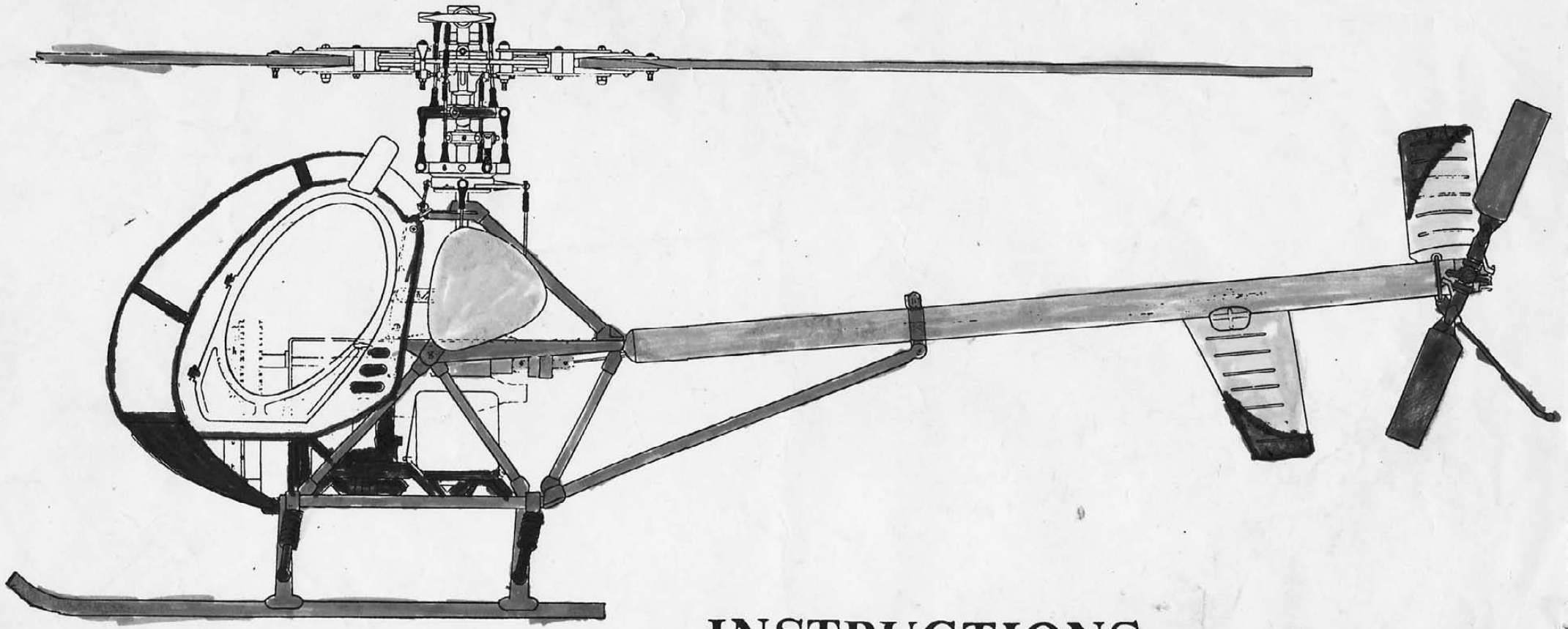


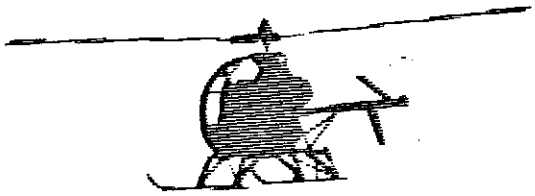
MORLEY
HELICOPTERS

INSTRUCTIONS

# HUGHES 300

**MORLEY HELICOPTERS**

# HUGHES 300



SPECIFICATION

Near 1/7 scale Hughes 300 model helicopter.

| | |
|---|---|
| Rotor diameter | 45in. 1143mm |
| Main rotor rpm | approx 1100. |
| Main rotor | Morley 'AT' collective head |
| Engine | .35 - .40 cu in. 5.75 - 6.5 cc |
| Radio | any four channel proportional radio system is suitable - main rotor cyclic (2) main rotor collective/throttle tail rotor collective (full collective pitch is standard for all Morley helicopters.) |
| Fuel capacity | 8fl oz (250cc) in tank supplied |
| Flying weight | 6.5 lbs (3kg) approx |

Dear Customer

Thank you for choosing 'Morley'. I 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.

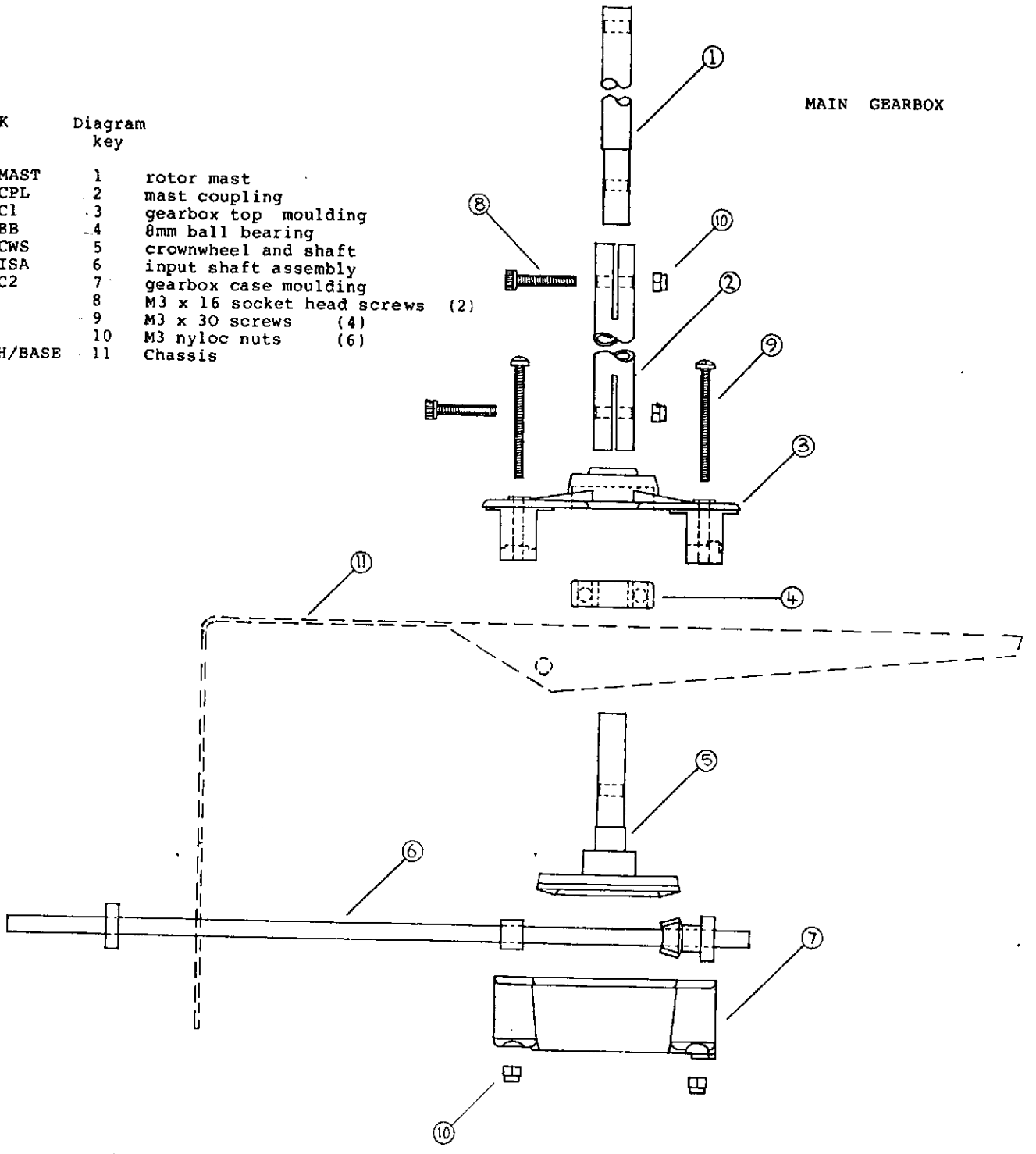
The design is unique and even to those who are thoroughly skilled in the intricacies of a model helicopter I would respectfully suggest following the assembly instructions, especially on the subject of the plastic chassis members and tail boom. It is best to complete the assembly in numerical order.

Sincerely,

Jim Morley

# 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 | 5 | crownwheel and shaft |
| 0MG/ISA | 6 | input shaft assembly |
| 0MG/C2 | 7 | gearbox case moulding |
| | 8 | M3 x 16 socket head screws (2) |
| | 9 | M3 x 30 screws (4) |
| | 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 ballraceisattherear.
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 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 rapid wear will occur on the new gear).

