MORLEY HELICOPTERS

HUGHES 300

SPECIFICATION

Near 1/7 scale Hughes 300 model helicopter.

Rotor diameter	45in.	1143mm
Main rotor rpm	approx 1100 - 1300	
Main rotor	Morley 'AT' collective head	
Engine	.40 cu.in.	6.5 cc
Radio	any four channel proportional radio system	
	is suitable, or five channel helicopter radio	
	(full collective pitch is standard for all	
	Morley Mk 3 helicopters).	
	main rotor cyclic (2 servos)	
	main rotor collective/throttle (1 or 2 servos)	
	tail rotor (1 servo)	
Fuel capacity	8fl oz (250cc) in tank supplied	
Flying weight	6.5 lbs (3kg) 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 full capabilities of the model's performance.

The Hughes 300 is a 1/7th near scale model and is designed to be easy to build and fly, and simple and cheap to repair. It has an excellent flight performance, being stable yet responsive, and is suitable for beginners who need a strong, steady model, and experts who want to be able to tune a model for extra performance.

The design is unique and even to those who are thoroughly skilled in the intricacies of a model helicopter we would recommend following the assembly instructions, especially on the subject of the plastic chassis members and tail boom. It is best to complete the assembly in numerical order.

Sincerely,
Morley Helicopters

ENGINE MOUNT

STOCK CODE	Diagram key	
0MR/EM	1	engine mount mouldings
0MR/FAN	2	fan
0MR/FLY	5	flywheel
0MR/P14T	6	drive pulley, 14T
0MR/SP	7	starter pulley
M3x20SC	29	M3 x 20 socket cap screws (4)
M3NLN	30	M3 x nyloc nuts (4)

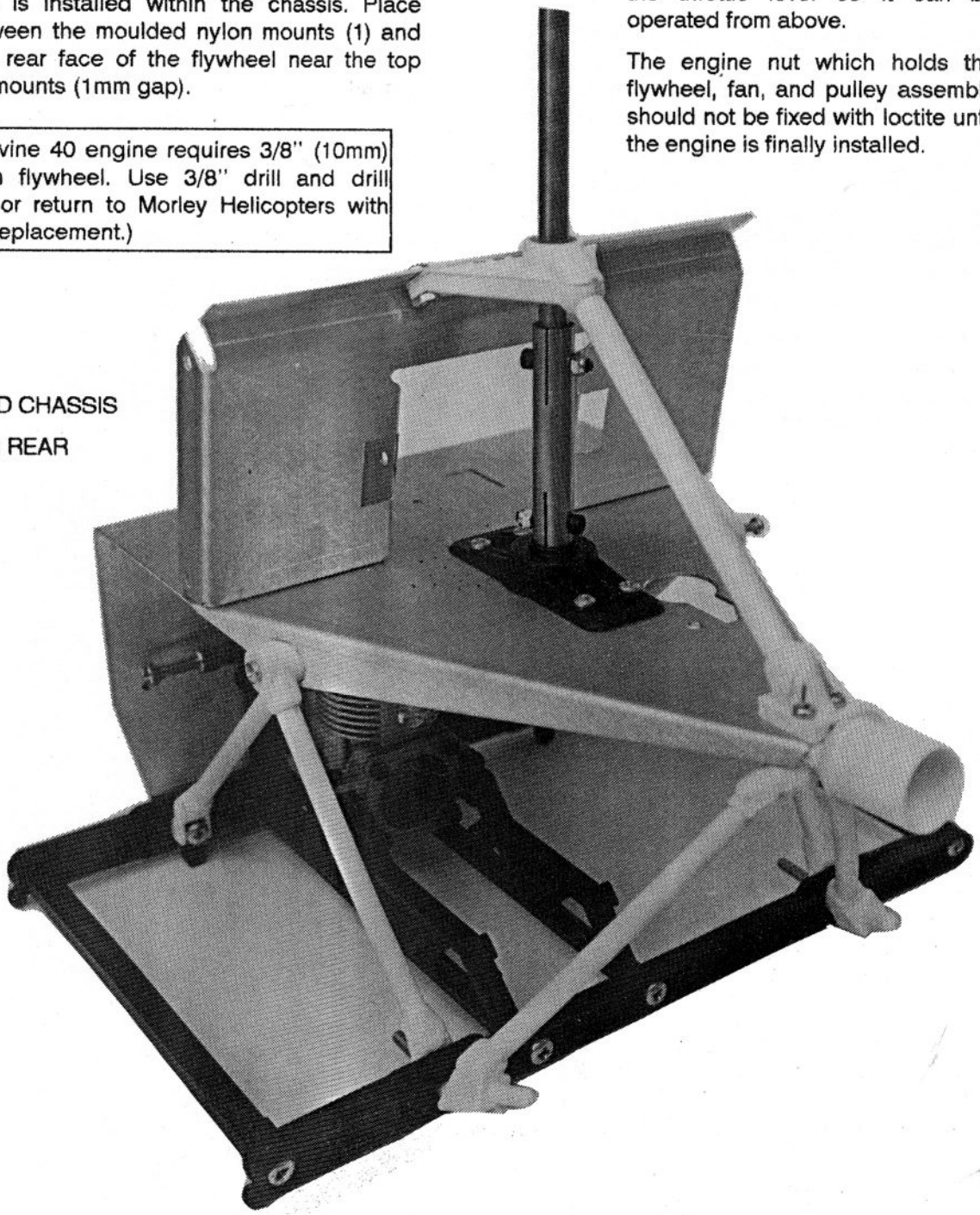
Temporarily fit flywheel (5) on engine crankshaft making sure flywheel inner face is seated properly onto the prop driver.

Follow by fan (2), drive pulley (6) and engine nut, but note that these are not fitted finally until the engine unit is installed within the chassis. Place engine between the moulded nylon mounts (1) and line up the rear face of the flywheel near the top front of the mounts (1mm gap).

(N.b. Irvine 40 engine requires 3/8" (10mm) hole in flywheel. Use 3/8" drill and drill stand, or return to Morley Helicopters with £1 for replacement.)

Drill mounts for 3mm screws to suit your engine so that spacing is correct - cutting away one vertical stiffener in the mount if necessary. Fit a brass ball from the controls pack to the throttle lever on the engine and adjust the position of the throttle lever so it can be operated from above.

The engine nut which holds the flywheel, fan, and pulley assembly should not be fixed with loctite until the engine is finally installed.



COMPLETED CHASSIS

VIEW FROM REAR

MAIN GEARBOX

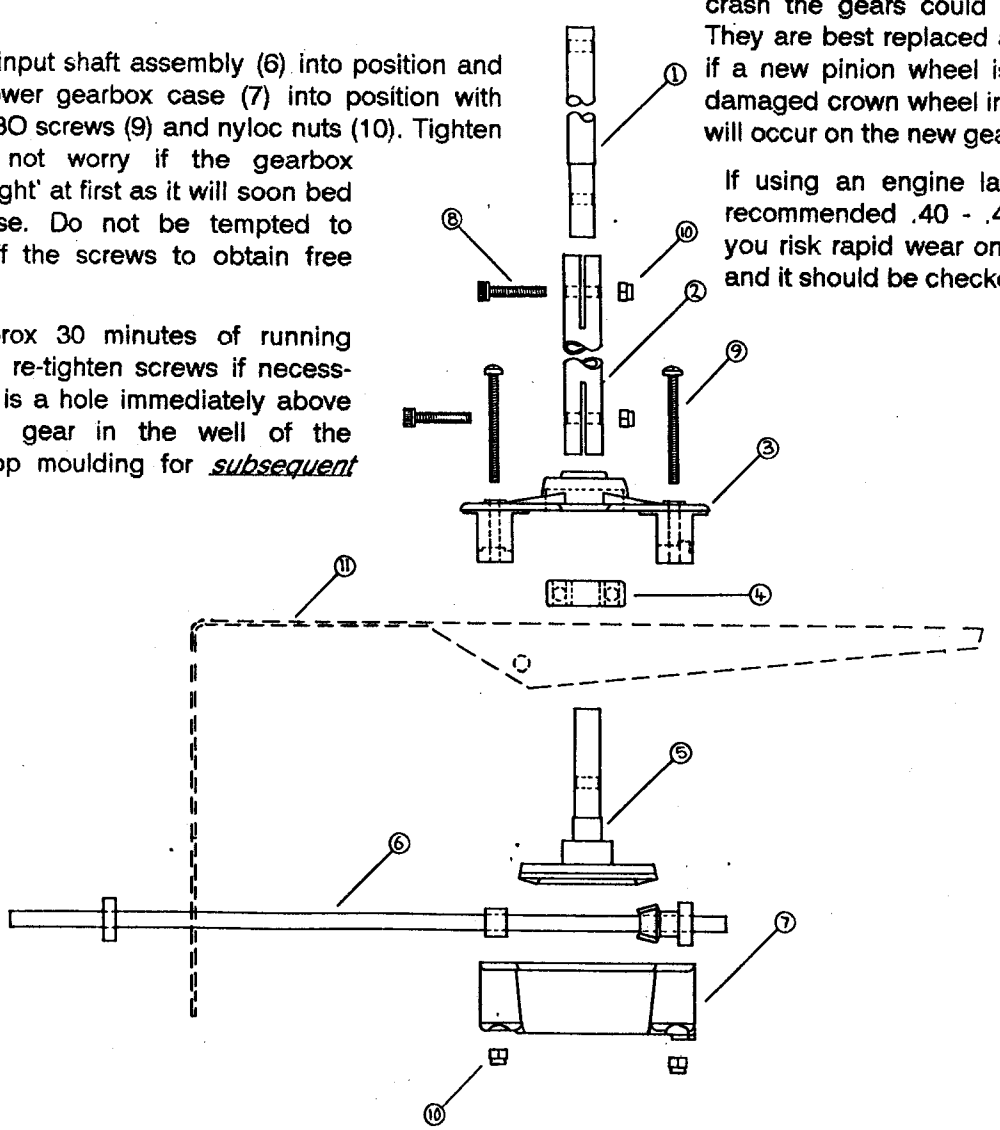
STOCK CODE	Diagram key	
0MG/MAST	1	rotor mast
0MG/CPL	2	mast coupling
0MG/C1	3	gearbox top moulding
0MG/BB	4	8mm ball bearing
0MG/CWS -DC	5	crownwheel and shaft (deep cut gear)
0MG/ISA -DC	6	input shaft assembly (deep cut gear
0MG/C2	7	gearbox case moulding
M3x16SC	8	M3 x 16 socket head screws (2)
M3x30	9	M3 x 30 screws (4)
M3NLN	10	M3 nyloc nuts (6)
300CH/BASE	11	Chassis

