

MFA SPORT 500

'Collective' Conversion kit



**MODEL FLIGHT
ACCESSORIES**

MFA SPORT 500 COLLECTIVE PITCH CONVERSION KIT. Pt.no.767.

This high quality kit enables the teeter rotor (fixed pitch) Sport 500 to be converted to collective pitch operation. Collective pitch means both rotor blades increase and decrease their pitch together, as well as individually for directional control. The advantage is it gives more instantaneous response to vertical climb and descent commands. This allows a more aerobatic performance, a faster landing approach/descent and extreme rough weather flying capability. The head uses Bell/Hiller mixing i.e. approximately 50% of the control input to the head from the swash plate goes direct to the rotor blades, giving positive cyclic response. With the MFA Autorotation Unit (available separately, pt.no.768) added, the model has autorotation capability allowing it to be landed safely (with a little practice!) if the engine should stop when flying.

IMPORTANT: Please, abide by the instructions! The conversion is straightforward but it must be done carefully as this is the only way the model will give its best in terms of reliability, ease of flying and performance.

ADDITIONAL ITEMS REQUIRED:

RADIO: If you have a standard 4 channel radio, a fifth servo is required and it should be connected together with the existing throttle servo via a 'Y' lead (available from your radio supplier). This gives one servo for throttle and one for collective pitch, both operated together via the throttle stick. If you decide to purchase another radio, we would recommend one for helicopters which will already have this and other useful facilities.

GYRO: We would recommend a gyro if you are not already using one. It will make flying much easier and smoother in appearance.

ENGINE: Your existing Sport 500 .40 engine will fly the model fine but, for best performance (especially in the vertical climb) we advise a .45 -.46 engine (a spare engine plate is included). Recommended is the MFA Blue Bird 46 AAC engine, this has been extensively tested in the Sport 500 Collective and it delivers top performance. This quality engine is not only powerful, smooth running, has excellent heat dissipation, it is also lower priced than most!

PREPARATION FOR ASSEMBLY:

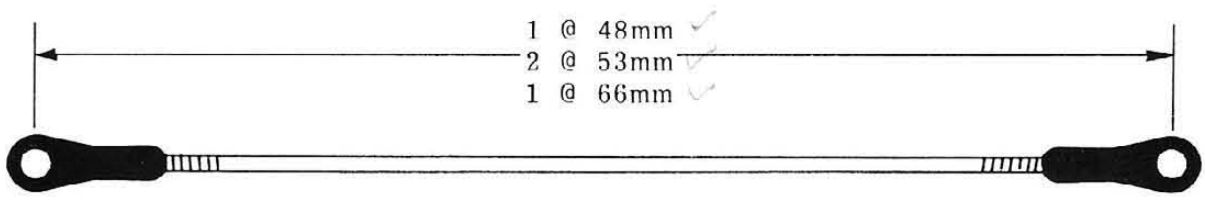
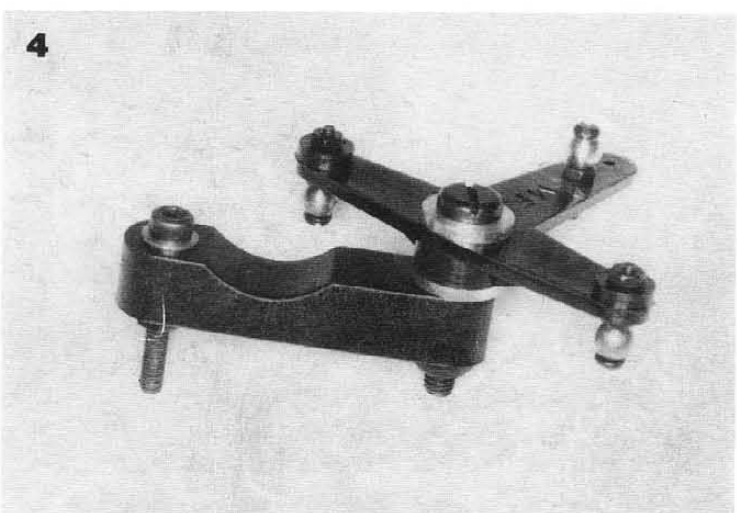
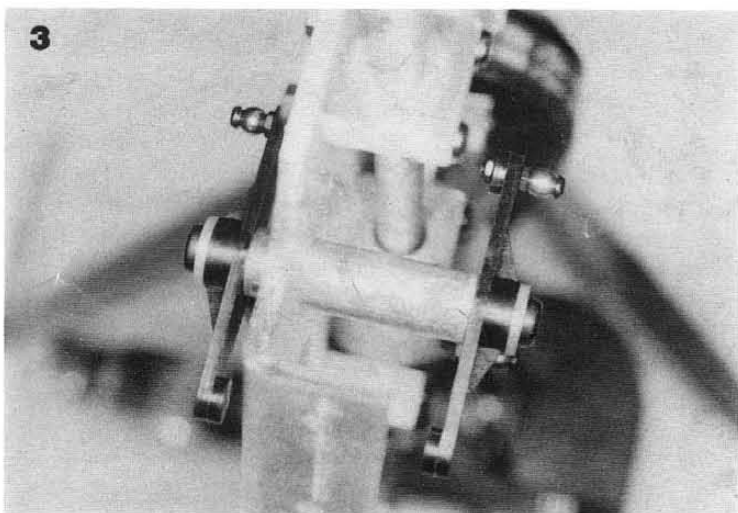
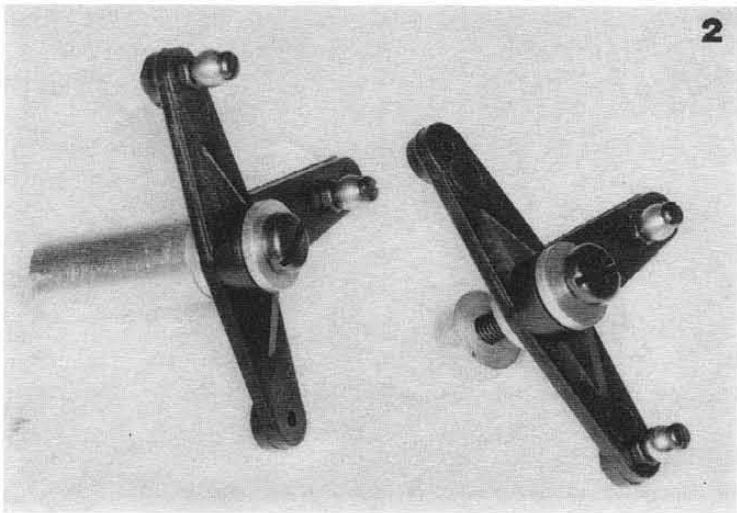
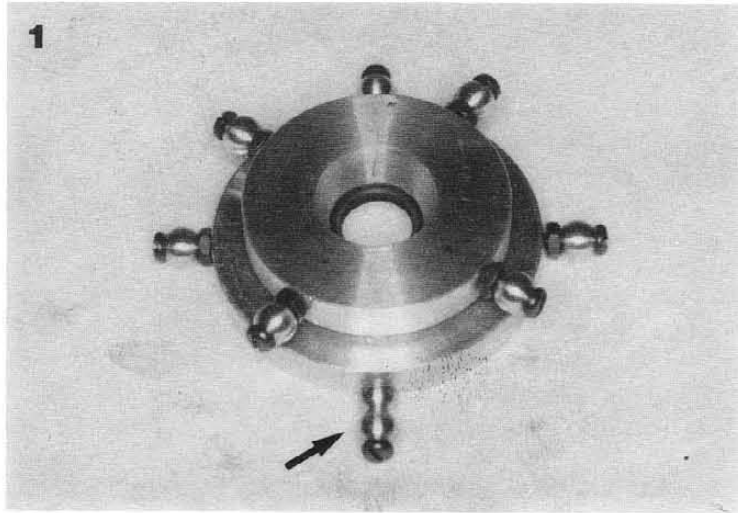
1. Notice that this kit includes a new main chassis plate (H.20) which you may (or may not!) have to change on your model. To identify whether you need to change this, see if your existing chassis has TWO sets of ELONGATED holes (one above the other) for the lower mast bearing block (H.4) screws. If it does, there is no need to change it. If there is only ONE set of ROUND holes for the lower mast bearing block screws, you need to use the new chassis. Note the above is for identifying the chassis type, there are other differences between the two.