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

| 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 |
| | 29 | M3 x 20 socket cap screws (4) |
| | 30 | M3 x nyloc nuts (4) |

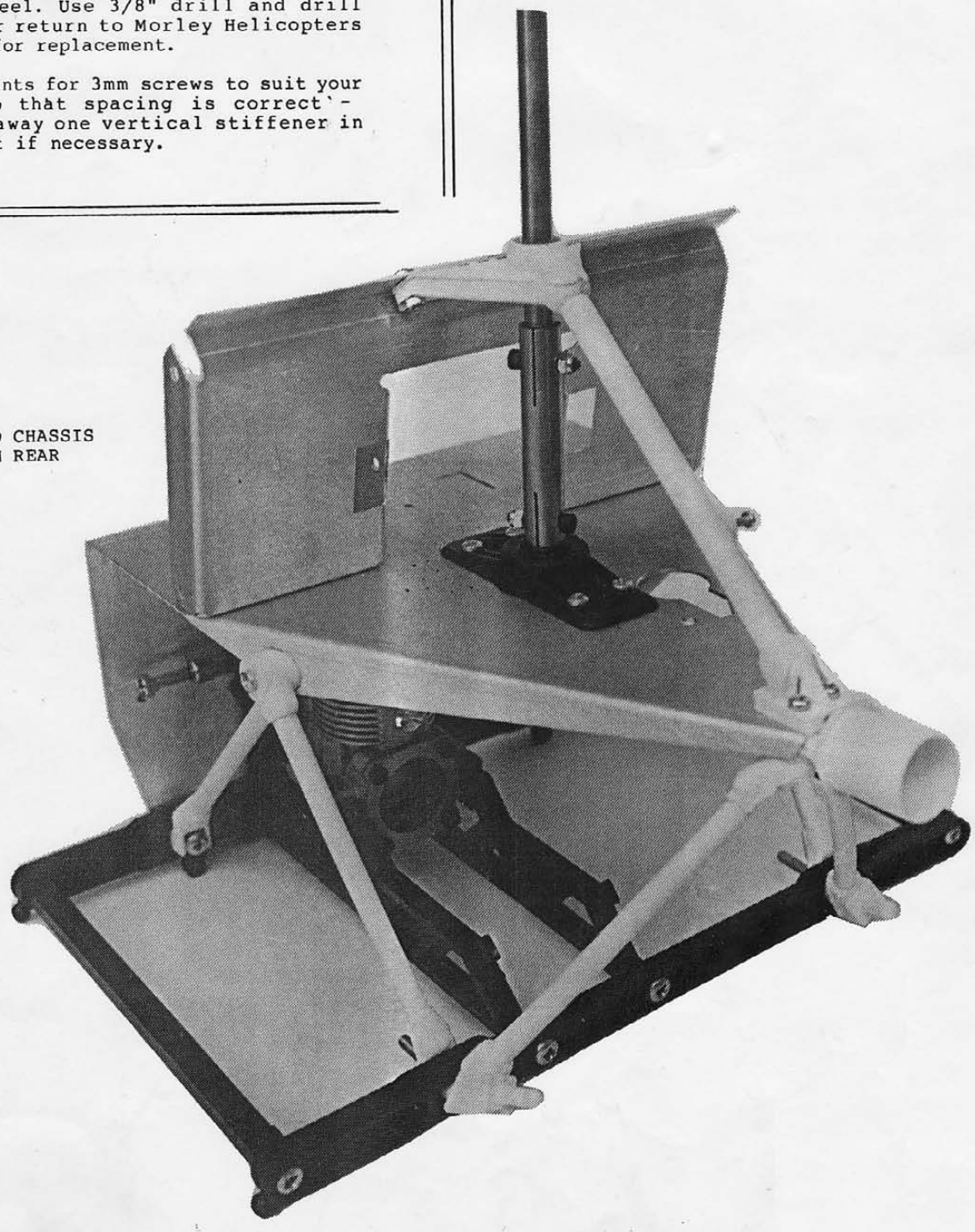
Temporarily fit flywheel (5) on engine crankshaft making sure flywheel inner face is seated properly onto the prop driver. Follow by fan (2), drive pulley (6) and engine nut, but note that these are not fitted finally until the engine unit is installed within the chassis. Place engine between the moulded 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" 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, pulley assembly should not be fixed with loctite until the engine is finally installed.



COMPLETED CHASSIS
VIEW FROM REAR

| 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 |
| | 19 | 5/16 oilite bearing |
| | 20 | M4 x 8 screw (6) |
| | 21 | M4 nuts " " (10) |
| | 22 | M4 x 30 " " (4) |
| | 23 | plastite 8 x 3/8 self tapping screws (11) |
| | 24 | M3 x 10 screw (3) |
| | 25 | M3 x 20 " " (3) |
| | 26 | M3 nuts (6) |
| | 27 | self tap screw 2 x 3/8 (1) |
| | 30 | M3 nyloc (1) |
| | 31 | M3 x 25 screw (2) |
| | 32 | M4 star washers (4) |

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 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. This can be enlarged to suit your engine if needed.

Fix the engine prop-driver, flywheel (5) fan (6) 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.

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.

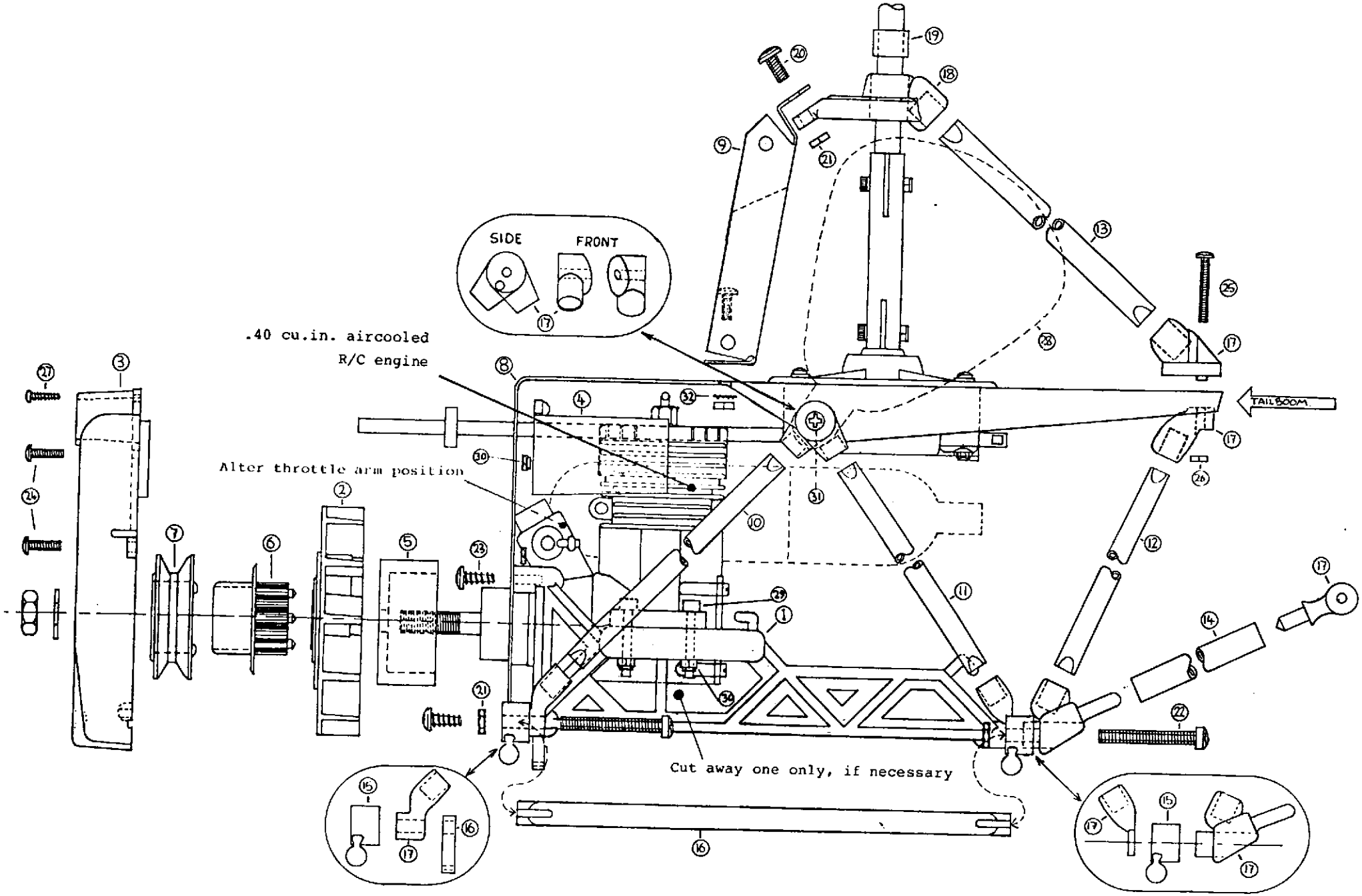
Check the length of each stay to ensure it is correct. Trim if needed. Do not glue <u>any</u> until all are in place. Fit by filing small flats on the stay tube and making sure it will go fully into place.