With crownwheel shaft (5) upwards through centre of the three adjacent holes in chassis (11), slide the 8mm ball bearing (4) down the shaft until it is touching the gear. The gearbox top moulding (3) is also slid down the shaft, over the ballrace, and through the chassis. Make sure the (larger) recess in the moulding for the input ballrace is at the rear.

Pack the gearbox with light grease. (I.e. fill the base)

Place the input shaft assembly (6) into position and pull the lower gearbox case (7) into position with four M3 x 30 screws (9) and nyloc nuts (10). Tighten fully. Do not worry if the gearbox appears 'tight' at first as it will soon bed in with use. Do not be tempted to slacken off the screws to obtain free rotation.

(After approx 30 minutes of running check and re-tighten screws if necessary. There is a hole immediately above the pinion gear in the well of the gearbox top moulding for *subsequent lubrication with gear oil before flying sessions.)*



Assemble the mast (1) to the gearbox using the coupling (2) with M3x16 socket head screws (8) and nyloc nuts. Do not use other types of screws or nuts.

(Note that in the event of a severe crash the gears could be damaged. They are best replaced as a pair, e.g. if a new pinion wheel is used with a damaged crown wheel increased wear will occur on the new gear).

If using an engine larger than the recommended .40 - .45 cu in size, you risk rapid wear on the gearbox, and it should be checked frequently.

H300 CHASSIS

STOCK CODE	Diagram key	
0MR/FD	3	fan duct
0MR/FDE	4	fan duct extension
300CH/BASE	8	base plate (not within packet)
300CH/SEAT	9	seat back
300CH/ST4	10	118mm stay tubes (2)
" "	11	105mm stay tubes "
" "	12	116mm " " "
300CH/ST5	13	120mm " " (1)
" "	14	250mm " " (2)
300CH/CS	15	crossmember moulding (2)
300CH/SS	16	spacer moulding (2)
300CH/ENDS	17	pack nylon stay ends
300CH/TOP	18	mast top bearing moulding
0MG/OIL	19	5/16 oilite bearing
M4x8	20	M4 x 8 screw (6)
M4N	21	M4 nuts " (10)
M4x30	22	M4 x 30 " (4)
ST3	23	plastite 8 x 3/8 self tapping screws (11)
M3x10	24	M3 x 10 screw (3)
M3x20	25	M3 x 20 " (3)
M3N	26	M3 nuts (6)
ST1	27	self tap screw 2 x 3/8 (1)
M3NLN	30	M3 nyloc (1)
M3x25	31	M3 x 25 screw (2)
M4SW	32	M4 star washers (4)

Borrow the boom end (1) from the tail boom pack and fit all stay end mouldings as shown. Assemble the stays starting with the two at the front (10), each 118mm long. Follow front stays with (11) 105mm, (12) 116mm, the single rear strut (13) 120mm, and finally the two 250mm 5/16th stays (14) for tail boom support.

Check the length of each stay to ensure it is correct. Trim if needed. Do not glue any until all are in place. Fit by filing small flats on the stay tube and making sure it will go fully into place.

Place front moulded chassis cross-member (15) in position at bottom of chassis (8). The engine unit can now be fitted to the chassis and crossmember.

Follow with outer spacers (16) and rear cross member (15), using self-tap plastite screws (23).

Elongate the access hole to glow plug if necessary. A remote socket for the glow plug is a useful item to fit at this point. Glow plug access is via the hole in the chassis plate.

Fit the flywheel (5) fan (2) and 14 tooth drive pulley (6) using locking compound or paint between the surfaces. Fit 'V' section starter pulley (7) over drive pulley using slow epoxy or super glue. An engine backfire on starting will undo this assembly unless it is properly tightened and locked.

Fit fan duct (3) to the front of the assembly using 3mm nyloc nut (30) on top screw. At the very top of the duct drill through the alloy chassis with a 2mm bit and fit the moulded duct extension (4) at the rear, holding in place with a small self tapping screw (27). The extension may be cut away if necessary to clear the cylinder head.

Next fit the aluminium seat back pressing (9) using M4 x 8 screws (20) with star washers under the chassis, followed by the triangular moulded housing (18) for the rotor mast top bearing.

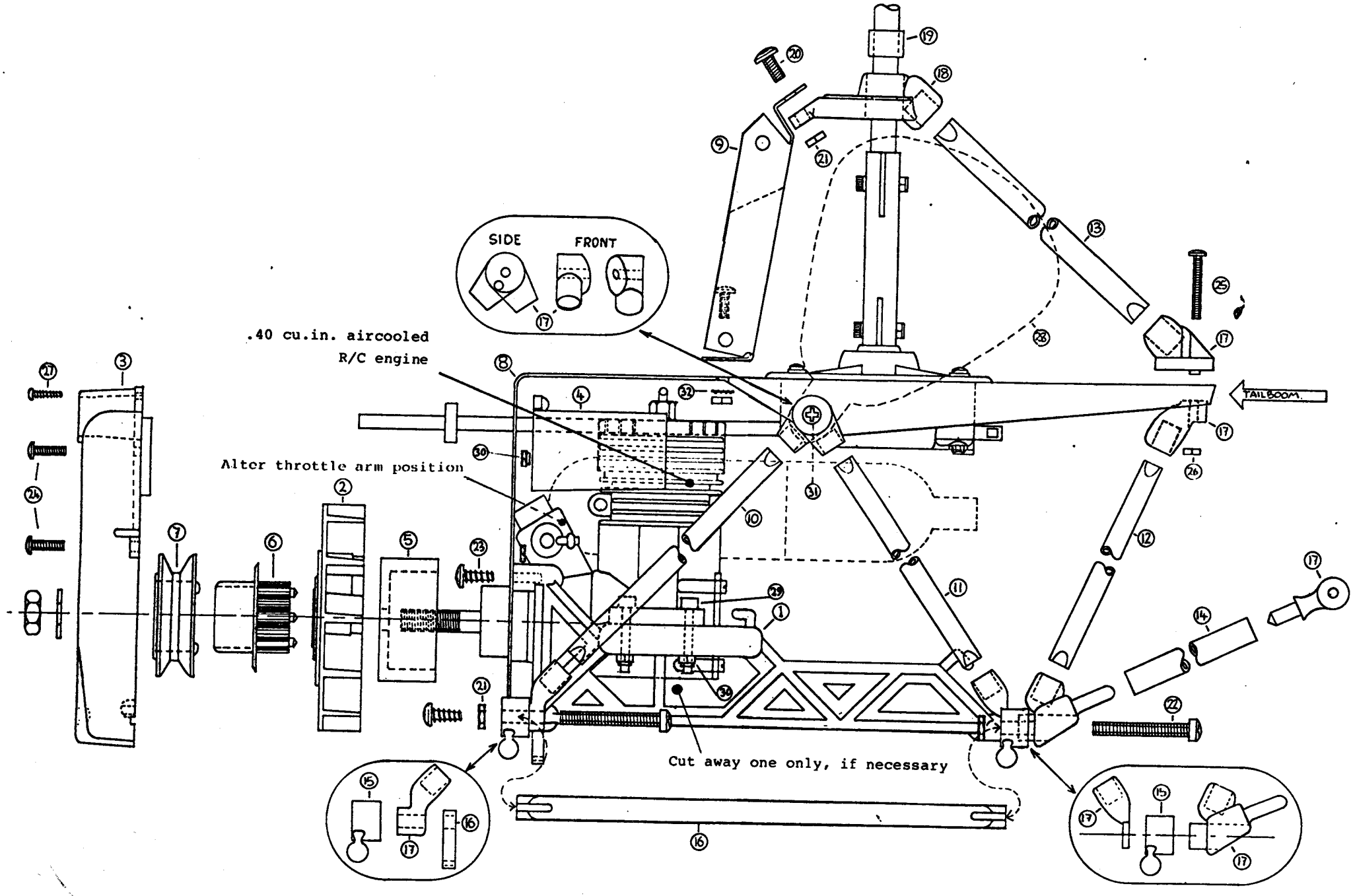
Note that the gearbox input shaft should be parallel with the bottom rail of the engine mount. Any misalignment here will be due to incorrect length or improperly seated stay tubes.