2. Also this kit contains a complete new set of ply parts for the bulkhead (F.1), radio and servo mounts. We would recommend that you build this complete new assembly for your model but, you may wish to replace the old servo mount (F.4) only, by carefully separating it from the rest of the ply and then gluing the new servo mount (F.8) into position. Also notice the new bulkhead (F.1) is the same as the old except the servo linkage holes at the top have been elongated upwards by about 12mm so, you can modify the holes in your existing bulkhead the same, rather than replace it, if you wish.

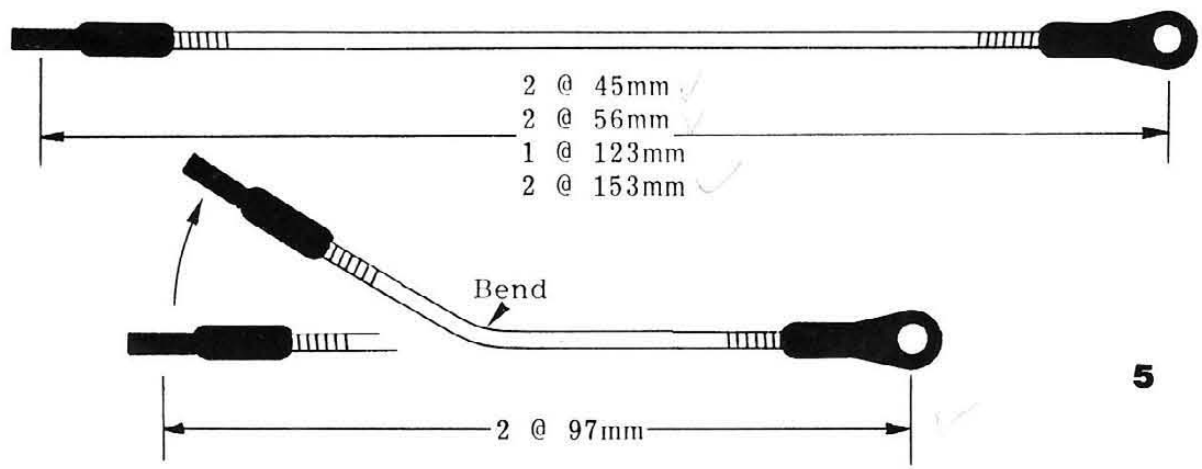
3. PREPARING YOUR MODEL FOR CONVERSION:

a. If you are changing the chassis (see 1 above) proceed as follows: Remove the complete rotor assembly, mast & mast bearing blocks, tank and engine assembly, front bulkhead/radio mount, U/C legs, tail boom & tail boom support, main gearshaft blocks and finally the 'T' bellcranks.

b. Re-assemble the new chassis as before (without the 'T' bellcranks at this stage) but use the new mast (CO.10). Note the lower mast bearing block mounting holes are elongated, this is to allow for adjustment in gear meshing so, set the block so there is no up and down play of the mast but the gears are still free to turn. Put a drop of 'Loktite' behind the block and also M3 washers behind the nuts before fully tightening.



LINKAGE DIMENSIONS



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c. When re-fitting the engine/engine plate assembly, use an existing M4 x 25 screw and nut for the uppermost hole and two M4 x 12 screws & nuts for the middle and lower holes. This is in preparation for fitting the new larger tank assembly.

d. If you are not changing the chassis (see 1 above), proceed as follows: Simply remove the rotor assembly, mast, complete bulkhead/radio mount (or modify as 2 above), fuel tank, fuel tank clips, fuel tank plate and the 'T' bellcranks. Fit the new mast (as described in b above). Replace the middle and lower M4 x 25 screws & nuts that are holding the engine plate to the chassis with M4 x 12 screws & nuts. You are now ready to fit the collective pitch conversion!

ASSEMBLY:

1. Assemble the swash plate (CO.18) as Fig.1, using the brass balls and M2 x 12 screws & nuts as before. Note the double ball (arrowed) does not have an M2 nut on the inside. Fit the O ring (H.83) in the centre.