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.

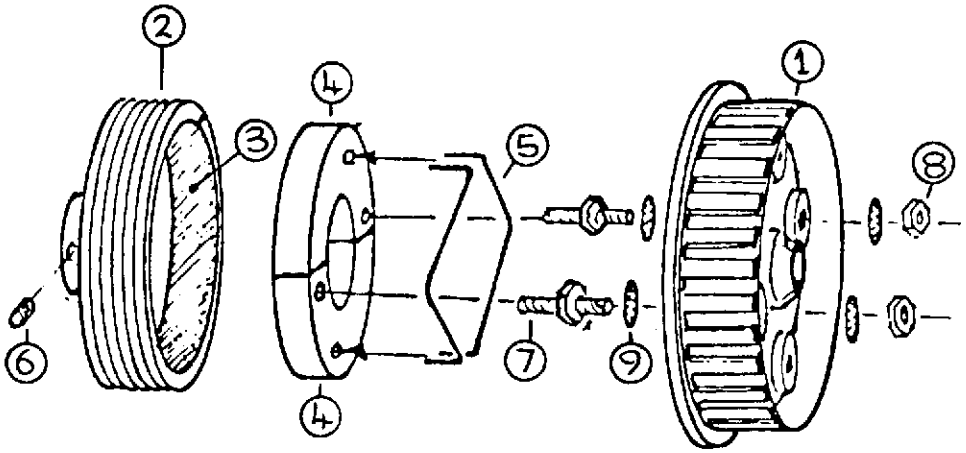
Then either use a cyanoacrylate super glue run into the flat or a contact adhesive such as Evo-Stik. Do not try to put super glue onto parts and then insert as it will certainly lock in the wrong place. If using Evo-Stik allow several <u>days</u> for the glue to set properly.

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

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

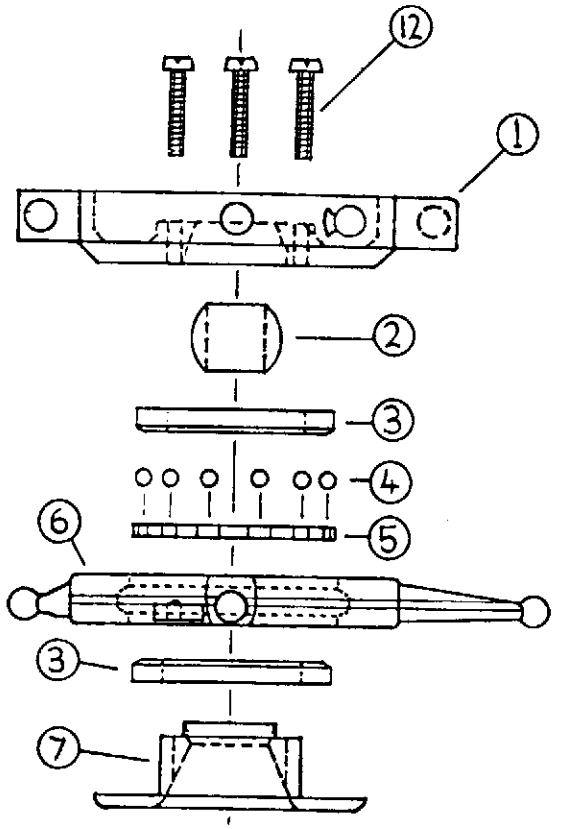


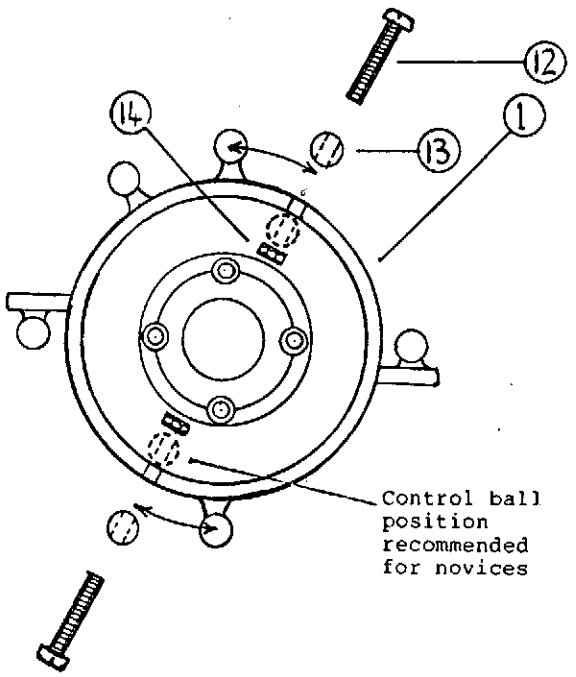

Carefully cut the Ferodo clutch lining (3) to the correct length to fit inside the clutch drum (2). Roughen the drum with emery paper or a file and cover it and the lining sparingly with slow setting epoxy adhesive, then press the lining tightly into place. Clamp in position with clothes pegs or similar until set.

Thread the M4 x 20 socket set screws (7) into the clutch shoes (4) and 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 not in use.

Fit 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).

| STOCK CODE | Diagram key | |
|---|---|---|
| OSP/TOP | 1 | top moulding |
| OSP/BALL | 2 | centre ball |
| OSP/RING | 3 | small alloy ring (2) |
| OSP/BRG | 4 | bearing balls (12) |
| OSP/CAGE | 5 | ball cage |
| OSP/CENTRE | 6 | centre plate |
| OSP/BOTTOM | 7 | bottom moulding |
| OSP/DRIVER | 8 | s/p driver assembly |
| | 9 | ball eye |
| | 10 | 2 x 3/8 self tap screws (2) |
| | 11 | M4 x 6mm set screw |
| | 12 | fixing screws M2 x 12 (6) |
| | 13 | brass ball (2) |
| | 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 on the diagram).

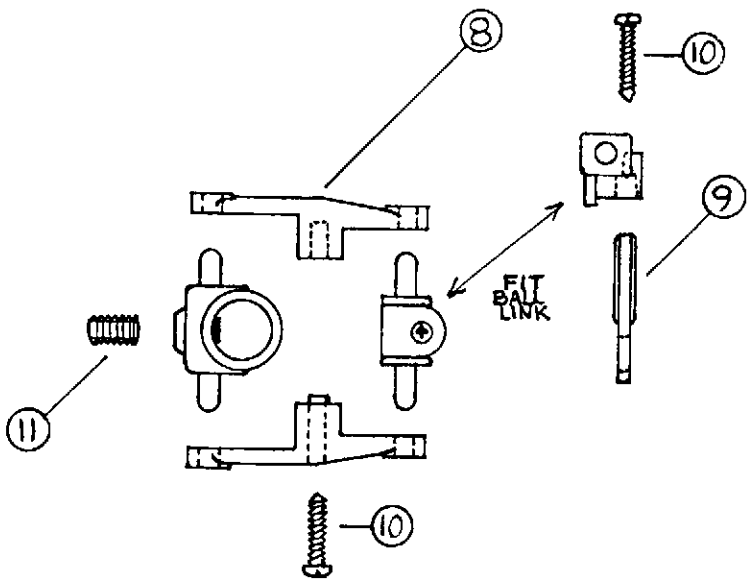
Wipe all the alloy parts clean to ensure smooth running. Fill the groove in the centre plate (6) with a light grease then place on a flat clean surface. Insert one of the two small alloy rings (3) into the centre plate ensuring that the chamfered side is uppermost. Next insert the grey plastic ball cage (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 to 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 12 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.

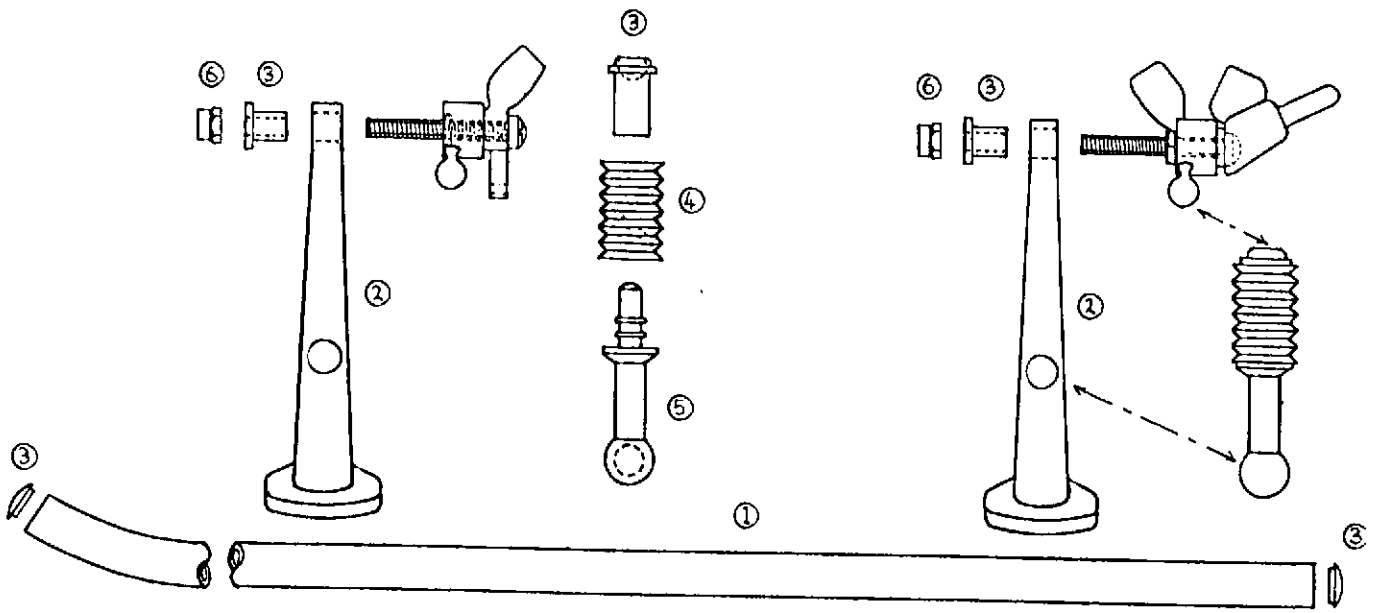
Place on rotor mast with long arm to the rear. (Except for Bell 47 when the long arm goes to the front)