- When gluing use either a cyanoacrylate super glue run into the flat or a contact adhesive such as Evo-Stik. Do not try to put super glue onto parts and then insert as it will certainly lock in the wrong place. If using Evo-Stik allow several days for the glue to set properly.

Score the outside of the 5/16" oilite bearing (19) using a knife or file, and the bore of the triangular top bearing moulding (18) to give a good key for the adhesive.

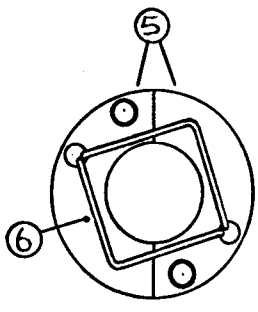
Slide the bearing down the mainmast and into position, and epoxy it into place - it fits loosely to allow self-alignment with the main mast before gluing. Slow setting epoxy is better than fast for this job.

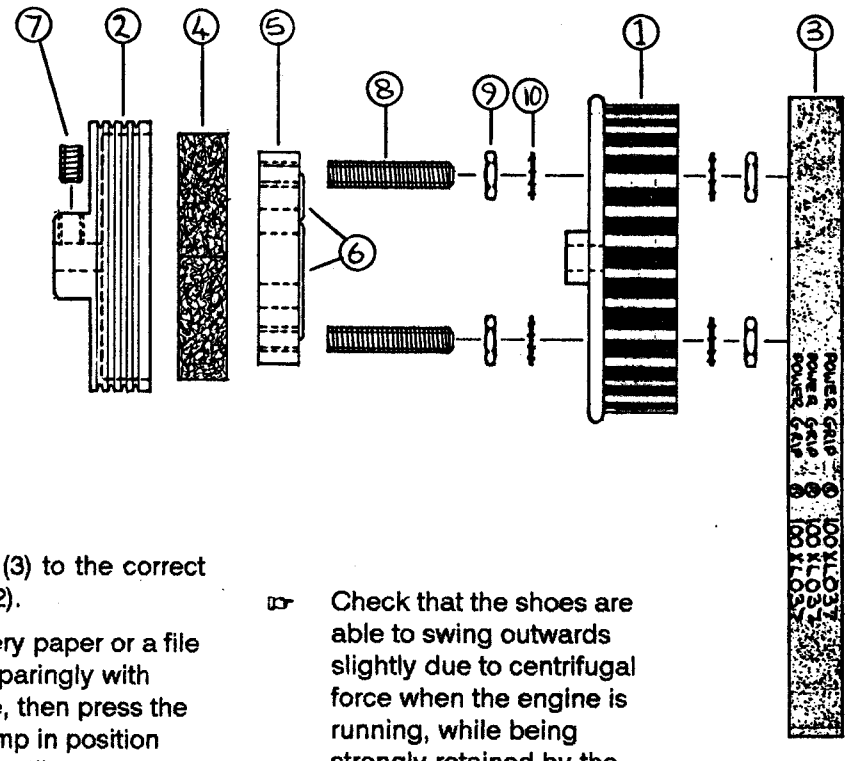
The M4 x 30 screws are used during installation of the undercarriage.


SIDE
FRONT
.40 cu.in. aircooled
R/C engine
Alter throttle arm position
TAILBOOM
Cut away one only, if necessary

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 (3) 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 (7) into the clutch shoes (4), with the key end of the screw just level with the surface of the shoe. Fit an M4 thin nut (8) at the rear, one turn clear of the shoe. Locate clutch springs (5) in clutch shoes and add star washers (9) 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 (6).

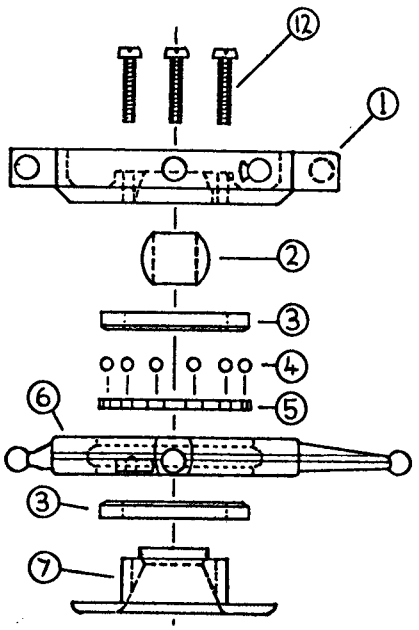
Excess length of the M4 x 20 screws may be removed with a small hacksaw if desired. Hold the screw against rotation while this is done, by fitting the Allen key into the slot.

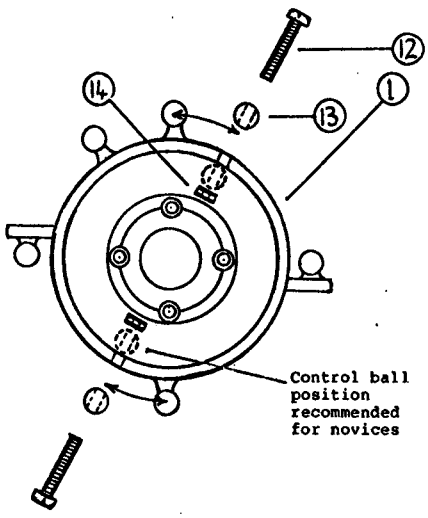
SWASHPLATE

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.

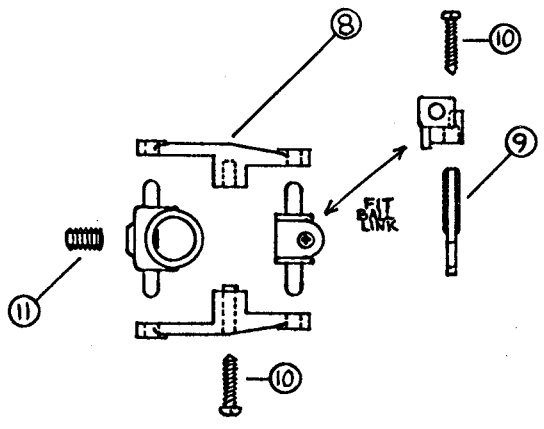
The top moulding can then be placed over the ball and the whole assembly secured together with 4 M2 x 12mm screws (12). It is important not to overtighten these screws - however, there should be no free play in the bearing, so careful fitting is required.

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).

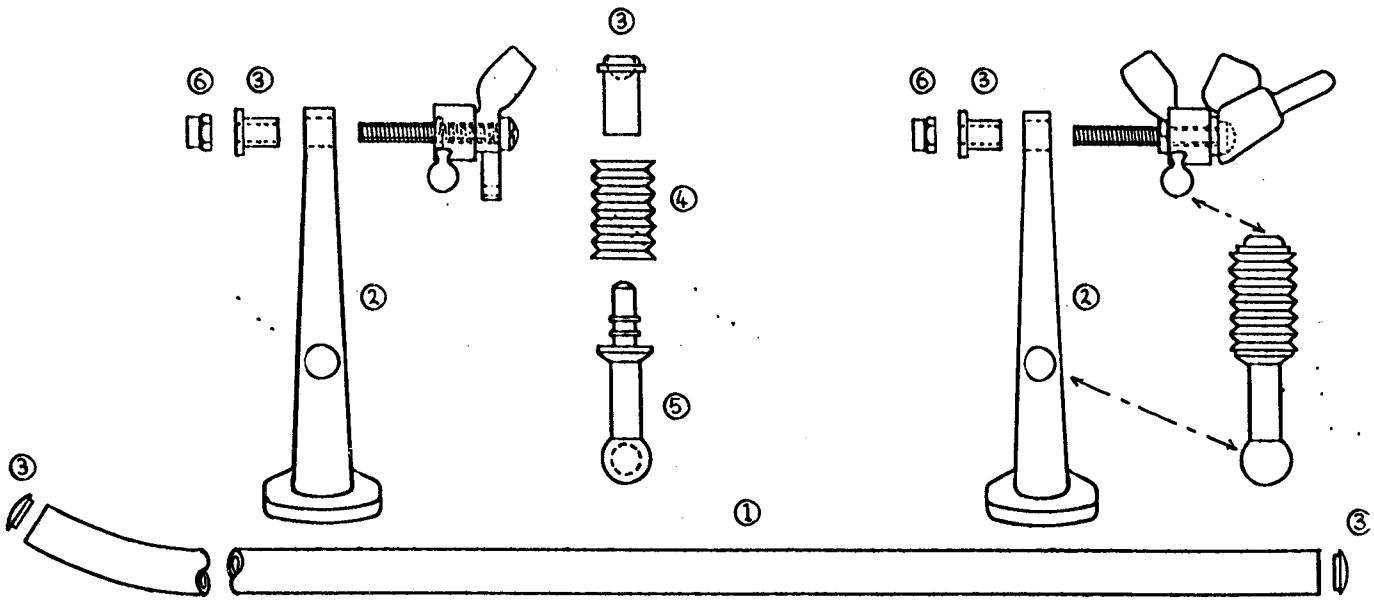
Assemble the swashplate driver using No 2 x 3/8" self tapping screws (10). Cut 5mm from the end of the ball eye (9) and fit to the small pivot. using No 2 self tapper.

☞ 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.



H300 UNDERCARRIAGE

STOCK CODE	Diagram key	
300UC/SKDS	1	skids (2)
300UC/LEG	2	leg moulding (4)
300UC/TOP	3	damper top/skid end/leg bearing (4)
300UC/DAMP	4	rubber damper (4)
300UC/SKT	5	socket strut (4)
M4NLN	6	M4 nyloc nut (4)



Hot water or a hair drier can be used to soften the plastic leg mouldings if it is difficult to force the mouldings over the aluminium skids.