2. Make up two 'T' bellcranks (CO.37) as in Fig.2 using brass balls, M2 x 12 screws & nuts as before but use the INNER hole on the MIDDLE arm. Use T bellcrank bearings & washers (CO.38) and fit one to the bellcrank mount (CO.16), with an M4 x 16 screw, noting which one! Use the bellcrank spacer (CO.17) on the other. Fit them both to the front bellcrank hole in the chassis with an M4 x 25 screw, Fig.3.

3. Make up the third T bellcrank & bearing and attach to the For/Aft Cyclic Crank Mount (CO.22) with an M4 x 25 screw & nut, Fig.4. Attach the other end of the mount to the chassis with an M3 x 20 socket head screw and an M3 nut either side of the chassis, setting the inner nut to allow the mount to pivot but without lateral play. At the same time fitting the Anti-Rotation Link Bracket (CO.28) under the M3 nut on the other side (arrowed Fig.7). Swap the front tail boom M4 x 25 screw & nut for an M4 x 30 screw & nut (arrowed Fig.6). Fit a brass ball to the top of the anti-rotation link bracket with an M2 x 12 screw and two nuts, Fig.7.

4. Assemble all the links as Fig.5 to the lengths shown (measure from the CENTRE of each clevis hole) from the appropriate length threaded rods. Note that some have their clevises at right angles to each other and some parallel.

5. Fit the swash plate (larger side down) and connect to the two left/right cyclic/collective bellcranks with two 53mm links, Figs.6 & 7. The link on the right side of the chassis (viewed from the rear) goes to the INNER of the DOUBLE ball on the swash plate. Connect the outer of the double ball to the top of the anti-rotation link bracket with the 48mm link. Connect the for/aft cyclic crank (on it's mount) to the remaining two balls on the swash plate with two 45mm links.