Assemble swashplate driver with No 2 x3/8 self tappers and fit a ball eye (8) to the small pivot.

Swashplate rocking movement must be free and the assembly should slide easily up and down the main rotor mast. Slide the swashplate driver over the mast before fitting rotor head but leave locking to mast until later when the correct position has been found.



| 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) |
| | 6 | M4 nyloc nut (4) |

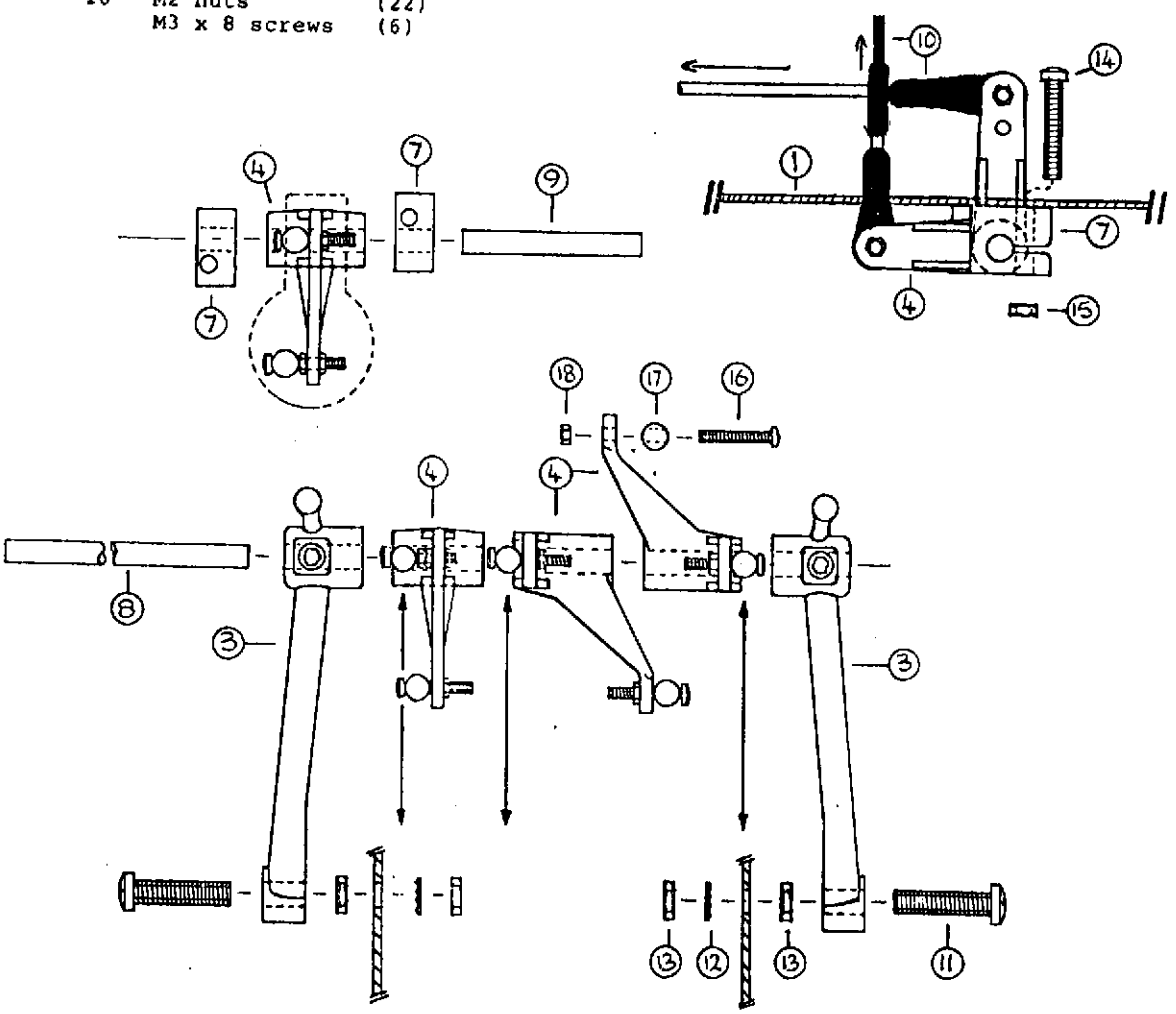



Hot water or a hair drier can be used to soften the plastic leg mouldings if it is difficult to fit the mouldings to the aluminium skids.

Glue nylon pads (3) on the ends of the skids. Fit M4x30mm screws through the strut ends, black spacer block, and crossmembers 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.

| STOCK CODE | Diagram key | |
|---|---|---|
| 0CON/CA | 3 | cradle arms (2) |
| 0CON/BELL | 4 | pairs bellcranks (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 |
| | 11 | M4 x 16 screws (2) |
| | 12 | M4 star washers (2) |
| | 13 | M4 thin nuts (4) |
| | 14 | M3 x 16 screws (2) |
| | 15 | M3 nuts (8) |
| | 16 | M2 x 12 screws (18) |
| | 17 | ball end ball (18) |
| | 18 | M2 nuts (22) |
| | | 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 sketch.

Fit all the brass balls with M2 screws and nuts to the remaining three bellcranks as shown in sketches, 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 grubscrew 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 bellcranks to the swashplate as shown in the diagram. Two moulded ball eyes end to end on a 12mm length of threaded stud connect the collective pitch bellcrank to the bellcrank assembly. As the collective bellcrank is moved it raises or lowers the swashplate on the main mast, which in turn will increase or decrease collective pitch on the main rotor.

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.

Fit two servos (21 & 22) to the twin mounting bracket (5) and fix in position. 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 four servo radio can use five 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 chosen location as in diagrams A or B, complete the linkage and fit the servo.

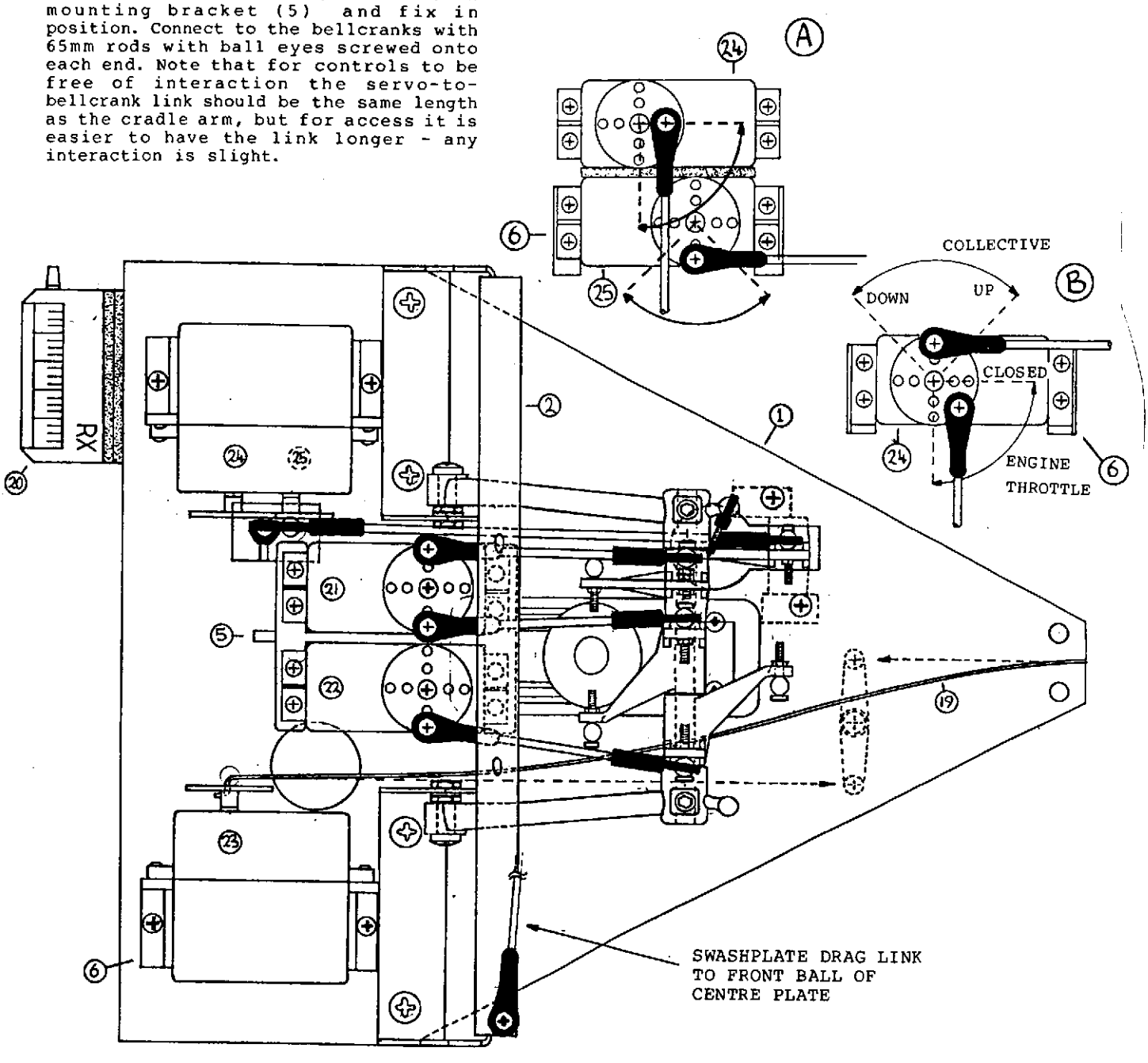
The tail rotor servo (23) is mounted on the left hand side for connection to the tail rotor control wire later.