Glue nylon pads (3) on the ends of the skids.

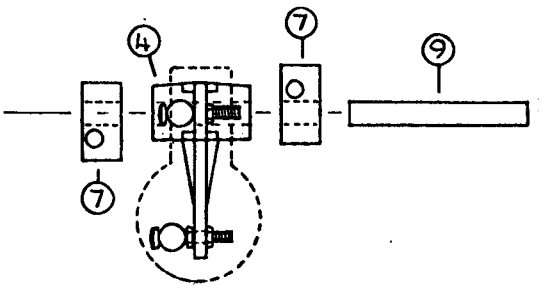
Place the black spacer blocks and crossmembers over the M4x30mm screws already fitted to the chassis, as shown in the chassis diagram, and secure with M4 flat nuts. Assemble plastic bearings (3) and the main legs (2) onto the M4 bolts and secure with nyloc nuts (6).

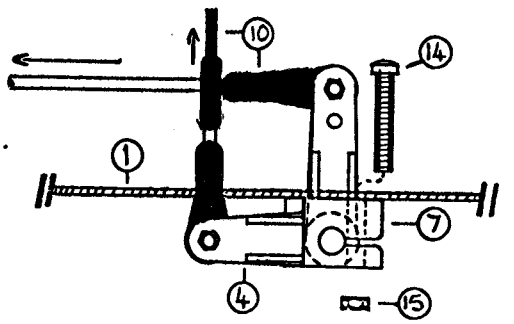
Assemble four damper struts using the strut ends (3), damper (4) and socket strut (5) as shown in the diagram.

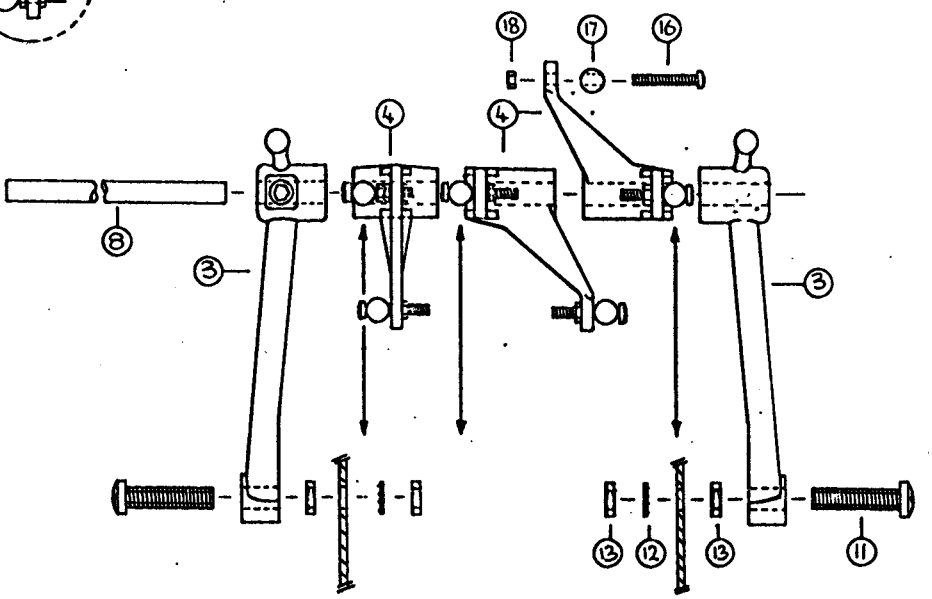
H300 CONTROLS

STOCK CODE	Diagram key	
0CON/CA	3	cradle arms (2)
0CON/BELL	4	bellcrank pairs (2)
0CON/TMNT	5	twin servo mounting bracket
0CON/SMNT	6	servo mounting bracket pairs (2)
0CON/MNT	7	pair bellcrank mount blocks
	10	ball eye (29)
0CON/ROD50		threaded stud 50mm
0CON/ROD65		connecting rod 65mm (10)
0CON/ROD135		connecting rod 135mm
0CON/SH75		bellcrank shaft 75mm
0CON/SH30		bellcrank shaft 30mm

M4x16	11	M4 x 16 screws (2)
M4SW	12	M4 star washers (2)
M4N	13	M4 thin nuts (4)
M3x16	14	M3 x 16 screws (2)
M3N	15	M3 nuts (8)
M2x12	16	M2 x 12 screws (18)
ACC/BJ	17	ball end ball (18)
M2N	18	M2 nuts (22)
M3x8		M3 x 8 screws (6)







Fit one of the straight bellcranks (4) on the short (30mm) shaft (9) between the mounting blocks (7), with ball ends fitted to outside (right) edge. On the bottom ball use an M2 screw and a nut on each side of the crank moulding.

The assembly is fitted through the hole on the right of the chassis, with the blocks positioned under the chassis and held by two M3 x 16 screws (14) and nuts (15). This operates collective pitch control as in the diagram.

Fit all the brass balls with M2 screws and nuts to the remaining three bellcranks as shown in the diagrams, using threadlock on the nuts.

☞ The top ball on the straight crank should have an extra nut to give clearance. Lightly grease the 75mm shaft (8) and slide the bellcranks on it followed by the cradle arms (3) at each end.

Fit the cradle arms to the seat back (2) using an M4 x 16 screw (11) and a nut (13) on each side of the metal, and a star washer (12). Tighten the grub-screw at the end of each cradle arm to grip the 75mm shaft, but be careful not to overtighten. The assembly must be smooth in operation without being loose.

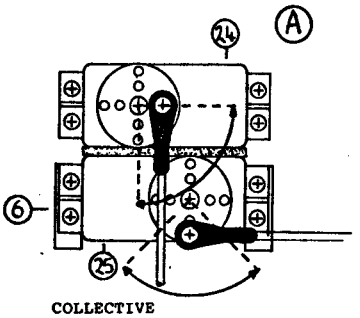
Fit moulded ball eyes (10) to each end of three 65mm rods, and connect the bellcranks to the swashplate. The overall tip to tip length of the rods and ends should be approx. 85mm.

Two moulded ball eyes end to end on a 12mm length of threaded stud connect the collective pitch bellcrank to the cradle assembly.

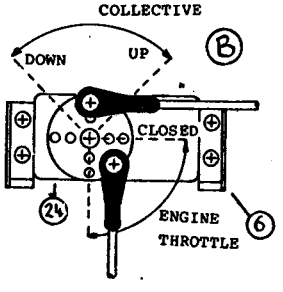
As the collective bellcrank is moved it raises or lowers the cradle & its bellcranks, which in turn move the vertical position of the swashplate on the main mast.

☞ When positioning servos ensure that the output discs/arms and pushrods do not foul anything. Always mount servos on rubber grommets to protect against vibration. Never be tempted to use less than the four screws supplied with the servos for mounting purposes.

5 Servo system



4 Servo system



Fit two servos (21 & 22) to the twin mounting bracket (5) and fix in position using M3x8 screws and nuts. Connect to the bellcranks with 65mm rods with ball eyes screwed onto each end.

Note that for controls to be free of interaction the servo-to-bellcrank link should be the same length as the cradle arm, but for access it is easier to have the link longer - any interaction is slight.

☞ A basic 4 servo radio can use 5 servos with a 'Y' lead on throttle/ collective, as shown in diagram 'A'.
If using only 4 servos, note the positions of the balls on the servo disc as shown in diagram 'B'. Align the throttle/collective servo (24) at the chosen location as in diagrams A or B, complete the linkage and fit the servo.