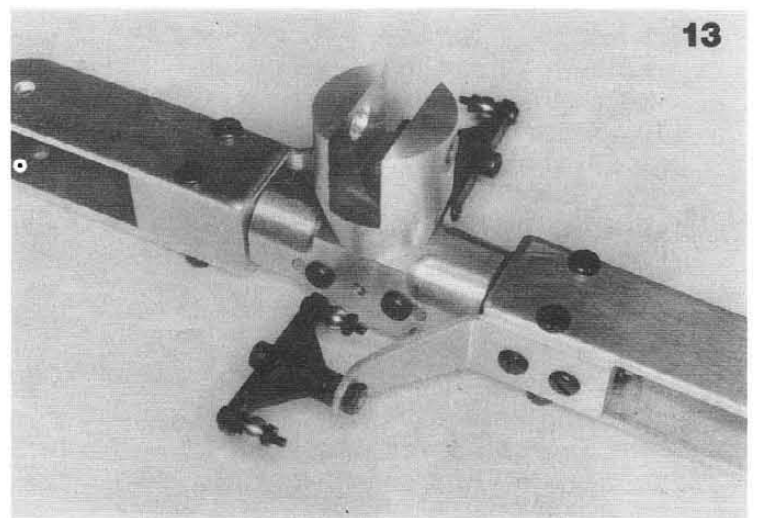
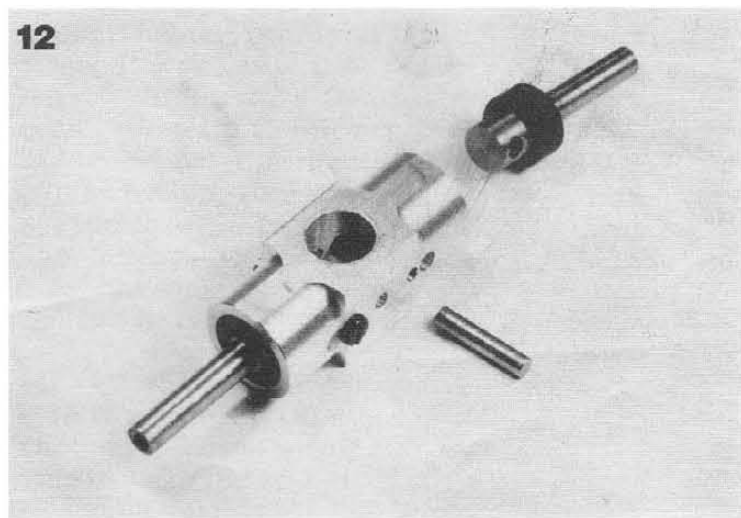
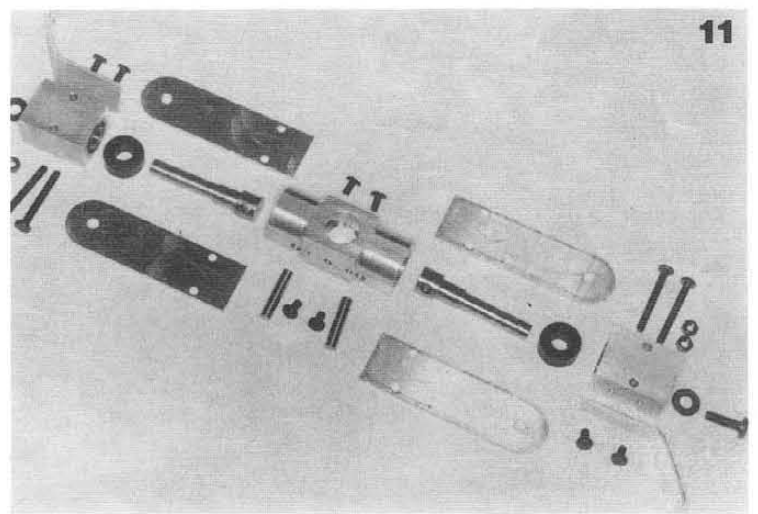
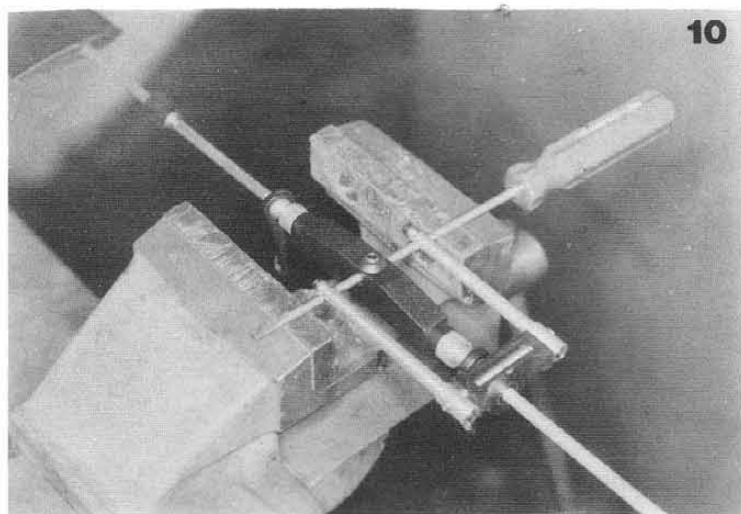
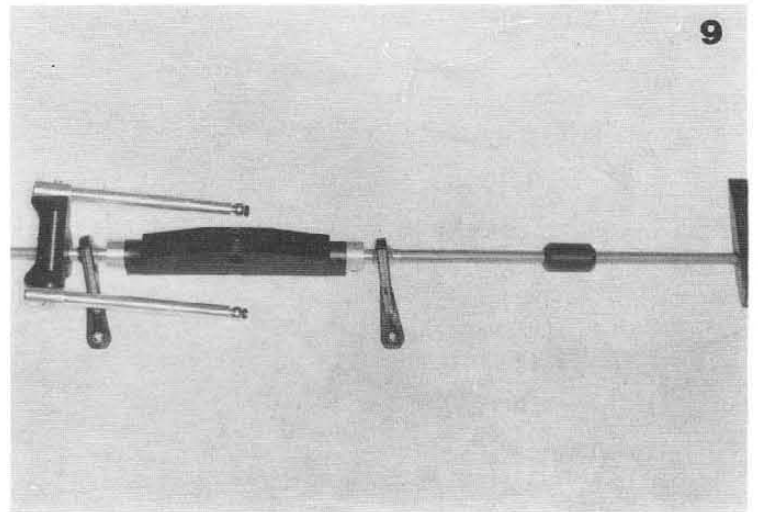
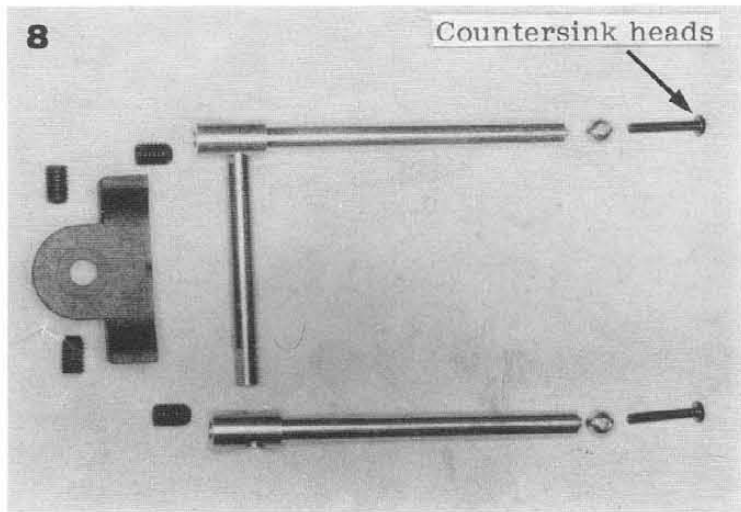
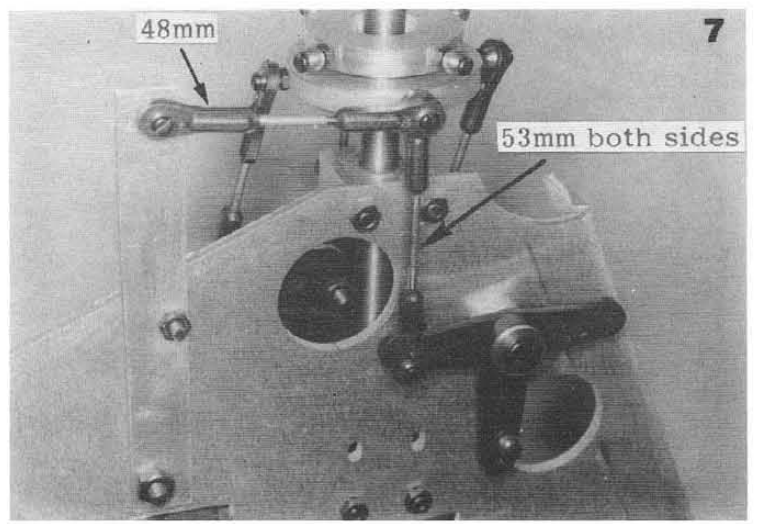