A gyro, if used, can be mounted on the plywood cabin floor.

The receiver battery is fitted later.

Finally fit the drag link to prevent the lower swashplate from rotating as seen in sketch , connecting to a ball end 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.



| 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/TK | | dummy fuel tank (2) (see chassis diagram, part 28) |
| 300CAB/CAT | 5 | door catch/screw anchor (2) |
| 300CAB/FLR | 4 | plywood cabin floor |
| | 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 strap radio nicad pack, with switch, to centre. Paint the cabin sides, rollbar and dummy fuel tanks if desired, followed by fuel proofer.

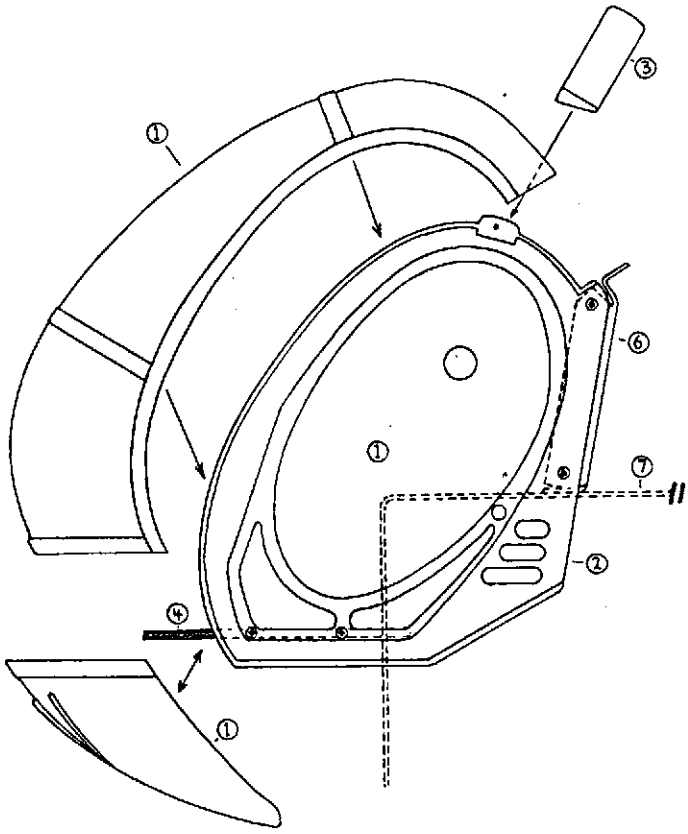
Disguise the battery pack with control console pieces cut from the large transparency moulding. Using the airframe as a jig, fit the cabin sides (2) to the seat back (6) with the self tap screws into the moulded screw anchors (5).

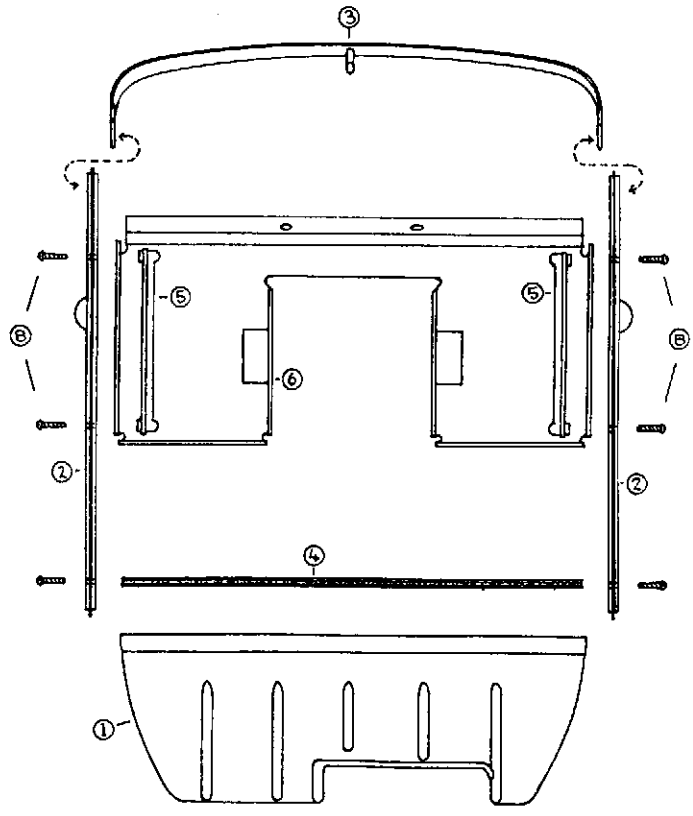
Carefully drill the cabin floor for the two small self tap screws on each side, then glue and screw floor in place.

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. Cut 5mm away from the scribed line on the moulding first, and then on the line. Fix it 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 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 paint.



# H 300 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/B430 | * | 430mm brass tube for drive wire |
| 300TB/B250 | | 250mm brass tube for control wire |
| | 13 | M4 x 6 socket set screws (6) |
| | 14 | 8ba nuts (2) |
| | * 15 | 16 g wire drive (1.5mm diameter) |
| | x 19 | 18g control wire (1.2mm diameter) |

* (not within packet)

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

First put the (larger) 16g. drive wire with 430mm brass tube and the 18g. control wire with 250mm tube into the end moulding (1) which is mounted on the chassis.

The drive wire and tube go through the lower hole of the boom end moulding (N.B. tail boom is angled slightly up), and the control wire and tube through the larger of the upper two holes (ignore the small hole).

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. Make sure 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.

