shank screw, using a little grease to ensure smooth operation. Fit the throttle control rods.

- Drill a 3mm hole in the chassis in front of the tail boom fixing holes to take the idler crank (5) for the tail rotor control rod. Fit the 340mm tail rotor control rod from the servo to the idler crank (Diagram C(19)). Use a brass ball and a ball eye to support the rod at a suitable point along its length. Drill a 2mm hole to take the small self-tapping screw (19), and trim the ball eye stem to length as necessary. Bend the end of the pushrod so the plastic eye fits the ball on the tail rotor servo output arm.

CONTROLS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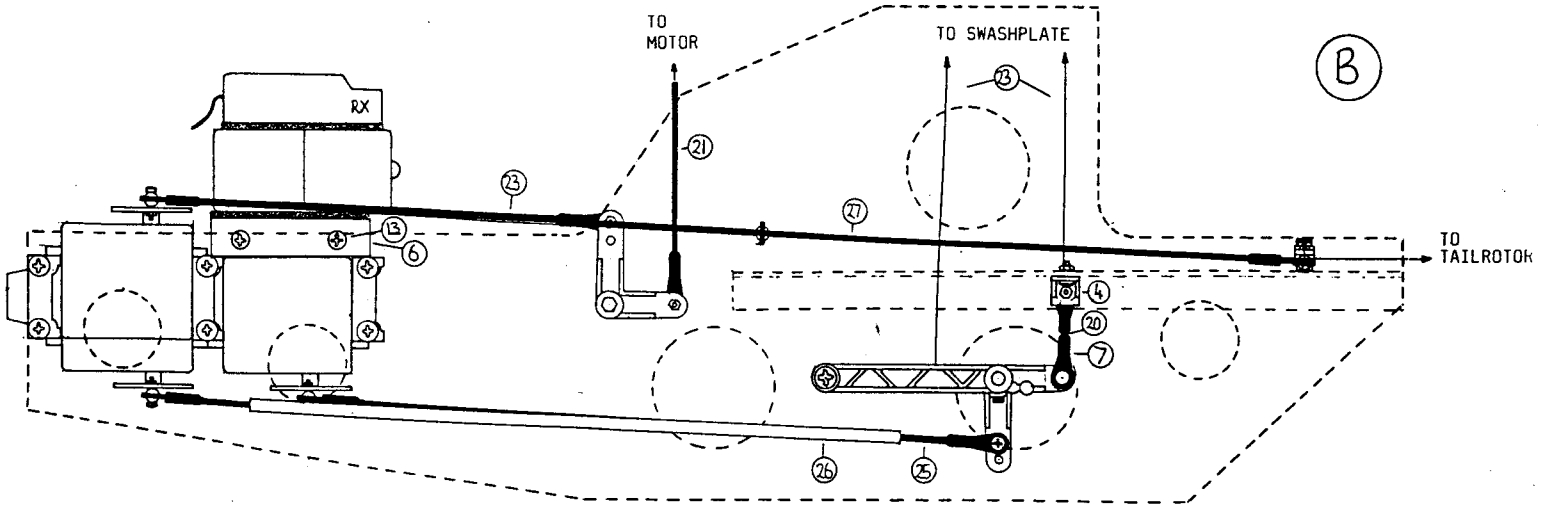
TO
MOTOR
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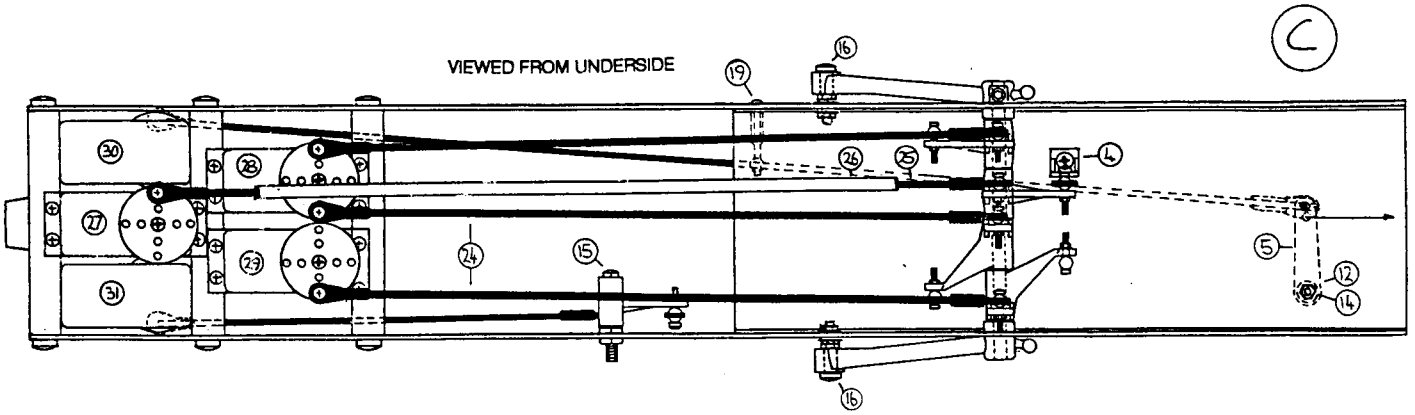
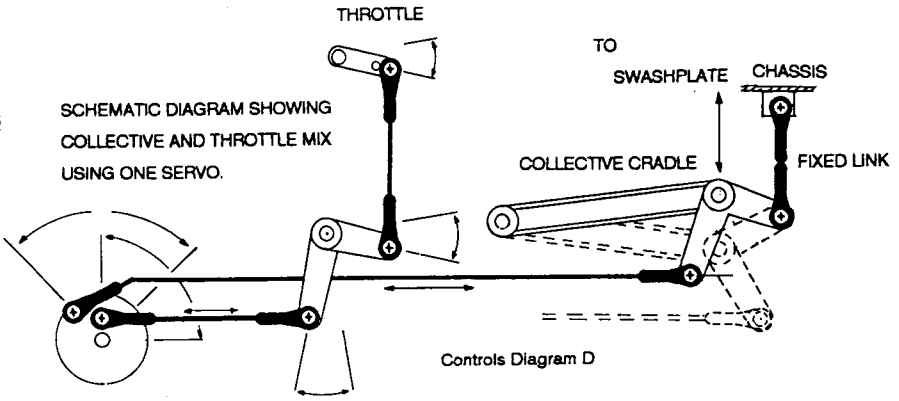

VIEWED FROM UNDERSIDE
C

- FOUR SERVO INSTALLATIONS ONLY: If using only four servos, the collective servo (27) should be mounted nearer the side, so that when the motor control bellcrank is mounted lower down it can also have a control rod to this servo. Arrange so that the throttle opens quickly from lowest collective setting. (See Diagram D).



Controls Diagram D

Slide the swashplate onto the rotor mast and install the 135mm control rods up to it from the bellcranks on the collective cradle.

Install the swashplate drag link between the ball on the top of the fan duct and the ball fitted to the lug on the swashplate centre plate, so that the long arm for fore/aft cyclic is aligned with the centre line of the airframe.

Check that the whole control system is smooth in operation. In particular the movement of the swashplate up and down the mast must be smooth - lubricate with a little grease or oil if necessary. Lubricate all the brass ball joints with a light oil (3 in 1 etc).

Because of the variations possible with this model, using different engines, tuned pipes, gyros etc, it is left to the customer to position and drill holes to fit the platform for the receiver and battery (usually above the pitch and roll cyclic servos or behind the collective cradle) but the Centre of Gravity should be at the mast WITHOUT THE CABIN FITTED. That is, before the cabin is fitted to the model, it will hang with the mast vertical when held at the mast top.