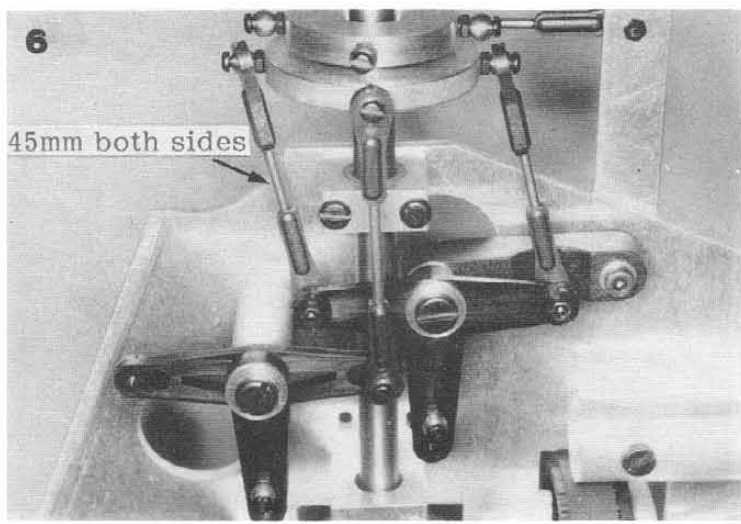
6. Assemble the head mixer as Fig.8. Use M4 x 6 grub screws to hold the head mixer arms (CO.6) onto the flats of the head mixer pin (CO.7). Set so the unit pivots freely without lateral play. The brass ball on each arm retained with a COUNTERSINK head M2 x 12 screw (no nut).