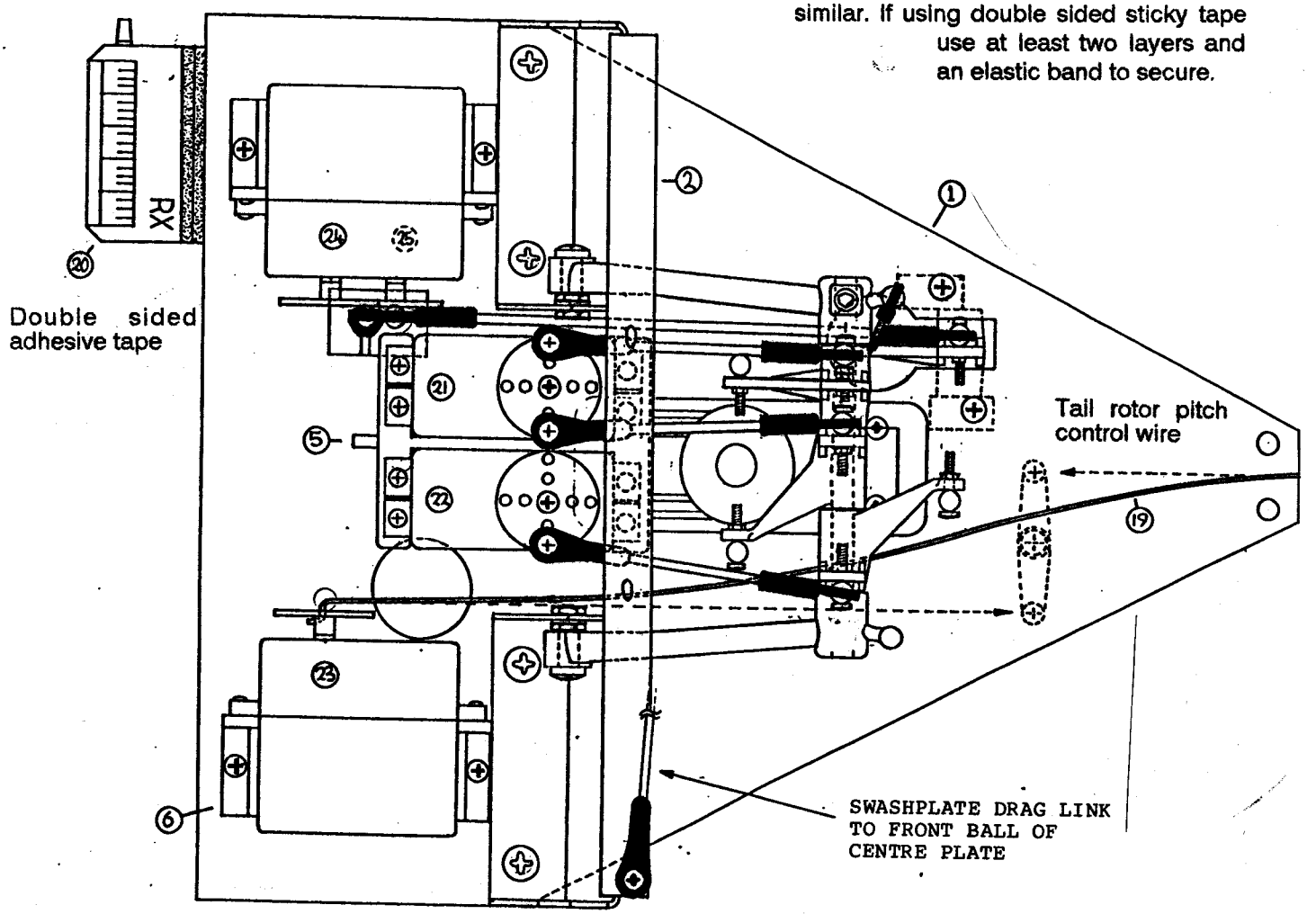
The tail rotor servo (23) is mounted on the left hand side for connection to the tail rotor control wire later.

- A gyro, if used, can be mounted on the plywood cabin floor. We recommend the Morley 'Gold' Rate Gyro or the Morley Full Pilot Authority Gyro.

The receiver battery is fitted later.

Finally fit the drag link to prevent the lower swashplate from rotating as seen in diagram, connecting to a ball end mounted on the seat back.

The radio receiver (20) must be well protected from vibration. Mount using rubber foam or similar. If using double sided sticky tape use at least two layers and an elastic band to secure.



H300 CABIN

STOCK CODE	Diagram key	
300CAB/SHT	1	sheet clear canopy mouldings (not in packet)
300CAB/SID	2	cabin side moulding (2)
300CAB/BAR	3	roll bar moulding
300CAB/FLR	4	plywood cabin floor
300CAB/TK		dummy fuel tank (2) (see chassis diagram, part 28)
300CAB/CAT	5	door catch/screw anchor (2)
ST1	8	2 x 3/8 self tap screws (8)

Cut out the canopy bottom fairing (1) and fix to cabin floor with clear impact adhesive. Note that the portion near the engine pulley is cut away to allow use of the starting belt (optional part ACC/B3 recommended).

Paint the ply cabin floor (4), and when dry strap the radio nicad pack, with switch, to centre.

☞ If using a 1000 or 1200 mah battery it is best not fixed to the canopy as a heavy landing could break the mounting points. Large batteries can be fitted to a reinforced false floor under the cabin floor, or to a fabricated bracket fixed to the main chassis.

Paint the cabin sides, rollbar and dummy fuel tanks if desired, followed by fuel proofer.

Disguise the battery pack with control console pieces cut from the large transparency moulding.

Using the airframe as a jig, fit the cabin sides (2) to the seat back (6) with the self tap screws into the moulded screw anchors (5).

Carefully drill the cabin floor 1.5mm for the two small self tap screws on each side, then glue and screw the floor in place.

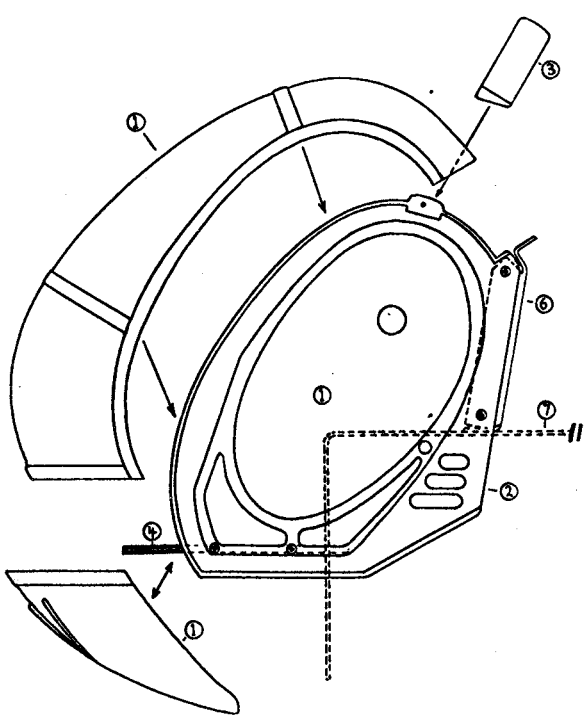
Use a sharp modelling knife or small sharp scissors to cut out the canopy bowl (1).

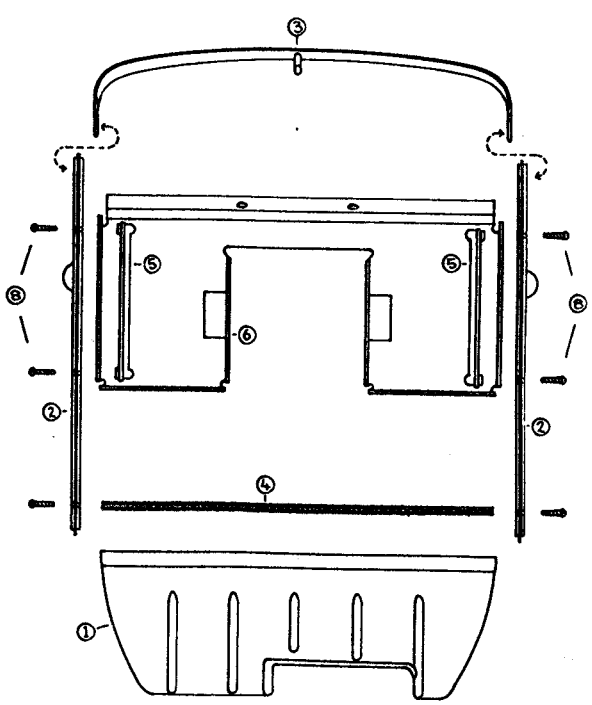
☞ Do not attempt to cut if cold, as the material can be brittle. Warm with water (not too hot!) if necessary. First cut 5mm clear of the scribed line on the moulding, check the fit, then make a second cut on the line if necessary.

Fix the canopy bowl to the inside surface of the cabin sides, carefully trimming as necessary. When assembled fit the roll bar (3) in place using clear impact adhesive on both parts.

Paint the inside of the bottom fairing. Cut out the clear side doors and windows (1) from the transparency using the door frame as a guide, fit handle mouldings, paint, then glue to door frame. One or both doors may be omitted for access if desired.

Stick plastic strip from canopy mouldings sheet around edges of dummy fuel tanks, and fit end mouldings also on the sheet to blank off end of the tank.





H300 TAIL BOOM

STOCK CODE		Diagram key	
300TB/END		1	end moulding
300TB/175		2	175mm boom tube
300TB/JNT		3	joint moulding
300TB/350		4	350mm boom tube
300TB/TAIL		5	tail plane
300TB/FIN)		6	dagger fin bracket
300TB/FIN)		7	dagger fin
300TB/SKID		8	skid moulding
300TB/LOCK		9	gearcase lock saddle
300TB/CL		10	8ba x 100mm wire clamp
300TB/B140		11	140mm brass tube for tail skid
ACC/HEX)		16	hex. ball socket (2)
" ")		12	hex. ball plugs (2)
300TB/B250			250mm brass tube for control wire
300TB/B430	*		430mm brass tube for drive wire
		13	M4 x 6 socket set screws (6)
		14	8ba nuts (2)
	*	15	16 g wire drive (1.5mm diameter)
	*	19	18 g control wire (1.2mm diameter)

* (not within packet)

***It is** most important to follow the correct sequence of assembly.*

First put the 430mm brass drive tube through the lower hole in the boom end moulding (1), and the 250mm brass control tube through the upper hole.

Insert the 16g (larger) wire through the drive tube, and the 18g wire through the control tube. Ignore the small hole in the moulding.

Feed the 175mm (2) boom tube over the end moulding and add the joint moulding (3). The drive wire and tube go through the centre hole of the joint moulding, and the control wire and tube through the right hole (viewed from the rear).

☞ The brass tubes and control wire must be inserted in the boom before it is glued together. Ensure joint moulding is vertical. Use super glue to fix.

Fix the dagger fin (7) into its bracket (6) and into the hole in the 350mm boom tube (4). Feed the boom tube over the wires and onto the joint moulding with the drive tube going through the hole in the top of the fin bracket, and the control wire going through the small hole at the base.

☞ Line up the assembly to make sure the dagger fin is vertical and fix the boom tube in place.