TAIL ROTOR CONTROL
Transmitter stick moved to left

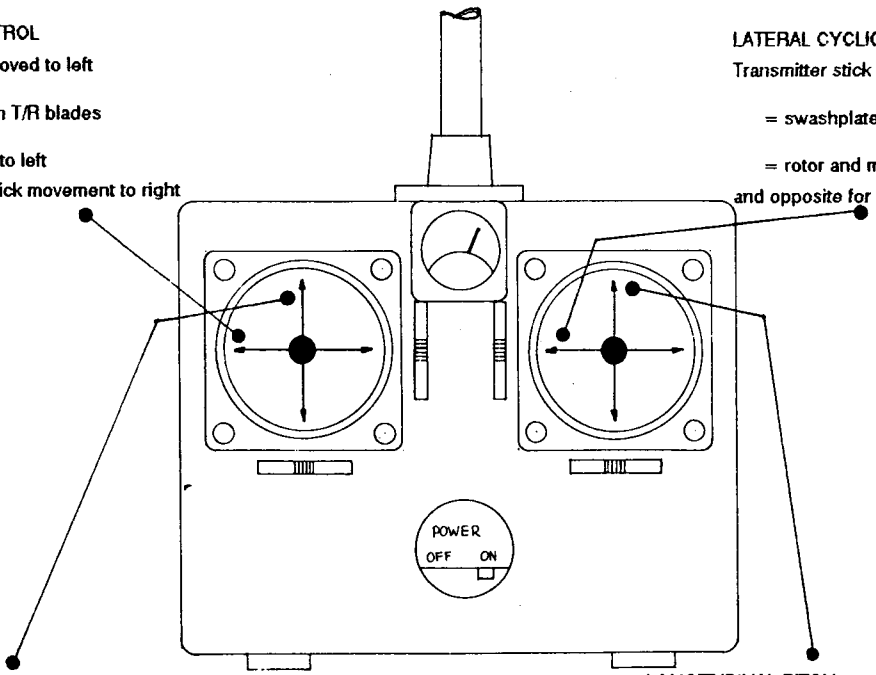
= extra pitch on T/R blades

= nose moves to left
and opposite for stick movement to right

LATERAL CYCLIC PITCH
Transmitter stick moved to left

= swashplate tilts to left

= rotor and model tilt left and model moves left and opposite for stick movement to right.



MAIN ROTOR COLLECTIVE/THROTTLE
Transmitter stick pushed forward

=swashplate moves up and throttle opens

=extra pitch and lift (model ascends)
and opposite for stick pulled back

LONGITUDINAL PITCH
Transmitter stick pushed forward

= swashplate tilts forward

= rotor and model tilt forward and model moves forward and opposite for back stick movement.

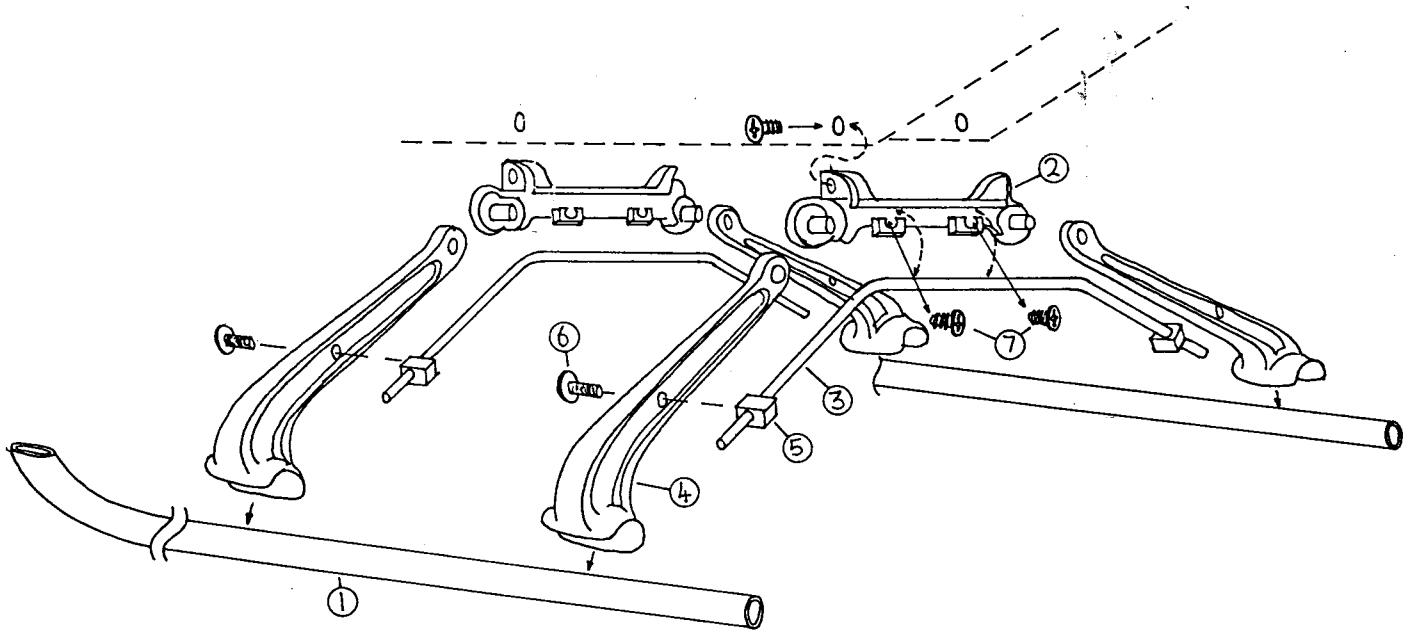
UNDERCARRIAGE

STOCK CODE	Diagram key	
MXAUC/SKDS	(1)	skids
MXAUC/CRS	(2)	square collar
MXAUC/WIRE	(3)	U/C wire strut
MXAUC/LEG	(4)	U/C leg moulding
MXAUC/CLR	(5)	U/C brass collar
M4x8	(6)	M4 x 8mm screw (4)
ST3	(7)	No 8 x 3/8 taptite screw (8)

Push an undercarriage leg (4) onto each end of the undercarriage cross member (2) and trap it in position with the undercarriage wire (3) which is locked in position with taptite screws (7).

Feed a square collar (5) onto the wire end until it is wedged into the leg section, and fasten with an M4 x 8 screw (6) through the leg web.

The two leg assemblies should then be fixed in the chassis using taptite screws. The skids must be pressed into the leg mouldings to complete the undercarriage. This can be made easier by warming the moulding in hot water.



TAIL ROTOR

STOCK CODE	Diagram Key	
0TR/C1	1	gearcase moulding
0TR/C2	2	gearcase back moulding
0TR/GIN	3	input mitre gear and shaft
0TR/GOUT	4	output mitre gear and shaft
0TR/BB1	5	3/16" ballrace
0TR/BB2	6	6mm ballrace
0TR/OIL1	7	3/16" oilite bearing
0TR/OIL2	8	6mm oilite bearing
0TR/BL	9	blade (2)
0TR/BM	10	blade mount (2)
0TR/HUB	11	1/2 hub and spacer (2)
0TR/YOKE	13	control yoke
0TR/BB2	12	ballrace 6 mm (2)
0TR/CLR	15	control rod collars (2)
ACC/BJ	16	eye end (2)
M3X20SC	18	M3 x 20 socket cap screw
M3N	19	M3 nuts (2)
0TR/CS	20	csk screws 2b.a. (2)
M2X16	21	M2 x 16 screws (4)
M2X12	22	M2 x 12 screws (6)
M2N	23	M2 nuts (14)
ST1	25	2 x 3/8 self tap screws (2)
ACC/BJ	26	ball end ball (2)
0TR/CH	27	M2x12 skt cap screw (2)
M2SW	28	M2 star washer (2)

Remove the oilite bush (7) and push the input shaft (3) into the case as in the diagram. Place the output shaft (4) (i.e. the larger shaft with a hole down the centre) in position in the case (1).

Fill the case with a clean good quality light grease and attach back moulding (2) using M2 x 16 screws (21) and nuts.

Push the oilite bush along the input shaft into the gearcase. Check for free rotation.

Place a countersunk screw (20) through one of the ballraces (12) followed by a moulded spacer (11) and, with paint or locking compound, screw tightly into one of the blade holders (10). *Locking with paint or compound is essential.*

Fit a ball end (26) to the pitch control arm of the blade holder using M2 x 12 screw (22) and a nut (23) on each side of the arm. Repeat with the second ballrace and holder.