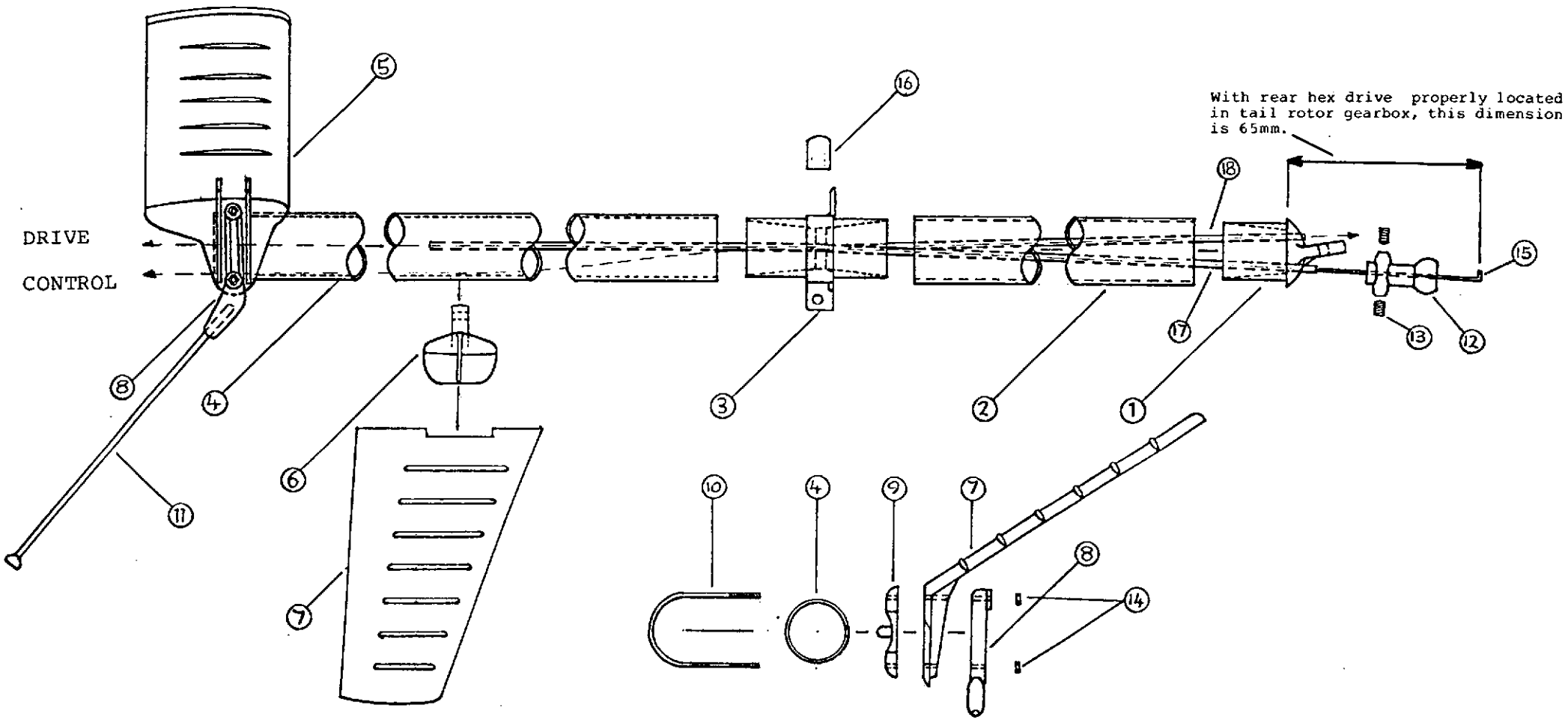
Bend the end of the drive wire over at 90 degrees as shown in the diagram, and pull the ball of the hex. coupling back over the bend and tighten the set screws (13).

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 a dab of grease. Hex drives without grease will fail due to overheating, so this is a must.

Re-attach tail boom to the chassis.


DRIVE
CONTROL
With rear hex drive properly located in tail rotor gearbox, this dimension is 65mm.
5
16
18
15
8
4
3
2
1
17
13
12
6
11
7
10
4
9
7
8
14
7

| 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 | ouput 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 moulding (2) |
| 0TR/YOKE | 13 | control yoke |
| 0TR/BB2 | 12 | ballrace 6 mm (2) |
| 0TR/CLR | 15 | control rod collars (2) |
| | 16 | eye end (2) |
| | 18 | M3 x 20 socket cap screw |
| | 19 | M3 nuts (2) |
| | 20 | csk screws 2b.a. (2) |
| | 21 | M2 x 16 screws (4) |
| | 22 | M2 x 12 screws (6) |
| | 23 | M2 nuts (12) |
| | 25 | 2 x 3/8 self tap screws (2) |
| | 26 | ball end ball (2) |
| | 27 | M2x12 socket cap screw (2) |
| | 28 | M2 star washer (2) |

Gearbox.

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.

Tail Rotor.

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.

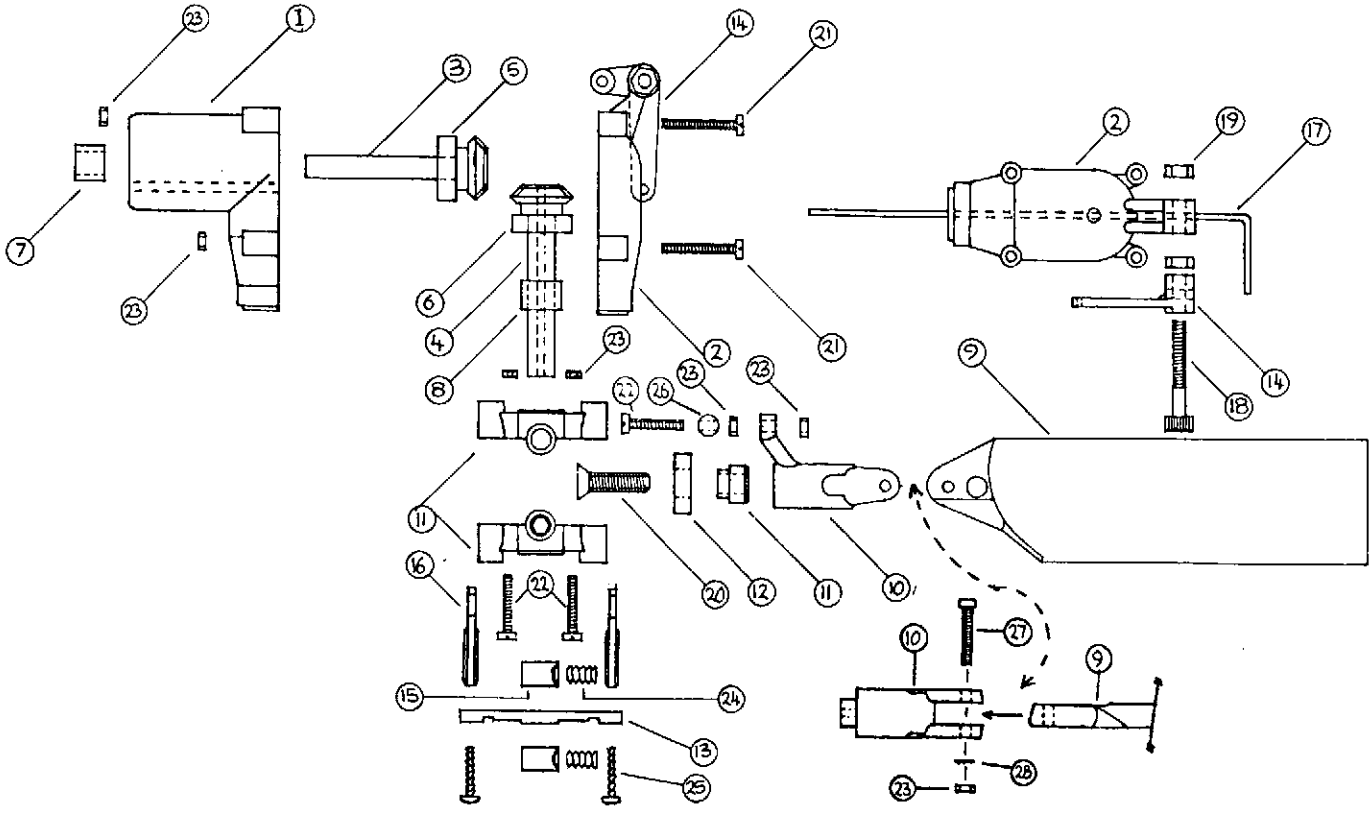
Clamp the ballraces between the moulded hub halves (11) and draw halves together using M2 x 12 screws (22) and nuts (23). Do not apply adhesive. File small flats on the output shaft (4) of the gearbox to seat the set screws, and fit tail rotor hub to output shaft. Do not overtighten the grub screws. 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 (flat surface away from the gearbox), and hold with M2 x 12 socket cap screw, star washer and nut. Refer to the diagram for correct installation.