7. Slide the Fly Bar (H.37) into the Fly Bar Holder (CO.4), then a Fly Bar Ball Joint (CO.9) on each side (note which way round they go), retaining them with M4 x 4 grub screws. Set them so that the fly bar is central (measure from the centre to each end) and is free to revolve with no end play, Fig.9. Clip a Fly Bar Link (CO.15) on to each fly bar ball joint. Slide the head mixer assembly on one side and the Fly Bar Balance Weight (CO.31 with an M4 x 4 grub screw) down the other. Screw on the Fly Blades making sure they are level with each other. Tighten the head mixer mount (CO.5) using two M4 x 6 grub screws, so that it is level with the fly blades and against the fly bar ball joint.

8. Now balance the fly bar by inserting a convenient rod through the fly bar holder and resting on the open jaws of a vice or similar. Note, don't allow the mixer arms to hang down or incorrect balance will result. Set the balance weight so that the fly bar balances level and tighten it, Fig.10.

9. Fig.11 shows the rotor hub parts. Push a Teeter Rubber (CO.20) on to the stepped section of each Blade Pivot Pin (CO.12) and insert them in to the Blade Joiner (CO.2), smear some grease round the edge of the rubbers if difficult. Retain each with a Blade Retaining Pin (CO.12) and then four M3 x 5 screws, Fig 12.

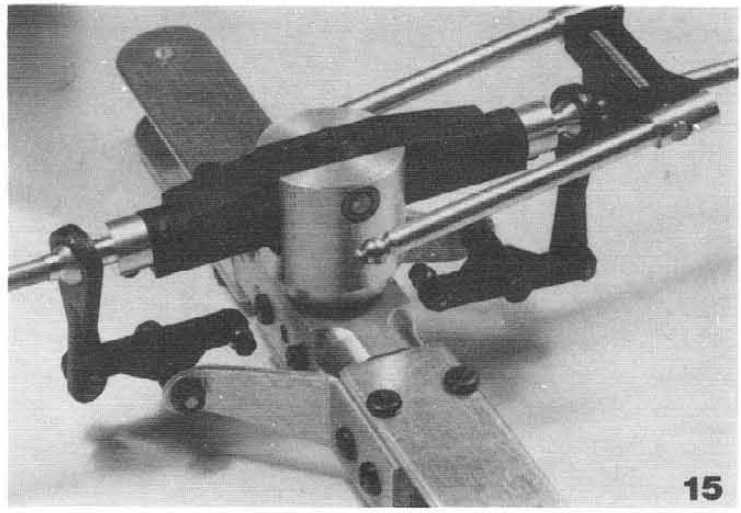
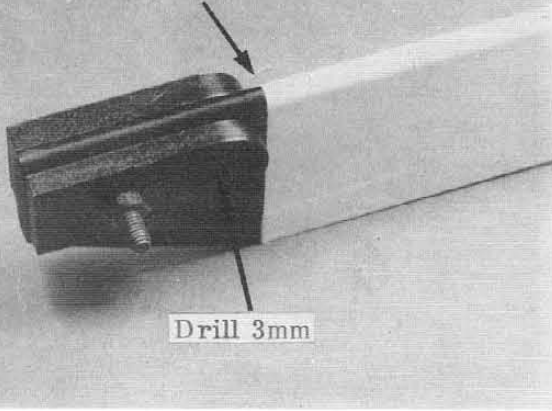
10. Slide on the two Blade Holders (CO.3), either way round. If difficulty is found here, check and if necessary file off any burr on the ends. Retain with M4 x12 screws with the Blade



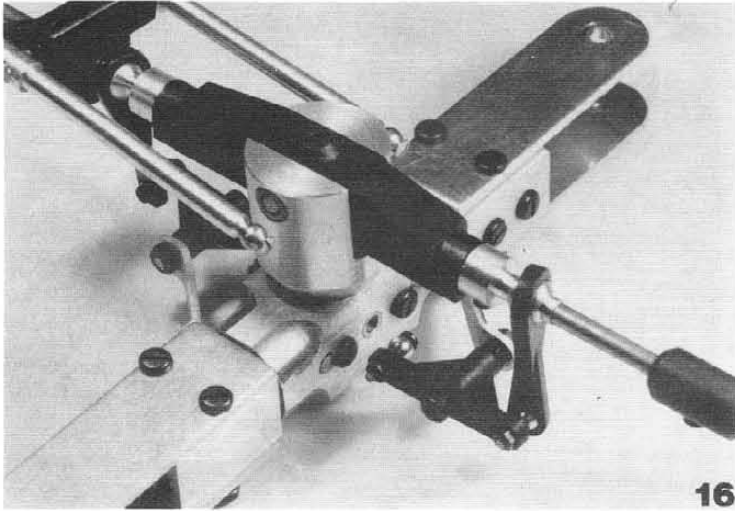
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Leave 45mm of root uncovered