Clamp the ballraces between the moulded hub halves (11) and draw halves together using M2 x 12 screws (22) and nuts (23). Do not apply adhesive.

File small flats on the output shaft (4) of the gearbox to seat the set screws, and fit tail rotor hub to output shaft. Do not overtighten the grub screws.

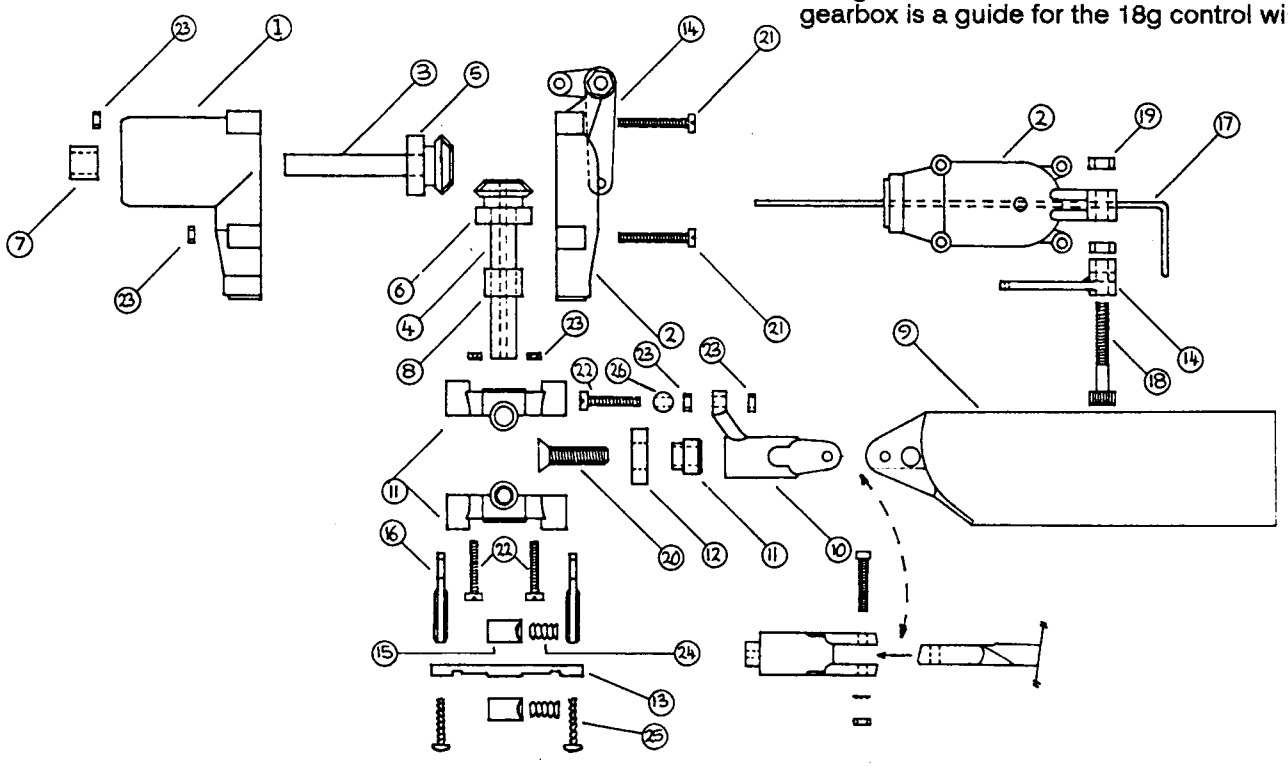
☞ Note that the outer surface of the hub should be flush with the end of the shaft.

Cut a 4inch (10cm) length from the 16g wire supplied and bend as shown for the pitch control rod (17). The wire passes through the centre of the shaft and moves the pitch control yoke (13) which is positioned between two collars (15).

A plastic ball eye (16) is fitted to each end of the yoke (13) with a self tap screw (25). The bellcrank (14) pivots on a 3mm bolt (18) on the arm protruding from the gearcase back, again with a nut both sides of the arm.

Slot the blades (9) into the holders (10), making sure they are leading edge forward (curved surface towards the gearbox, except Bell 47 when flat surface is towards the gearbox), and hold with M2 x 12 socket cap screw, star washer and nut. Refer to the diagram for correct installation.

☞ The groove in the main case of the tail rotor gearbox is a guide for the 18g control wire.



CABIN & TAILPLANE

The cabin and tail components are formed in ABS sheet. You will require a sharp pointed model knife, a suitable adhesive (super glue or solvent type such as Bostik No 1, part No ACC/BOS) and clothes pegs and a pair of pliers.

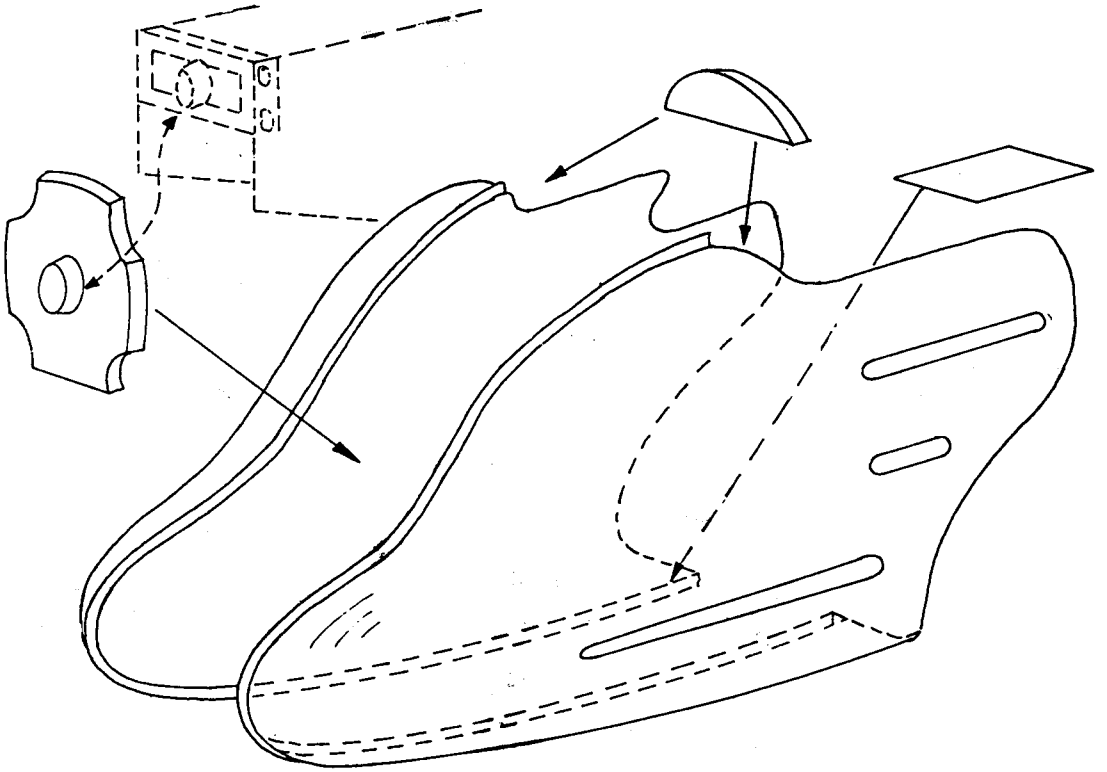
The material is cut by scoring with the knife point and bending the sheet along the scored line. Prepare by leaving the mouldings in a warm room for some time before attempting the cut. Practice on surplus material first.

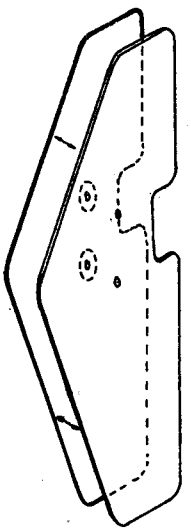
The material is first scored well clear of the desired line and then bent to break off at the cut. Then scribe a score at the finish line (on the cabin this is some 5mm from the nose shape on the flat, and where marked round the engine bay). The tailplanes are cut at the edge as no flat edging is necessary.