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



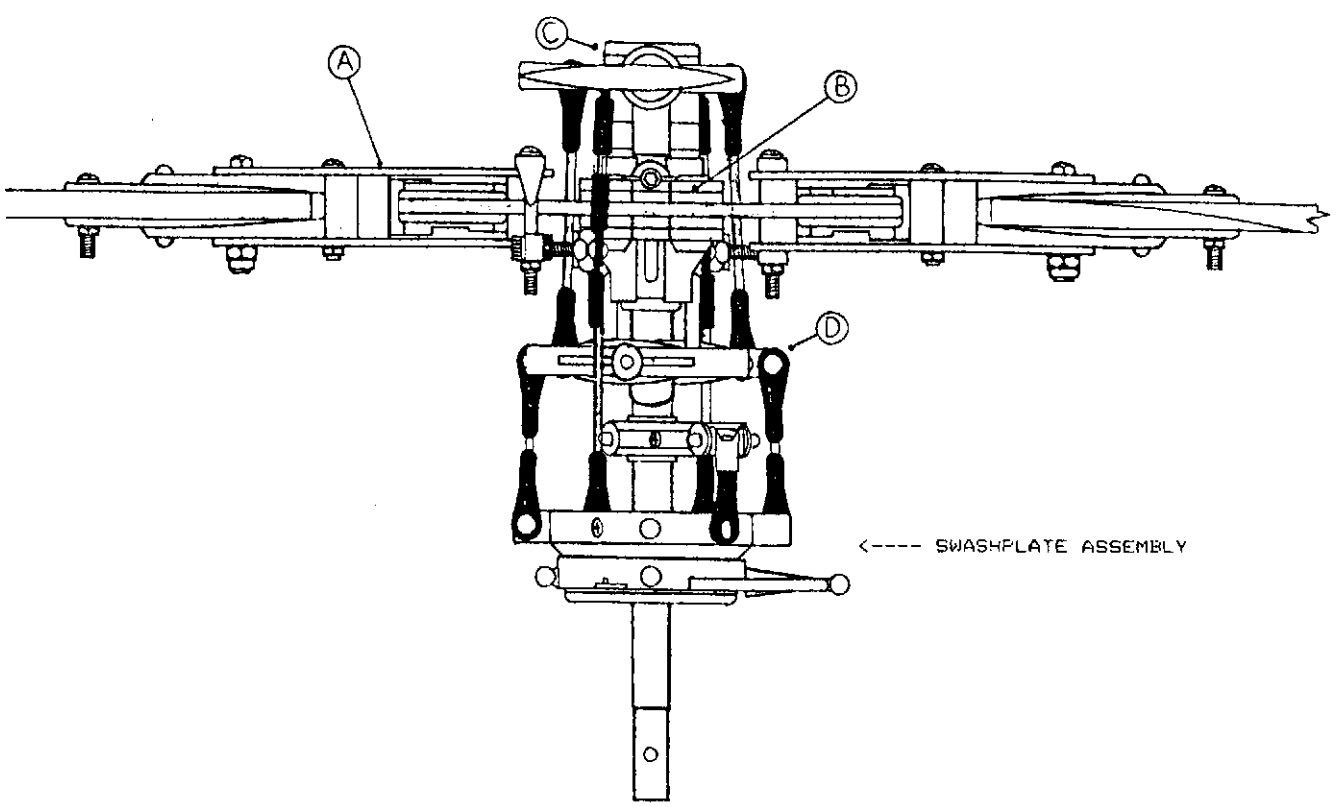
| STOCK CODE | Diagram key | |
|---|---|---|
| ORH/PLATE | 1 | head plate |
| ORH/FINGS | 2 | set of 4 finger plates |
| ORH/TOP | 3 | top plate moulding |
| ORH/MT | 4 | mast top moulding |
| ORH/RUBS ) | 5 | teeter rubber |
| " " ) | 5 | drag damper rubber |
| ORH/BM | 6 | blade mount |
| ORH/BRG | 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 |
| | 15 | 3mm oilite bearing |
| | 17 | square brass collar |
| BLADES | | main rotor blade (not in pack) |
| 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 cap head screw |
| | 24 | M3 x 20 cap head screw (plain shank) |
| | 25 | M3 x 20 cap head 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 cap head screw |

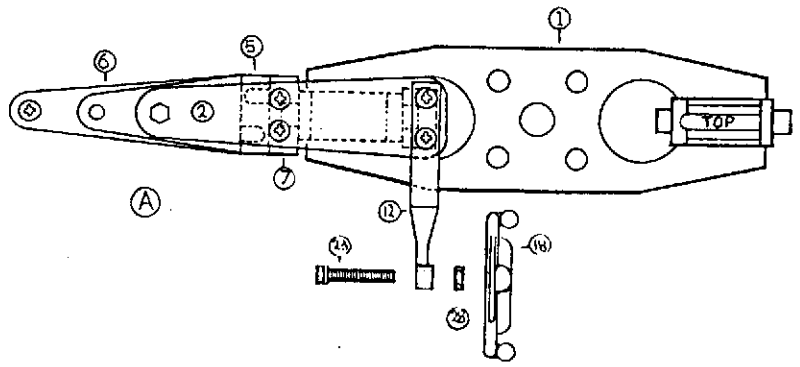
Mixer Assembly

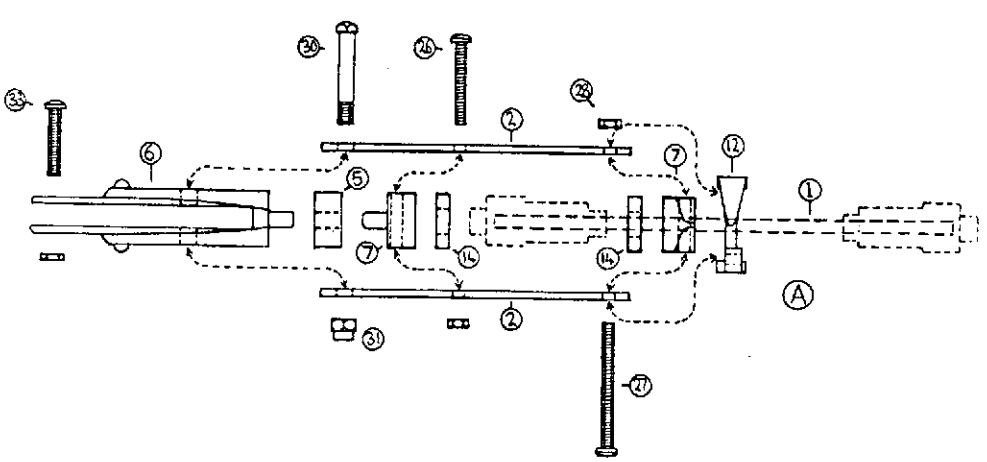
Cut the 50mm threaded stud into four equal lengths and fit a moulded ball eye to each end of each stud.

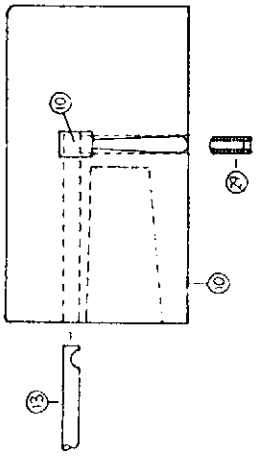
Pass an M3 x 20 cap head screw with a smooth shank (24) through the holes in each side of the mixer slider (20) as in sketch 'D'. The smooth shank acts as a pivot, so use some light grease. Thread the screws into the long rocker arms (19), allowing it to cut its own thread in the plastic. The arms must be allowed to move freely but without slop.

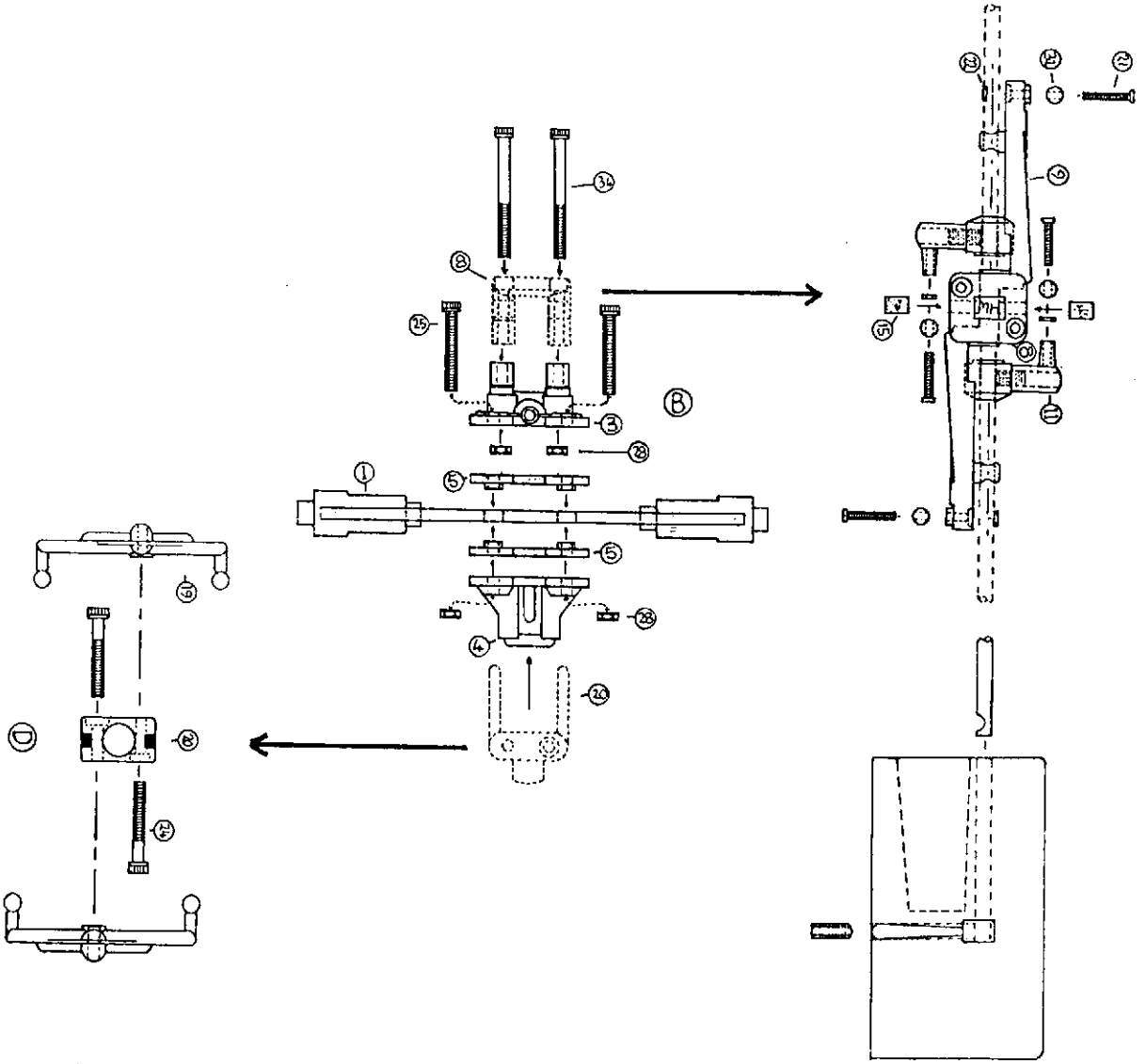
Slide the mixer slider onto the rotor mast with the fork fitting upwards to go into the grooves in the side of the mast top moulding. Connect the outer arms of the long rocker arms to the outer balls of the swashplate using two of the four ball eye and stud connectors.