When dry remove boom assembly from the chassis and slide a hex. ball coupling (12) over drive wire at rear, without removing wire from boom. Bend the end of the drive wire over at 90 degrees as shown in the diagram, and pull the ball of the hex. coupling back over the bend and tighten the set screws (13).

Grease the drive wire and push back through its brass tube from the rear of the boom. Put the hex. socket onto the tail gearbox input shaft and tighten the grubscrew onto the flat on the shaft.

Assemble the gearbox, lock saddle moulding (9), skid moulding (8), tailplane (5) and 'U' shaped wire clamp (10) to the end of the boom as shown in sketch, and tighten the nuts on the clamp. Push the drive wire rearwards to engage the coupling in the tail rotor gearbox.

The second hex. ball drive is slid over the drive wire as shown in sketch, and the wire bent over 65mm from the end of the boom 175mm tube.

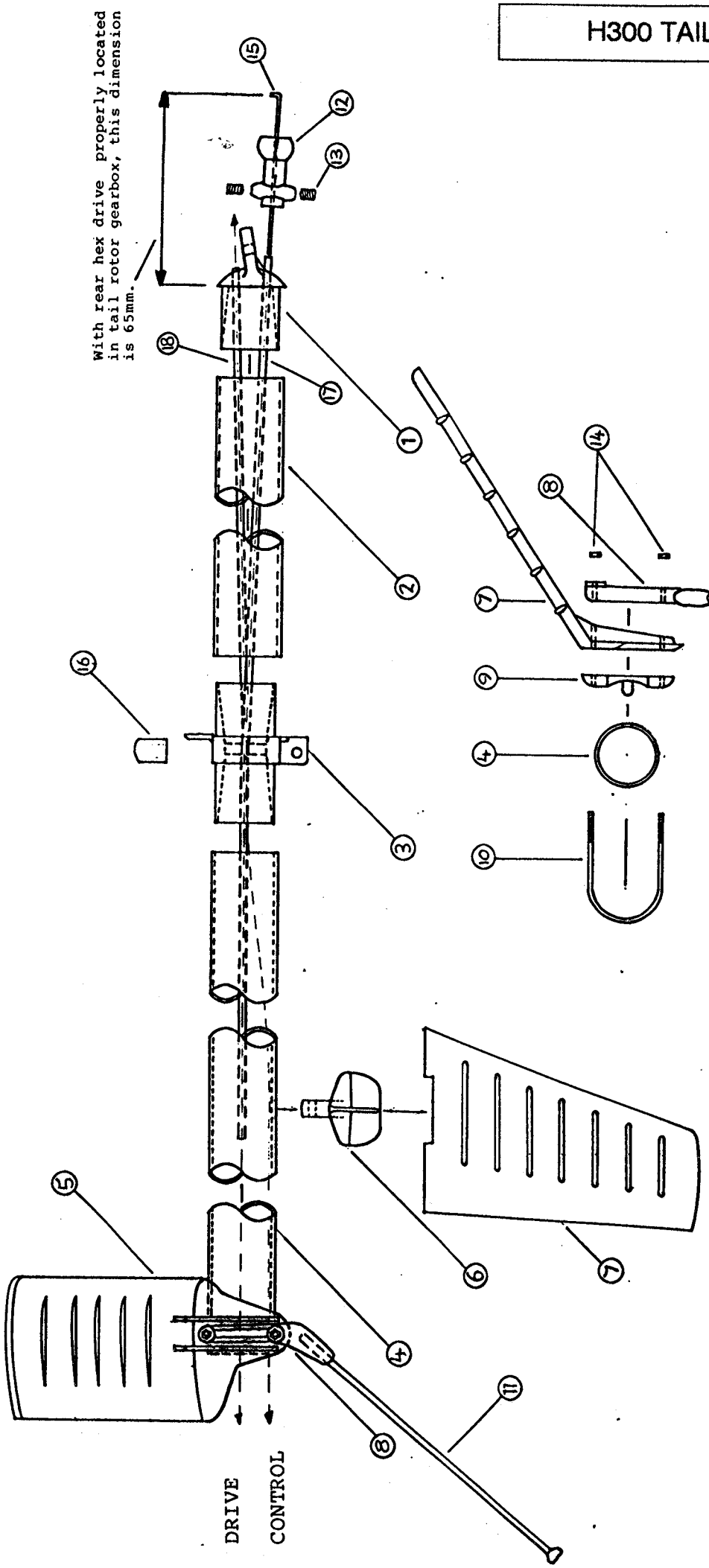
☞ Make sure the ball drive at the tail rotor end is pushed fully home before bending! Cut wire and complete the drive.

Fit final hex socket onto main gearbox shaft using grubscrew.

LUBRICATE the couplings with plenty of grease. Hex drives without grease will fail due to overheating, so this is a must.

Re-attach tail boom to the chassis.

H300 TAILBOOM



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.

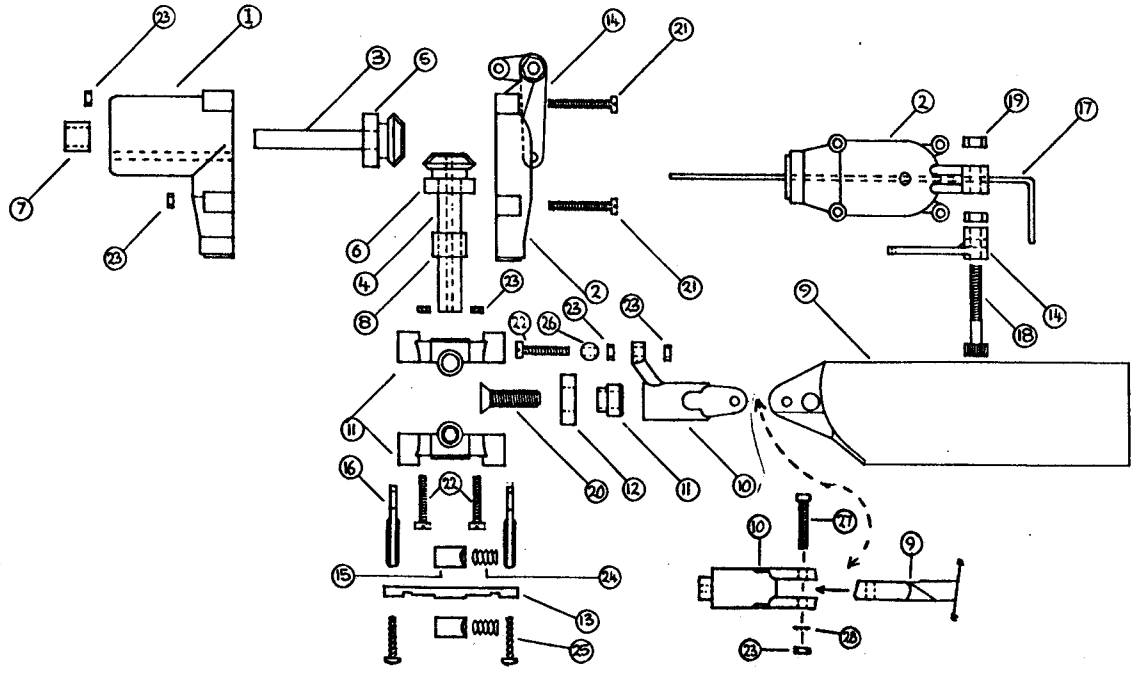
☞ Note that the outer surface of the hub should be flush with the end of the shaft.

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.



ROTOR HEAD

STOCK CODE	Diagram key	
0RH/PLATE	1	head plate
0RH/FINGS	2	set of 4 finger plates
0RH/TOP	3	top plate moulding
0RH/MT	4	mast top moulding
0RH/RUBS)	5	teeter rubber
" ")	5	drag damper rubber
0RH/BM	6	blade mount
0RH/BRG	7	bearing mount pairs
0RH/CRADLE	8	cradle carrier
0RH/FBZZ	9	flybar cradle (zig zag)
0RH/FB	10	flyblade
0RH/FBOA	11	flybar operating arm
0RH/IA	12	incidence arm
0RH/FBAR	13	flybar (not in pack)
0RH/BB	14	6mm ballrace
0RH/OIL	15	3mm oilite bearing
0RH/FB	17	square brass collar
0RH/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