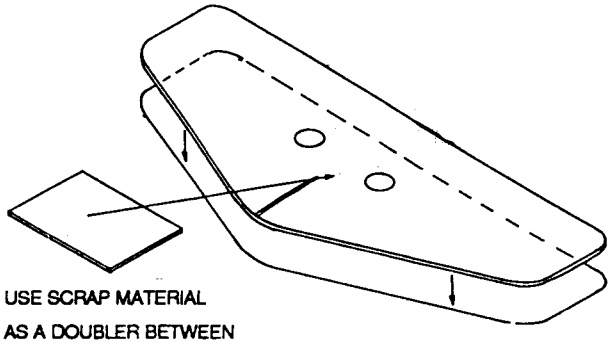
The remaining surplus is then 'bent' off using pliers at the finish line. Clean up with a sharp knife.

Glue the two halves together holding them in position with clothes pegs until the glue is set. When dry glue in the cabin bulkheads after using the chassis as a jig to ensure that the bulkhead is at the correct angle to align with the forward cross spacer.

Drill fixing holes through the three parts and paint as desired.







USE SCRAP MATERIAL
AS A DOUBLER BETWEEN
TAILPLANE HALVES AND
IN CANOPY

TAIL BOOM

STOCK CODE	Diagram key		
MXATB/END	(1)	Tail boom end moulding	
MXATB/JNT	(2)	Tail boom joint moulding	
MXATB/350	(3)	350mm boom tube	
MXATB/225	(4)	225mm boom tube	
MXATB/LOCK	(5)	gearcase lock saddle	
MXATB/SKID	(6)	tailskid moulding	
ACC/HEX	(7)	Hex ball drive coupling	
MXATB/STAY	(8)	Aluminium boom stay tube	
MXATB/BRKT	(9)	tailplane mount bracket	
	(10)	Elastic band retainers	
MXA/CAB	(11)	Vac-formed tailplane halves	
MXATB/B430	(12)	430mm brass tube	
MXATYB/140	(13)	140mm alloy tail skid	
MXATB/CL	(14)	2mm x 100 wire clamp	
M2N	(15)	M2 nut	(2)
M2x12	(16)	M2 x 12 screw	(2)
M3N	(17)	M3 nut	(3)
M3x16	(18)	M3 x 16 screw	(2)
M3x20	(19)	M3 x 20mm screw	(1)
M4 x6SS	(20)	M4 x 6mm set screw	(6)
M4x8		M4 x 8mm screws	(2)
M4N		M4 nut	(2)
M4SW		M4 star washer	(2)

- The tailboom assembly diagram is on the next page.

Feed the 16g (1.6mm) tail drive wire through the 430mm brass tube (12) and then the tube through the lower hole of the boom end moulding (1). Add the long boom tube (3). Fix with contact or super glue.

Feed the 18g (1.2mm) tail control wire through the smaller hole at the top of the boom end and out of the other end, then feed the boom joint moulding (2) over both wires and tube so that the tailplane bracket is on top, and fix with adhesive. Allow to dry.

Push and fix the short boom tube (4) onto the joint with the tail gearbox location hole at the rear and to the right. Careful alignment with the front of the tail boom is essential for correct tail rotor alignment.

Slide a hex ball coupling plug (7) over the drive wire at the rear, ball rearwards, then bend the end at 90 degrees. Pull the hex ball plug back over the bend and secure with two M4 x 6mm set screws (20).

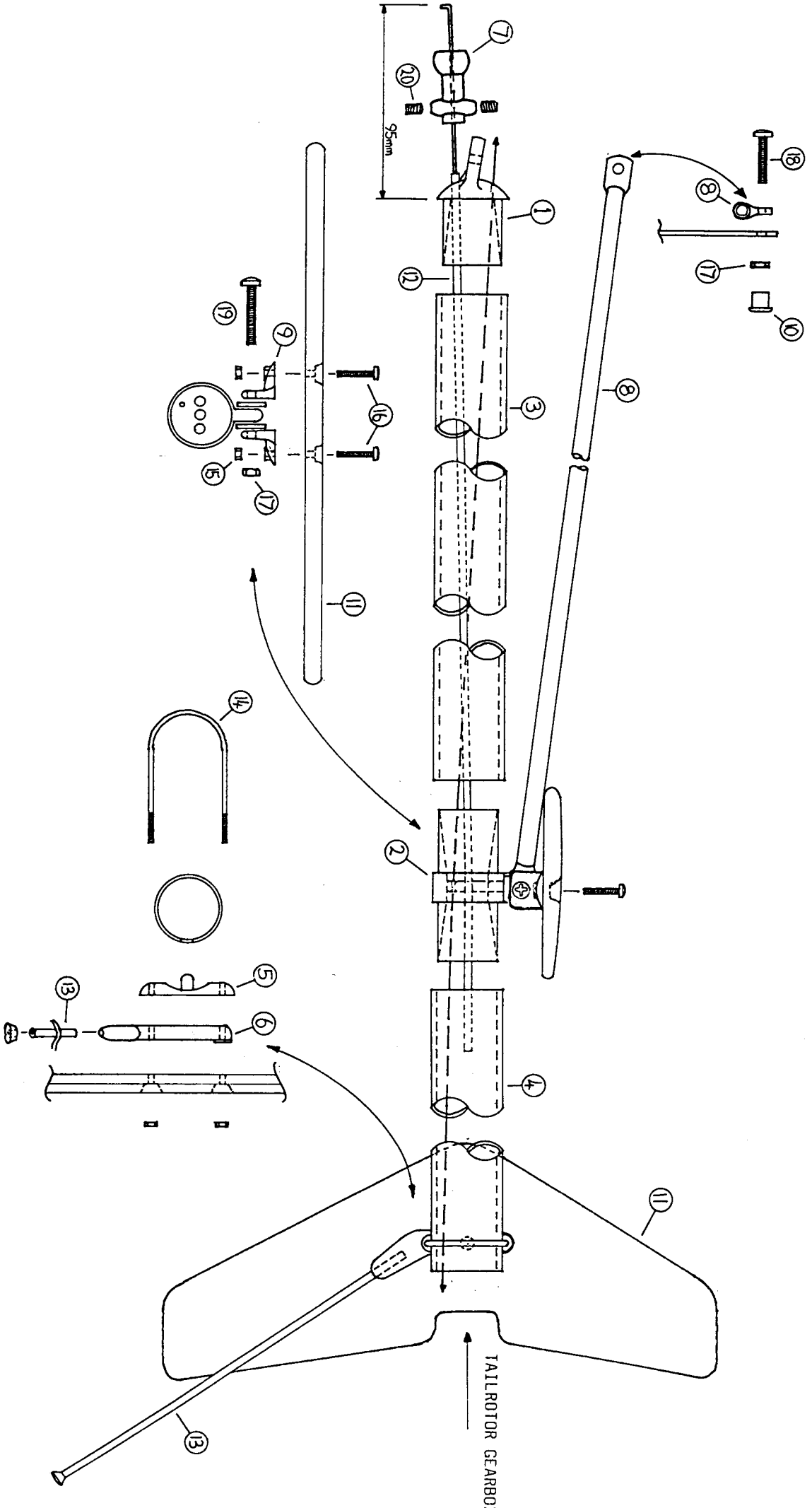
- File a small flat on the tail rotor gearbox input shaft, and put a hex ball socket on the shaft secured with an M4 x 6mm set screw onto the flat. Locate the assembly into the tail boom with the plastic lock saddle (5).

Push the drive wire from the front to er coupling you have just assembled. second hex drive plug as shown i. LUBRICATE the couplings with plenty o

Fit hex drive socket on the main gearbox o. taking care that the set screw locates prope. flat on the shaft..

Assemble fin (11) and tailplane (11) to tailb. using the right angled brackets (9) and M3 x 20 (1. and M3 nut (17), and the M2 x 12 (16) and M2 nu (15).