TOP
A


A




B

Insert an M3 x 16 cap head 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. 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 moulded 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 cap head screws (25) threaded full length and M3 flat nuts (28). Make sure the nuts are pulled home and the teeter rubbers are lightly clamped. 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').

Refer to sketch C. The flyblades (10) are fitted to the flybar (13) as in the sketch with the M4 x 10 socket set screws (29) passing through the rear of the flyblade into the square brass collet (10), and fitting <u>into the deep grooves</u> at the end of the flybar. Note that the trailing edge of the flyblade is square and not sharp.

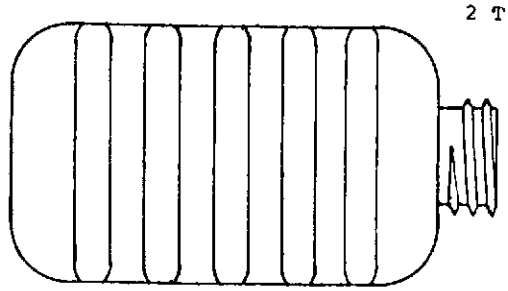
Fit a moulded ball eye to each end of the 37mm pushrods and use them to connect the flybar operating arms (11) to the inner balls on the mixer/rocker assembly. The flyblades (10) must be in line with each other. When satisfied, set the operating arms (11) in line with the flyblades and tighten the grubscrews.

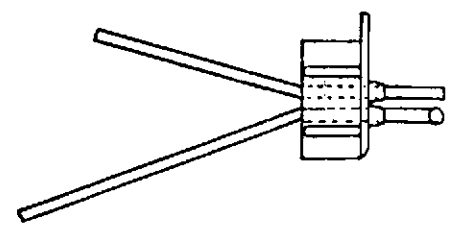
Thread a small rocker arm (18) onto the M3 bolt (23) on each incidence arm (12), and use the two remaining short connecting rods to link the ends of the 'zig-zag' cradles to the long arm of the small rockers.

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.

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.





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

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), (holder peg 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).

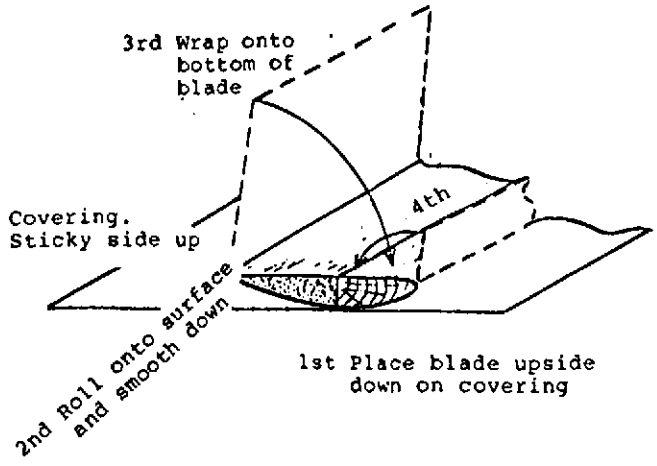
BLADE BALANCE

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 C. of G., 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.

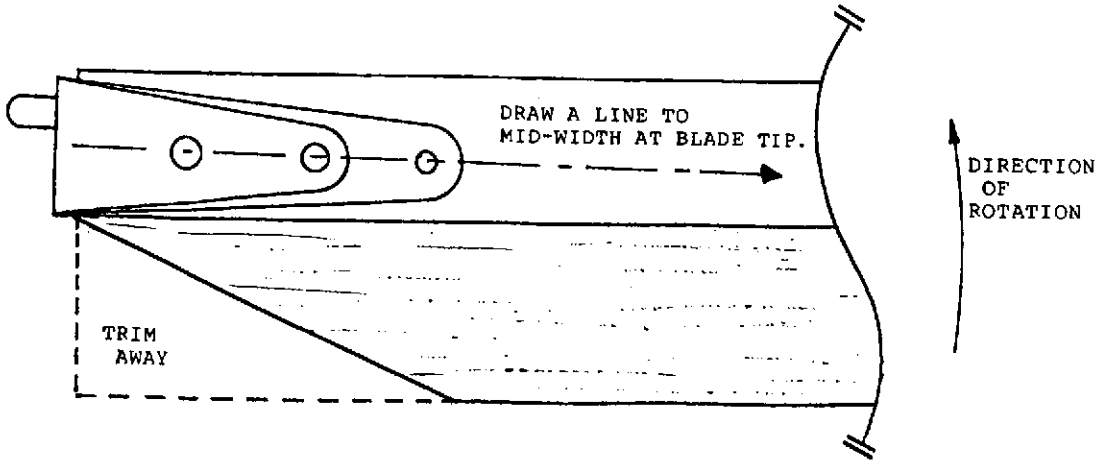
If the blades are of unequal weight and balance point, add covering material to the lighter blade in such a position that it will also move the balance point to match the other blade.

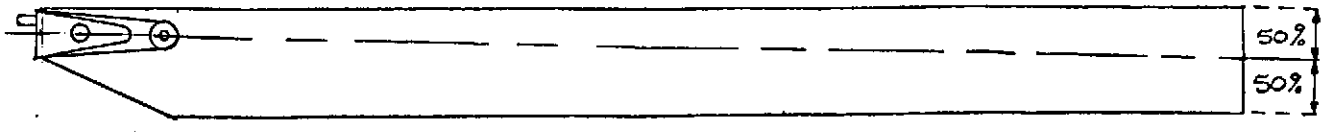
BLADES

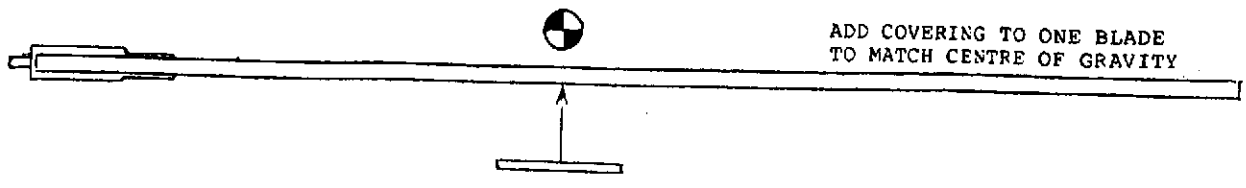



Insert the blades in the blade holders (6) and position so that a line from the two holes in the holders would extend to a point 50% back from the leading edge at the blade tip. This gives the correct amount of blade lead. Drill and fit the M3 x 16 (33) bolt and nut, then drill for the larger 4mm retaining 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.



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 0 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.

The model will move in the direction of tilt of the main rotor disc, which follows the same tilt of the swashplate. 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 0 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.

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. Some people prefer to fly other modes. 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 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. Note that moving the cyclic stick will tilt the rotor.

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, a great excess of collective pitch will 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 model screams and 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 2/3 to 3/4 of full throttle stick movement. Main rotor should be turning at approx 1100 rpm, equivalent to 4500 at the tail rotor.

Oscillations can also occur with any 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.

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

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. Repeat until confident.

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. If flying from rough grass then Morley floats (order No ACC/FLTS) can be an advantage, other training aids are more trouble than they are worth but the Morley string method may help.

A 30cm length of light dowel is used to make an extension to the tail boom, to provide 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 downwind. 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, and it works.

However, the forces involved with the flight of a helicopter are tremendous, so great care must be taken with all fitting and handling. Treat the model with a lot of respect and don't even start it, let alone fly it, near other people until you are both competent and confident.

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 circuit is just a hovering circle. Note that the controls are used to change the attitude of the model to position it as required, and not 'held' in any particular way. Note also that in forward flight a lot less power is required - this is caused by the addition of translational lift due to the extra air going through the rotor, and is what can give rise to trouble in stopping.

To slow down, gently reduce collective and bring the nose up slightly, but before the model stops travelling forward the attitude must be brought back to level and the power increased a lot to stop sink. Almost immediately slightly reduce power to stop a vertical climbout. You can then settle it down.

Happy Landings

Jim Morley