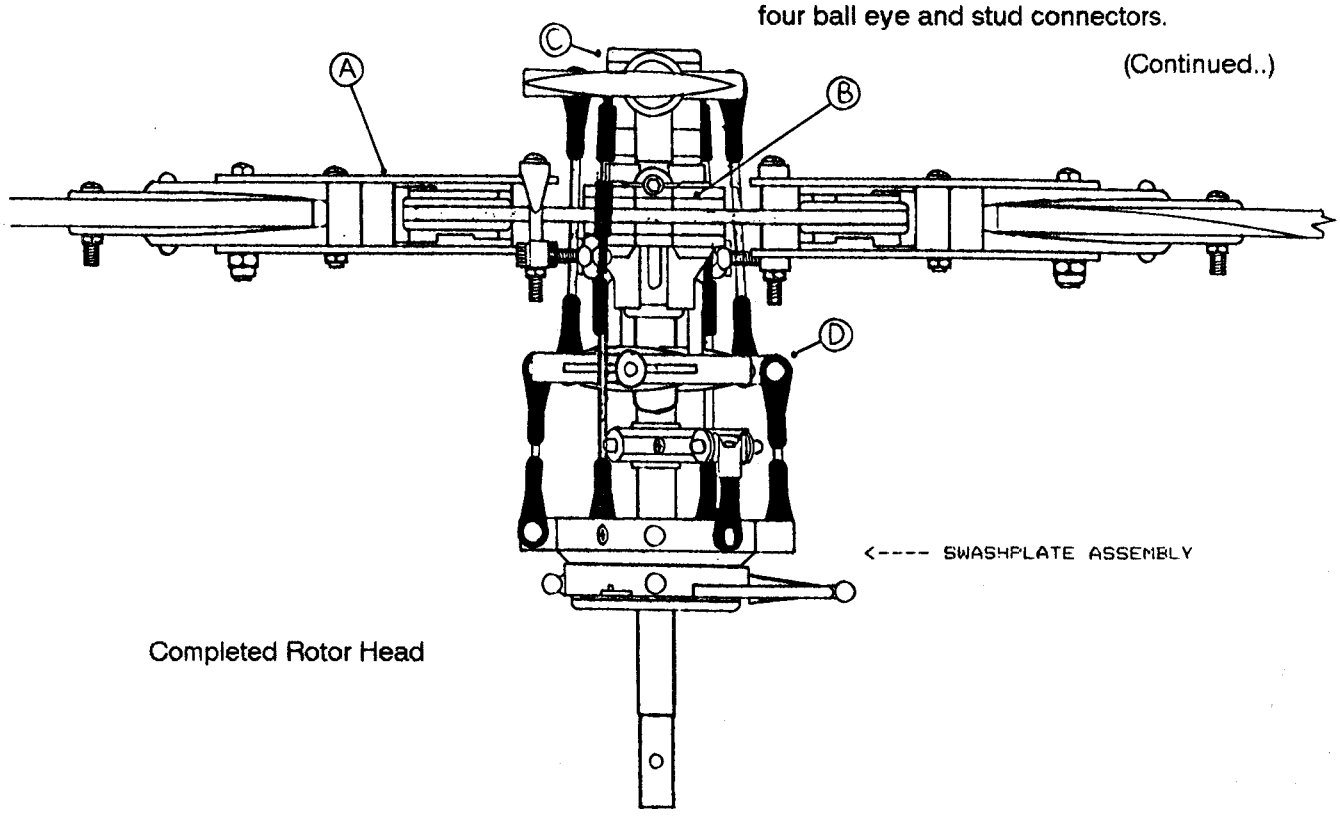
Cut the 50mm threaded stud into four equal lengths and fit a moulded ball eye to each end of each stud.

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.

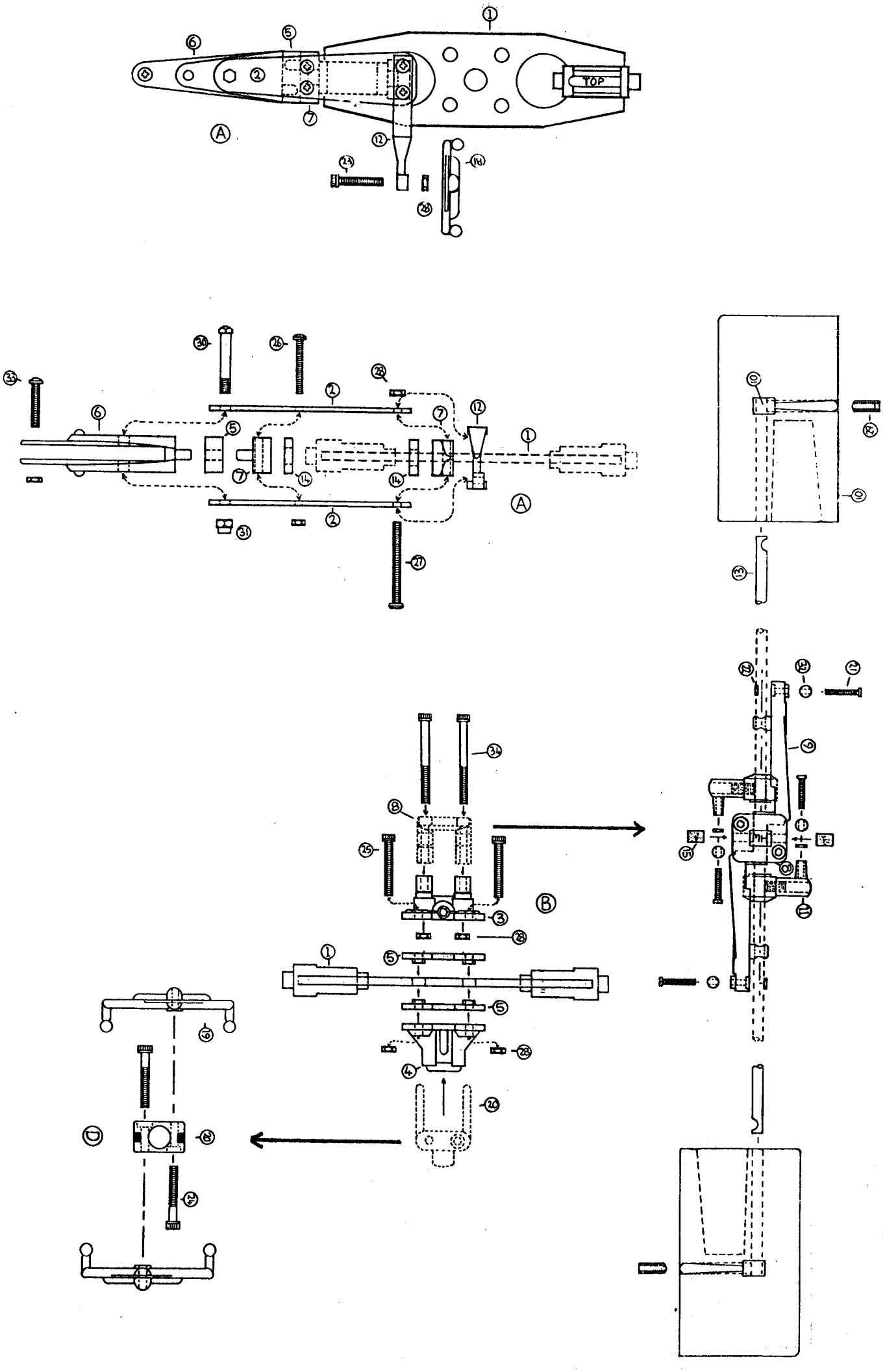
- The arms must be allowed to move freely but without slop.

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


TOP
A
B

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.

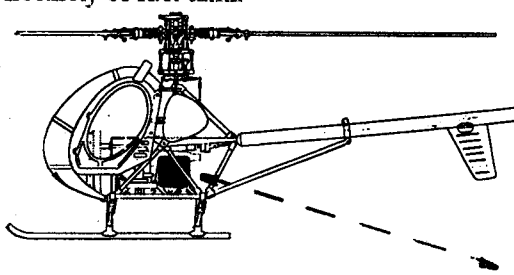
Fit a moulded ball eye to each end of the 37mm pushrods and use them to connect the flybar operating arms (11) to the inner balls on the mixer/rocker assembly. The flyblades (10) must be in line with each other. When satisfied, set the operating arms (11) in line with the flyblades and tighten the grubscrews.

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.

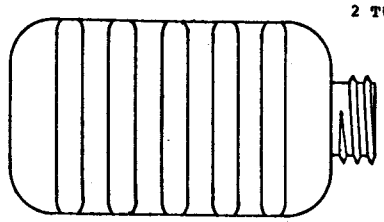
Thread moulded ball eyes onto the 37mm rods and use to connect the brass balls you have fitted on the swashplate cup to the short rocker on the incidence arms.

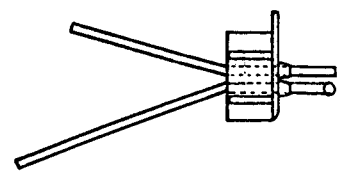
Lubricate all moving parts. Plastic on plastic should be lubricated with vaseline or similar e.g. mixer slider.

Assembly of fuel tank.



Assemble the fuel tank as in the diagram and fasten on the seating behind the engine with light rubber bands. These must not be tight or engine vibration will cause foaming of the fuel.





1 TUBE AT BOTTOM OF TANK FOR ENGINE FEED

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.