Attach the tailboom to the rear underside of the channel in the chassis using M4 x 8 screws and nuts, and fit 450mm aluminium stay tubes from the tailboom joint to the fixing holes above the tank position in the chassis using M3 x 16 screws (18). The small moulded retainers (10) are fitted over the excess screw threads to take the elastic bands which hold the fuel tank in position.


95mm
TAILROTOR GEARBOX

ROTOR HEAD

STOCK CODE	Diagram key	
ORH/PLATE	1	head plate
ORH/FINGS	2	set of 4 finger plates
ORH/TOP	3	top plate moulding
ORH/MT	4	mast top moulding
ORH/RUBS)	5	teeter rubber
" ")	5	drag damper rubber
ORH/BM	6	blade mount
ORH/BRG	7	bearing mount pairs
ORH/CRADLE	8	cradle carrier
ORH/FBZZ	9	flybar cradle (zig zag)
ORH/FB	10	flyblade
ORH/FBOA	11	flybar operating arm
ORH/IA	12	incidence arm
ORH/FBAR	13	flybar (not in pack)
ORH/BB	14	6mm ballrace
ORH/OIL	15	3mm oilite bearing
ORH/FB	17	square brass collar
ORH/MIX)	18	mixer short rocker
" ")	19	mixer long rocker
" ")	20	mixer slider
		50mm threaded stud
		37mm control rod
		ball eye mouldings
		M3 star washer
	21	M2 x 12 screw
	22	M2 nut
	23	M3 x 16 skt cap screw
	24	M3 x 20 skt cap screw (plain shank)
	25	M3 x 20 skt cap screw
	26	M3 x 20 pan head screw
	27	M3 x 30 pan head screw
	28	M3 nut
	29	M4 x 10 socket set screw
	30	M4 x 25 plain shank screw
	31	M4 nyloc nut
	32	ball end ball
	33	M3 x 16 pan head screw
	34	M3 x 30 skt cap screw

Mixer Assembly

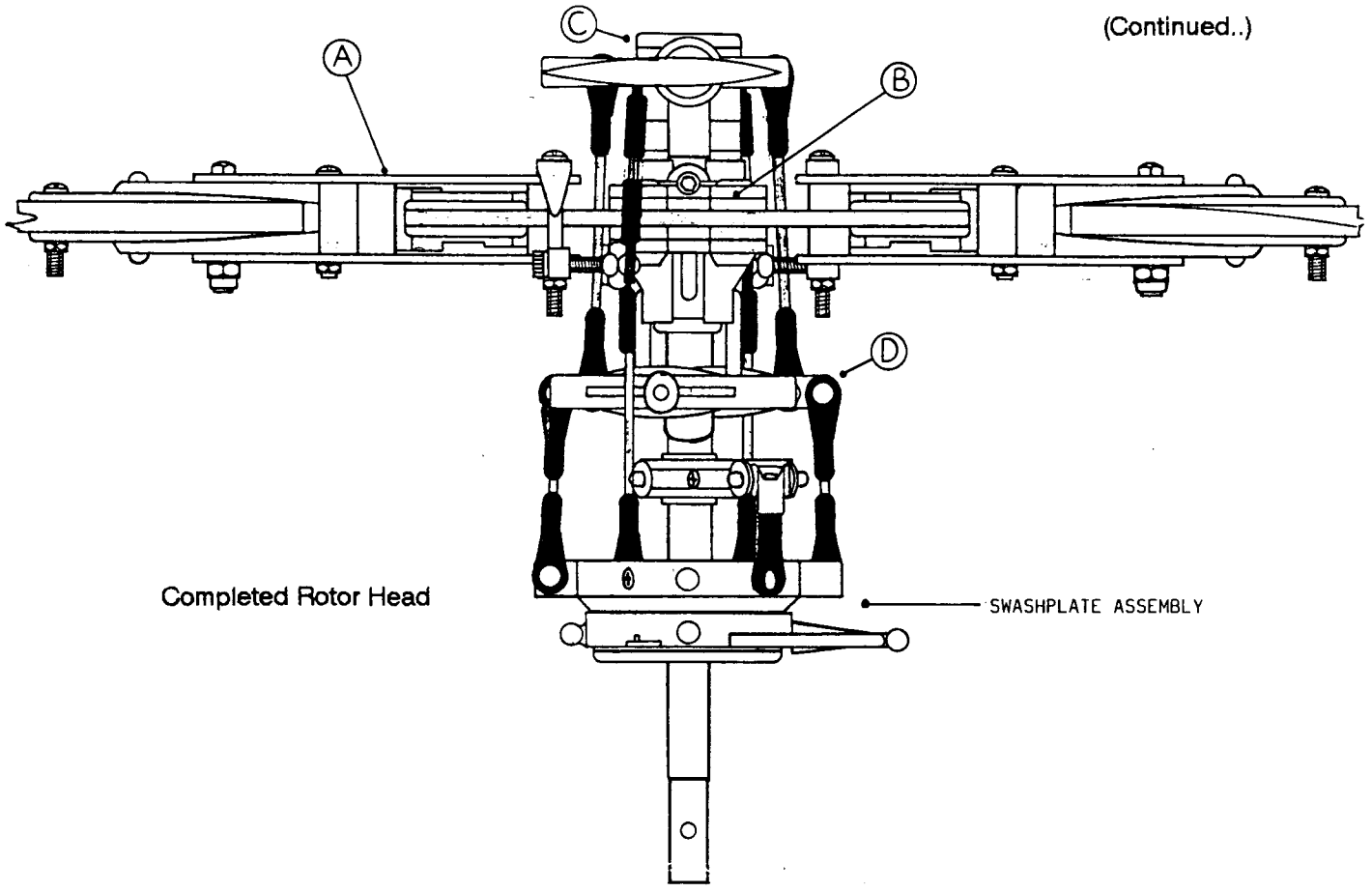
Cut the 50mm threaded stud into four equal lengths and fit a moulded ball eye to each end of each stud.

Pass an M3 x 20 skt cap screw with a smooth shank (24) through the holes in each side of the mixer slider (20) as in sketch 'D'. The smooth shank acts as a pivot, so use some light grease. Thread the screws into the long rocker arms (19), allowing it to cut its own thread in the plastic.

- The arms must be allowed to move freely but without slop.

Slide the mixer slider onto the rotor mast with the fork fitting upwards to go into the grooves in the side of the mast top moulding. Connect the outer arms of the long rocker arms to the outer balls of the swashplate using two of the four ball eye and stud connectors.

(Continued..)



Completed Rotor Head

ROTOR HEAD (continued)

Insert an M3 x 16 skt cap screw (23) through the pitch control hole in the two rotor blade incidence arms (12), and fix with M3 nut (28) as shown in sketch 'A'.

Push the four ballbearings (14) onto the stub axles moulded into the rotor head alloy plate (1).

☞ Note the word 'TOP' is marked on the stub axle. Remove any excess flash on the moulding with a sharp knife.

Lightly grease the bearings when in position. Fit the moulded bearing block (7) to the outer ballrace with the moulded stud to the trailing edge (anti-clockwise rotation). Assemble two steel fingers (2) onto the block using M3 x 20 pan head (cross head) screws (26), star washers and nuts (28).

Fit the inner bearing block (7) over the inner ballrace, between the steel fingers. Push the incidence arm (12) over the fingers and fit using 2 M3 x 30 pan head screws (27) through the inner bearing block followed by star washers and nuts (28).

Refer to sketch 'B'. Push mast top (4) onto mast. Remove rotor head fixing screw from inside the top plate moulding (3). Remove any flash remaining from the moulding. Place two M3 nut in the recesses in the base.

Sandwich the headplate (1) between the two teeter rubbers (5) and between the mast top and top plate moulding. Assemble using four M3 x 20 skt cap screws (25) threaded full length and M3 flat nuts (28).

☞ Make sure the nuts are pulled home and the teeter rubbers are firmly clamped but not distorted.

Fit the assembly on to the rotor mast and replace screw in top plate moulding, through mast.

Fit a brass ball to each end of the flybar cradle 'zig zag' using M2 screws and nuts, taking care to fit it on the side opposite the flybar position.

Snap the 'zig-zag' into the moulded carrier (8) and then push in the oilite bearings (15) over the small pivot shaft. Pass the fly bar (13) through the cradle, threading in the operating arms (11) as required.

The unit is fixed to the rotor head top moulding using 2 M3 x 30 socket cap screws (34) passing through the cradle and into the two M3 nuts in the top moulding (3). (Sketch 'C').

The flyblades (10) are fitted to the flybar (13) as in the sketch 'C' with the M4 x 10 socket set screws (29) passing through the rear of the flyblade into the square brass collet (10).

☞ The set screw *must fit into the deep grooves* at the end of the flybar. Note that the trailing edge of the flyblade is square and not sharp.

Fit a moulded ball eye to each end of the 37mm pushrods and use them to connect the flybar operating arms (11) to the inner balls on the mixer/rocker assembly. The flyblades (10) must be in line with each other. When satisfied, set the operating arms (11) in line with the flyblades and tighten the grubscrews.

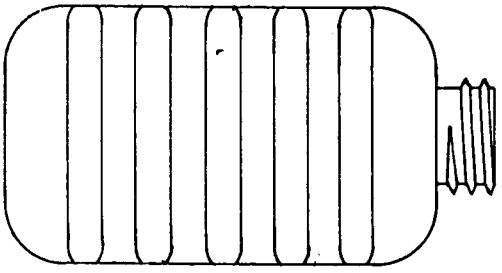
Thread a small rocker arm (18) onto the M3 bolt (23) on each incidence arm (12), and use the two remaining short connecting rods to link the ends of the 'zig-zag' cradles to the long arm of the small rockers.

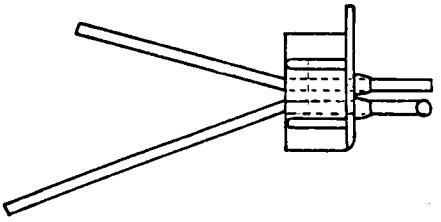
Thread moulded ball eyes onto the 37mm rods and use to connect the brass balls you have fitted on the swashplate cup to the short rocker on the incidence arms.

Lubricate all moving parts. Plastic on plastic should be lubricated with vaseline or similar e.g. mixer slider.

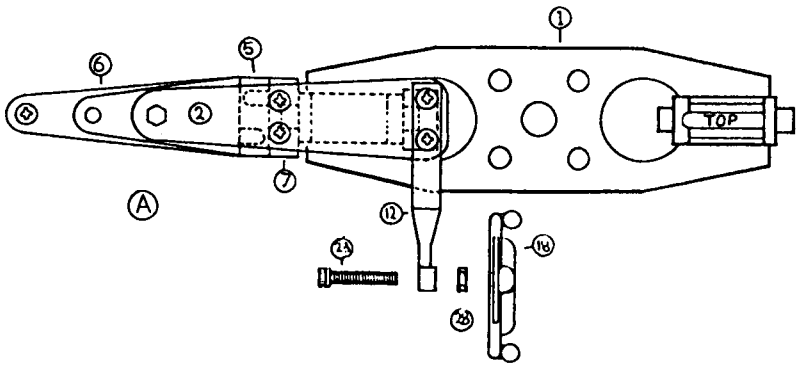
Assembly of fuel tank.

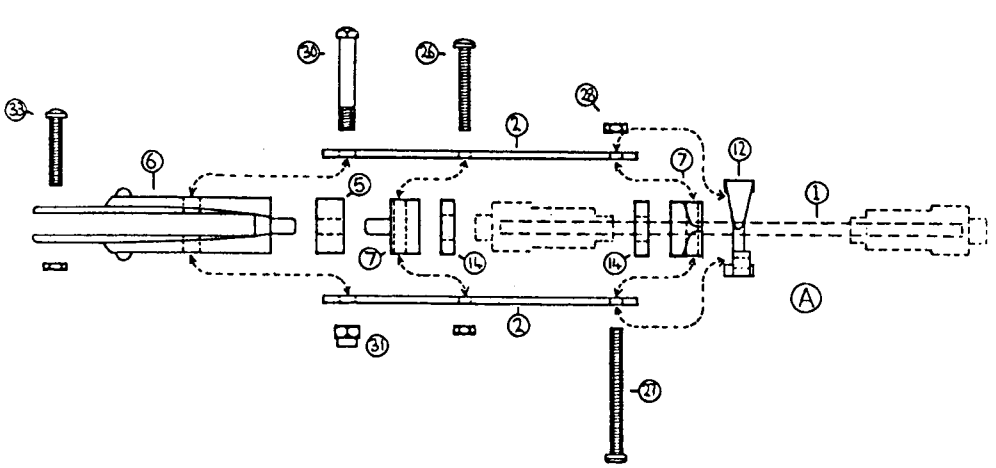
2 TUBES SIDE BY SIDE,
FOR VENT OR PRESSURE, AND FILL





1 TUBE AT BOTTOM OF TANK FOR ENGINE FEED


TOP
A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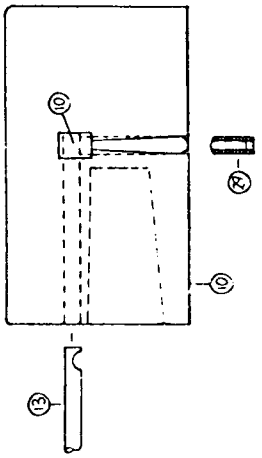
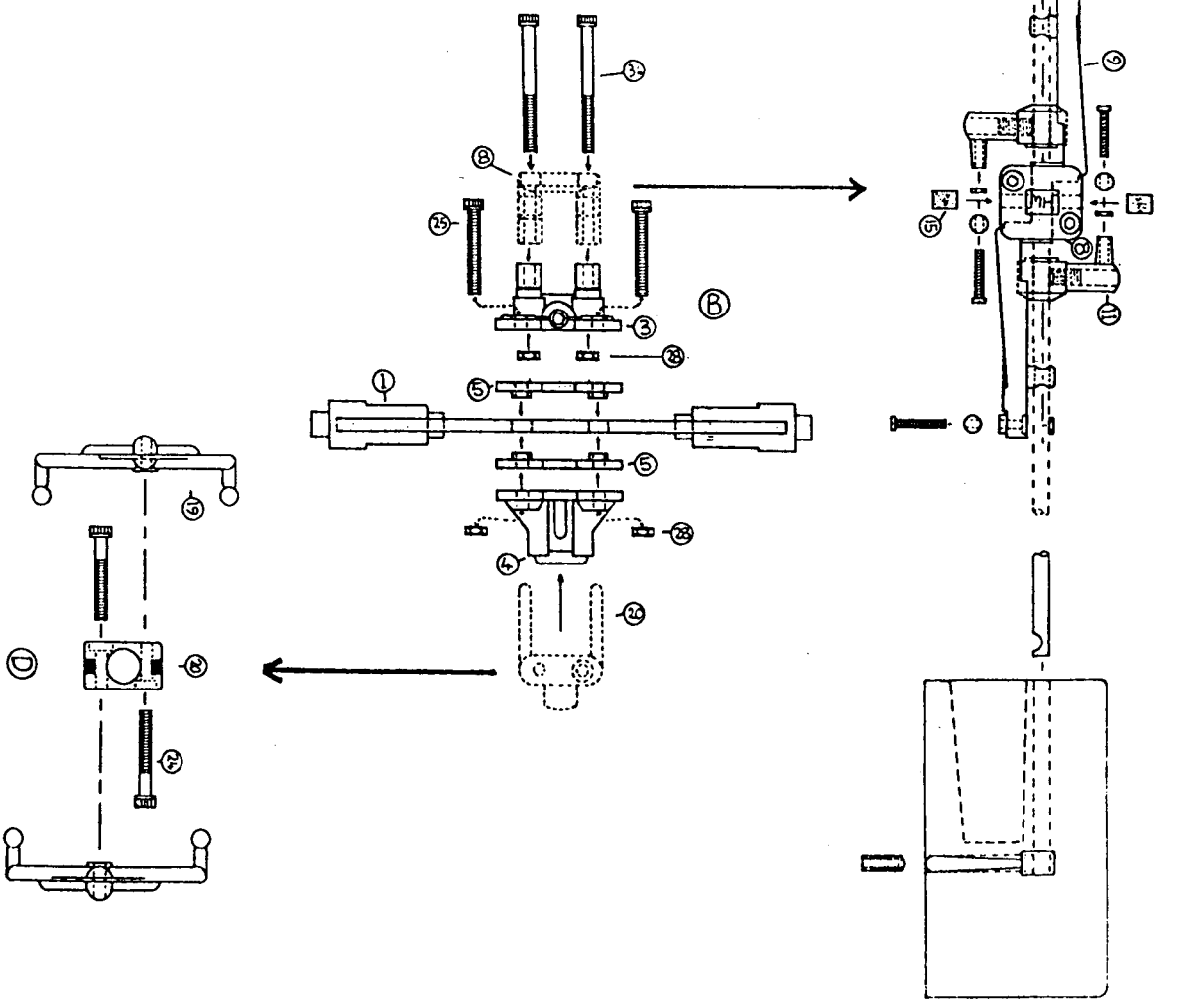
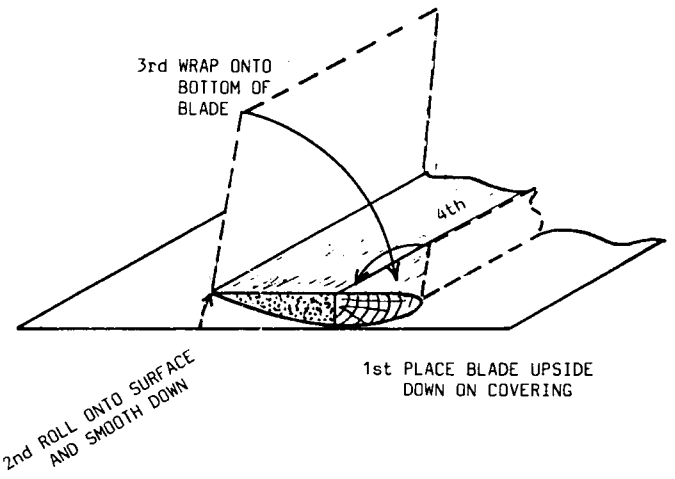