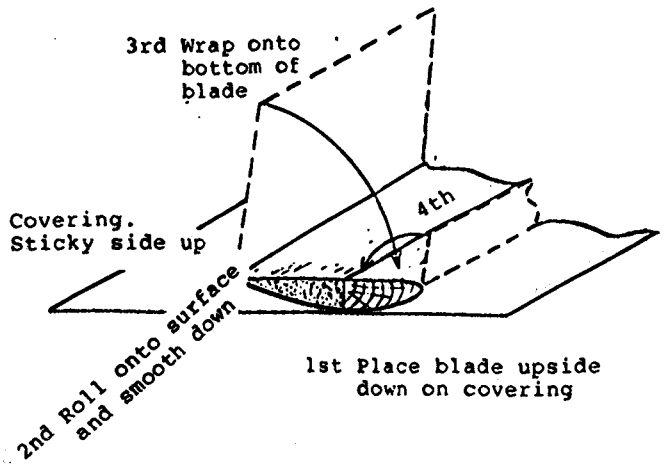
If the blades are of equal weight but differing centre of gravity, add covering material or electrical tape to move the balance point of one blade out towards the tip, and a similar amount of material to the other blade to bring the balance point towards the centre. Try and get the balance equal to within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

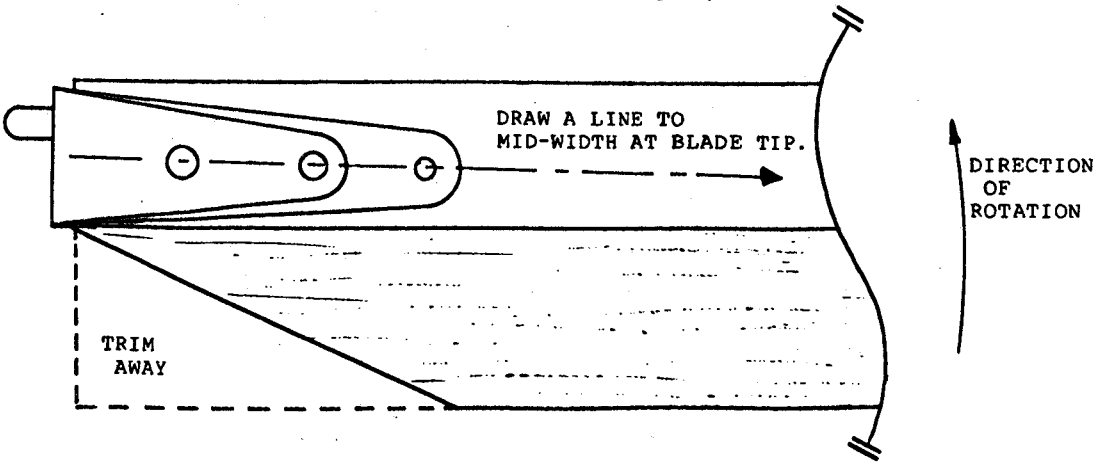
MAIN ROTOR BLADES

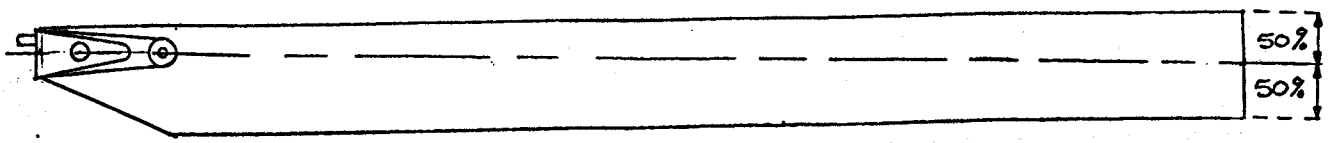


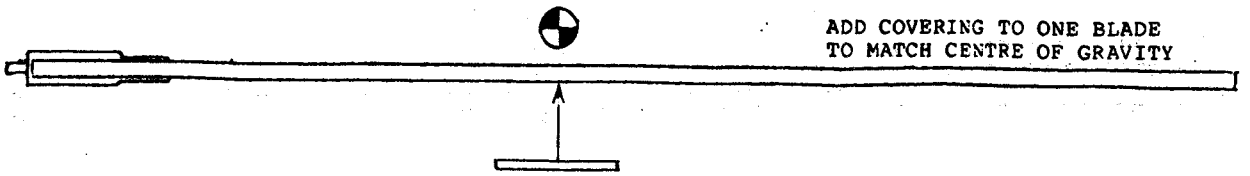
drill for the larger 4mm retaining bolt (36) and fit.

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.







Assemble the fuel tank as in the diagram and fasten on the seating to the rear of the engine with light rubber bands. These must not be tight or engine vibration will cause foaming of the fuel.

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.*

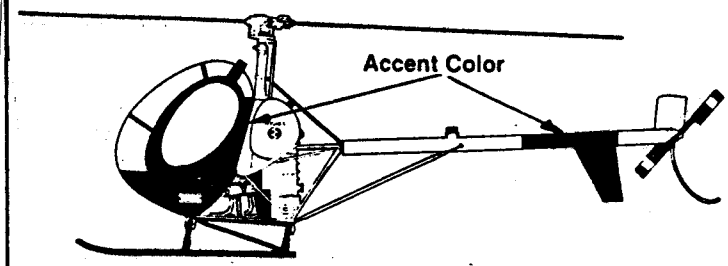
- If the engine screams and the model shows a reluctance to lift off then more pitch is required relative to throttle.
- If it lifts off but is very twitchy and sensitive on the controls again increase pitch to slow the rotor down.

☞ 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.

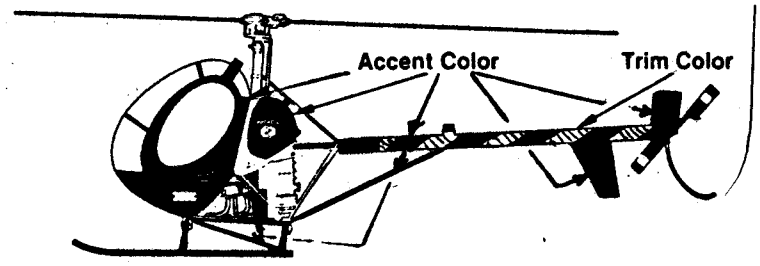
- Oscillations can also occur with a two bladed rotor head if the teeter is reduced by excessive tightening of the four teeter bolts (Rotor Head assembly sketch B). Try to adjust so the rotor head plate is held *firmly* but not solidly between the rubbers.

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.

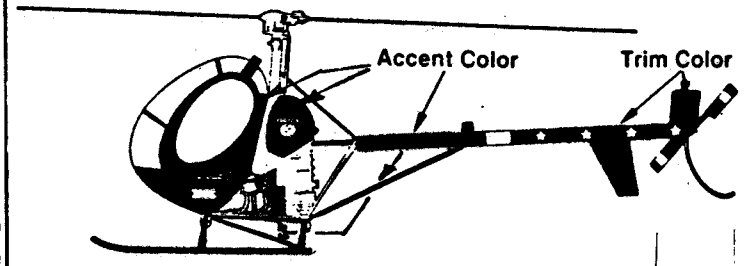
The model is now ready to fly.



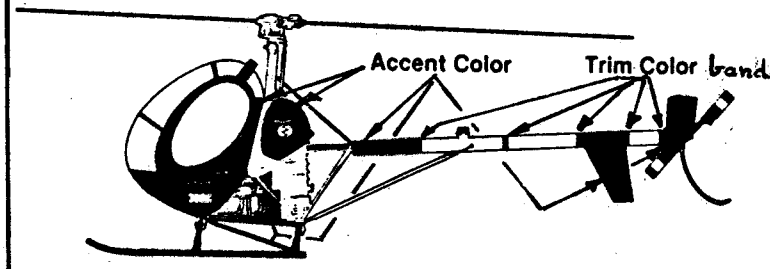
Hughes "Sky Knight"



Hughes "Yankee Clipper"



Hughes "Tripartite"



Hughes "Olympian"

Exterior paint	Interior fabric
Bright red	Red
Cocoa brown	Brown
Channel blue	Blue
Sun yellow	Yellow tan
Forest green	Dark green
International orange	Orange

There are a great many technicalities concerned with the flight of a helicopter, only the essential reactions will be described here.

Start by standing about three paces to the rear and three paces to the side of your model which is pointing into wind and on level ground. This is the best position for observing the attitude of the model and to be able to control the hover.

Increasing throttle/collective to the point of lift off will indicate that the model wants to go in one direction or another. Ignore this but apply a control (the cyclic control is as if you had hold of the model by the rotor top) to correct the movement. You can trim out the tail at this stage. Repeat until you are confident that your reactions will give a control in the right direction.

- Many beginners are confused by the apparent tendency of helicopters to leap off in random directions when they are about to leave the ground. Correct control inputs to counteract this have to be learned.

A touch more collective and the model will clear the ground. If at this stage it persistently goes in one direction the trim may be adjusted, either on the transmitter or by adjusting the length of the control rods to the swashplate.

Practice the above until you are confident you can keep the model in one position.

When the model is one metre clear of the ground (out of ground effect) control will be easier but a miscontrol will be more disastrous.

Training aids

If flying from rough grass then Morley floats can be an advantage, other training aids are more trouble than they are worth but the Morley string method may help.

A light extension to the tail boom is fitted to make an attachment for a 3 metre length of cord clear of the tail rotor. An active and understanding anchor man holds the other end with the model pointing down-wind. The model has forward trim set and the pilot stands to the left of the anchor man, who raises and lowers the string with the model. In this way the pilot learns the response of the model two controls at a time instead of having all four to worry about. This method has been tried, it works, and is recommended.

When you find that height control (do not let the model go above head height) and lateral control are an automatic reaction, then the forward trim is removed and the fore and aft cyclic becomes operational. As the string goes slack so the tail rotor control is needed. Persist until you find it easy. Try to get used to settling the model down - landing - rather than slamming the throttle shut when in the right place else you may chop the tail boom.

Now you can hover! Which you need to do to land. Follow this with slow flights forward, backwards and sideways until you can place the model at any point you want, and can keep it there.

The next stage is a circuit, which is easy, but coming out of forward flight back to the hover is not always so. On a calm day a slow and careful circuit is just a hovering circle. Note that the controls are used to change the attitude of the model to move it to the position required,and are not 'held' in any particular way. Note also that in forward flight above about 5 metres/second (12mph), a lot less power is required - this is caused by the addition of translational lift from the extra air going through the rotor, and is what can give rise to trouble in stopping.

To slow down, gently reduce collective and adjust cyclic to keep the model level. As the model slows the power will need to be increased to stop sink. When the model is stationary slightly reduce power to stop a vertical climbout. You can then settle it down.

Happy Landings

Morley Helicopters