B

MAIN ROTOR BLADES



Cut away the balsa at the blade roots to taper the blades, and flatten the top of the blade where it fits into the moulded holder (6), with the peg on the holder to the front.

Sand the blades lightly to smooth the surface then cover with the self-adhesive vinyl supplied. The overlapping edges should be under the blade trailing edge 'downwind' - (see diagram).

BLADE BALANCE

The rotor blades must be in static and dynamic balance. To achieve this is simply a case of making sure they have the same weight, and that the centre of gravity of each blade is at the same point.

If the blades are of equal weight but differing centre of gravity, add covering material or electrical tape to move the balance point of one blade out towards the tip, and a similar amount of material to the other blade to bring the balance point towards the centre. Try and get the balance equal to within 1-2mm.

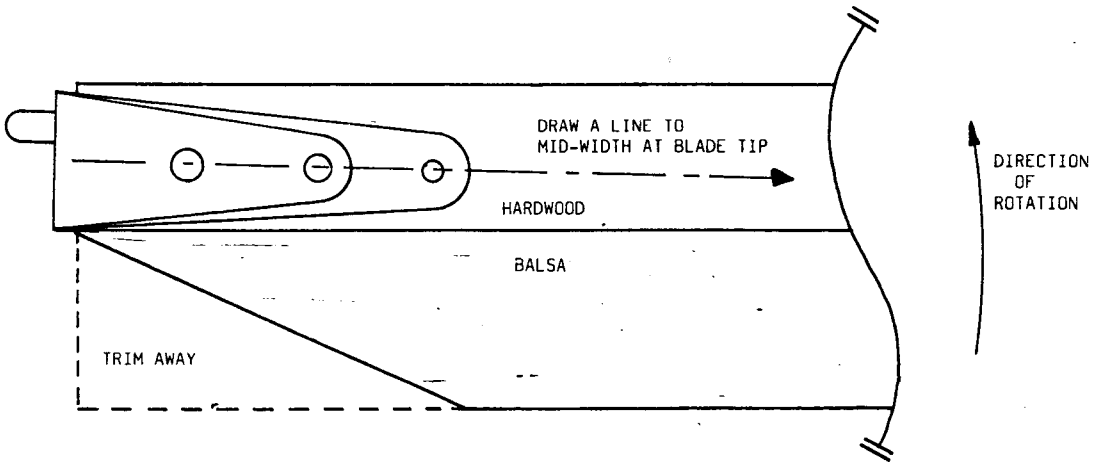
If the blades are of unequal weight and balance point, add covering material to the lighter blade in such a position that it will also move the balance point to match the other blade.

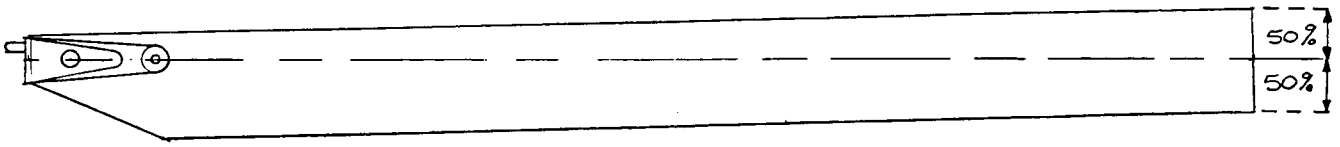
Insert the hardwood leading edge of the blades into the blade holders (6) and position so that a line from the two holes in the holders would extend to a point 50% back from the leading edge at the blade tip. This gives the correct amount of blade lead.

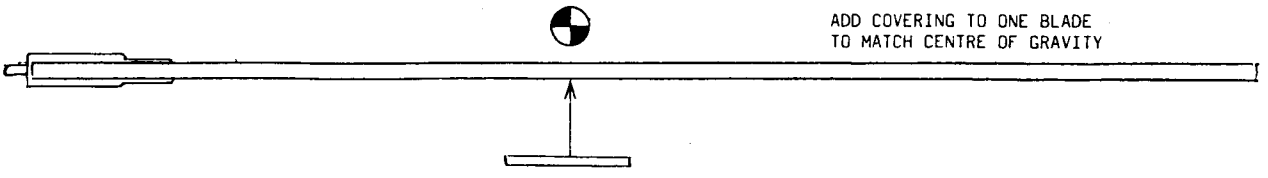
Use the holes in the moulding as a guide to drill the hardwood to fit the M3 x 16 (33) bolt and nut, then drill for the larger 4mm retaining bolt (36) and fit.

Place the rubber drag dampers (5) in position and push the complete blade assembly in place between the rotor head fingers using M4 screw (30) and nyloc nut (31) to secure.

Paint or tape one rotor tip red and the other white or yellow, or use Morley Helicopters dayglo tape, part no ACC/GLOW. Check that each tip in turn is the same height above the boom by turning the rotor until one blade is over the boom, measuring the distance down, then turning the rotor 180 degrees so the second blade is over the boom, and measuring that distance. This is static tracking and is very important.







Check that the completed model balances just in front of the rotor mast. Turn the rotor until the main blade are along the length of the model. Lift the model by the fly bar. The nose should be slightly down with the skids almost horizontal.

Main Rotor

- *Precise trim* can vary widely according to many factors, including model weight, engine power, air temperature, humidity, height above sea level, type of fuel used, glowplug condition, engine condition, etc.
- However, a reliable starting point is to set the bottom surface of the main blades to O degrees with the engine throttle closed.
- Total vertical travel of the swashplate on the main mast should be 11-13mm while throttle moves to open.
- Main blade pitch during the hover is approximatly 3 to 4 degrees.

How it works:

The model will move in the direction of tilt of the main rotor disc, which follows the same tilt of the swashplate. This tilt is controlled by the two cyclic pitch servos.

Tilting the swashplate down at the front will result in the rotor disc also tilting down at the front, and the model dropping its nose and moving forward from the hover. The same goes for left, back, and right, and any other angle - the rotor follows the tilt of the swashplate and the model moves in that same direction.

☞ An angular movement of the swashplate of about 15 degrees in each direction (total 30 degrees) is sufficient for ample control without over-sensitivity.

Tail Rotor

A suitable setting for the tail rotor is for the flat surface of the blades to be at right angles to the pitch control rod (i.e. pitch is O degrees) when the transmitter control stick is pushed fully to the right (with Tx trim at neutral).

☞ It is most important that the control rods move freely.

Engine

☞ Have you got lubricant in the gearboxes? Occasionally lubricate the main gearbox with oil through the hole in well at rear of gear case. Grease is also essential in the hex couplings for the tail rotor drive.

Follow the correct running in procedure for your engine as given by the manufacturer.

- The carburettor must be set rich enough to keep the engine cool, yet lean enough to provide ample power. With the rotor collective pitch set as specified the engine should be set to a rich two stroke mixture.
- The rotor head should be held while starting the engine with the throttle just open. The centrifugal clutch may drag when new but will quickly settle so it will be free at a correct idle speed. Open the throttle by pushing forward left hand stick if you have installed according to the drawing. This will speed up the rotor head and apply collective pitch.
- Rotor speed is important on any model helicopter and too great a deviation can cause aggravating problems.

At about half stick the rotor should be spinning fast and tracking correctly - that is each blade should be in the same path as the other. The coloured tips enable you to see this.

If tracking is incorrect throttle back the engine and wait for the rotor to stop, then increase pitch on the lower blade and reduce pitch on the higher blade. If in order, advance the throttle/collective to the point where the model is decidedly light.

Shaking

If there is a shake on the model, stop the rotor and add an extra band of covering material to one blade (15mm wide for minor shake, 50mm for vicious), try again, if worse put it on the other blade. The fly blades may also need dynamic balancing in this way.

When tracking and balance are sorted out the throttle/ collective may be advanced to the point of lift off.

☞ Too low a rotor speed will cause powerful oscillations of the whole model. Do not

mistake them for an unbalanced head. The answer is to reduce collective pitch by lengthening the push rods between the paddle arm and the rotor incidence arm.

☞ Incidentally, an excess of collective pitch can cause the clutch to slip and heat up, and the tail rotor will be unable to cope with torque because it is running too slowly. Also in this condition the engine is working very hard at low rpm of the cooling fan, *so this is a dangerous condition to stay with.*

- If the engine screams and the model shows a reluctance to lift off then more pitch is required relative to throttle.
- If it lifts off but is very twitchy and sensitive on the controls again increase pitch to slow the rotor down.

☞ Lift off is best at about 1/2 to 2/3 of full throttle stick movement. Main rotor should be turning at approx 1100 rpm, equivalent to 4500 at the tail rotor, although up to 1300 is fine.

- Oscillations can also occur with a two bladed rotor head if the teeter is reduced by excessive tightening of the four teeter bolts (Rotor Head assembly sketch B). Try to adjust so the rotor head plate is held *firmly* but not solidly between the rubbers.

Similarly with the tail rotor. If the model tends to revolve at the point of lift off increase or decrease the tail pitch setting by moving the collars on either side of the yoke.

The model is now ready to fly.

Diagram1 ↓

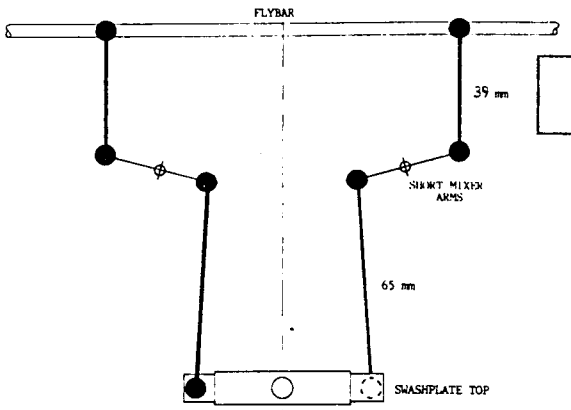
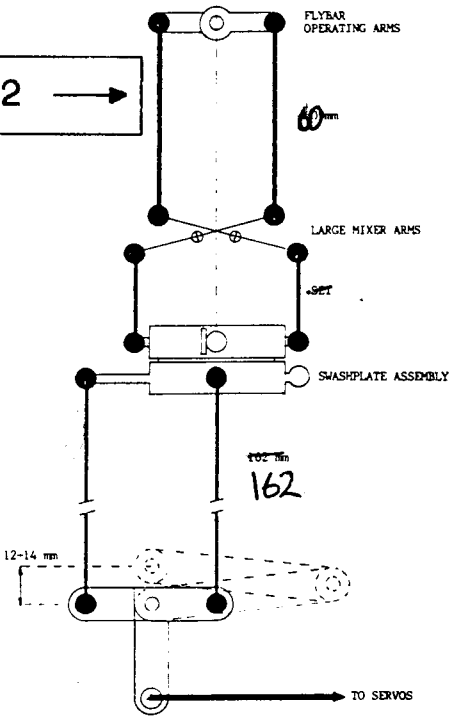
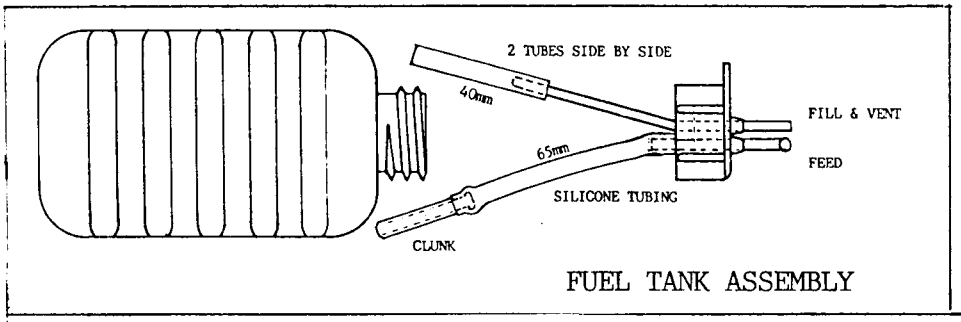


Diagram 2 →





FUEL TANK ASSEMBLY

Throttle

Check again that the throttle servo drives the throttle arm to its extremes without stalling and that the throttle arm rotates clockwise to close.

Collective Pitch

Select half or centre stick poition and check that the servo arm is at 90 degrees. Next adjust the bellcrank to swashplate rods, with the stick at bottom position the swashplate should just (only just) contact the mast oilite bearing holder, and moving the stick to the top, the swashplate should travel 13mm (measured on the mast).

Cyclic Servos

First select centre stick & trim on the collective pitch and centre trims on both cyclics, then adjust the three rods between the servos and the bellcranks until the swashplate is perfectly level. Next check the swashplate to mixer arm rods are 65mm and the short mixer arms to the flybar zig-zag are 39mm (DIAG 1), also the rods from the long mixer arms to the flybar operating arms are 60mm (DIAG 2).

Tailrotor

When the tailrotor stick and trim are at neutral the servo arm should be at 90 degrees and the idler assembly should be straight across the chassis.

Gyro Check

Holding the model by the rotorhead in one hand and supporting the tail with the other (one finger on the bellcrank), swing the model to the right -clockwise- the gyro should cause the servo to pull the crank forward, giving left to compensate for the right swing. Increasing collecrtive pitch will also increase (left) tailrotor pitch to counteract the added torque.

ATS check (if available) on your transmitter.

Final Check

Left cyclic tilts the swashplate to the left

Back cyclic tilts the swashplate backwards

Pushing the throttle/collective forward raises the s/p

Left tail pulls the tailrotor idler forward to increase pitch

If this is your first model helicopter, at this stage do not be tempted to fly it yourself. We strongly advise that you either return to the retailer where purchased or contact your local model flying club, who can put you in touch with a member that can help you trim the model and explain how to get you off the ground.

We wish you every sucess with your helicopter.