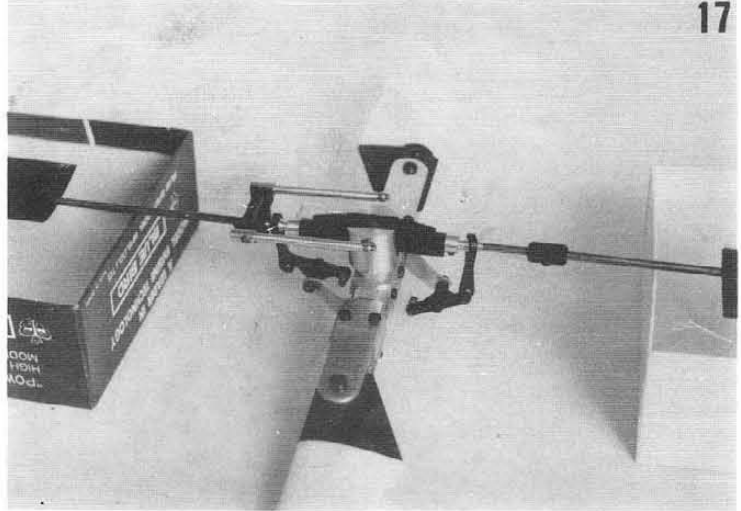
Drill 3mm



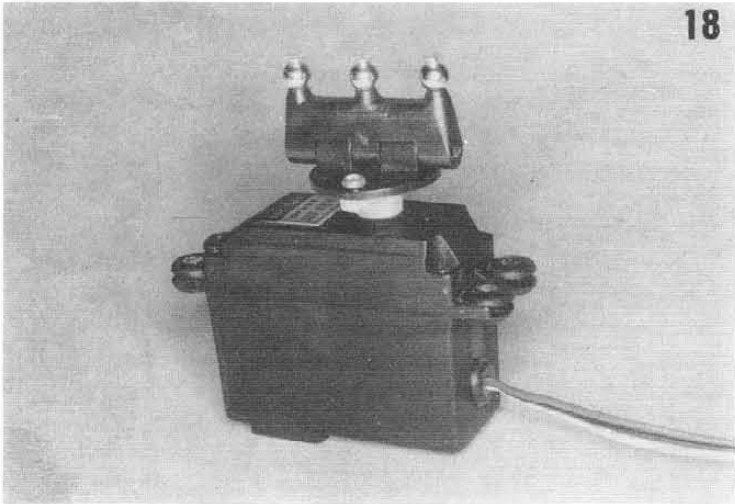
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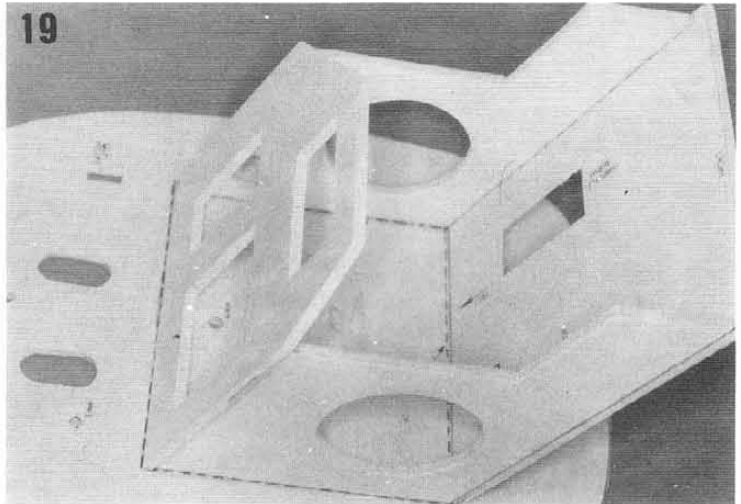
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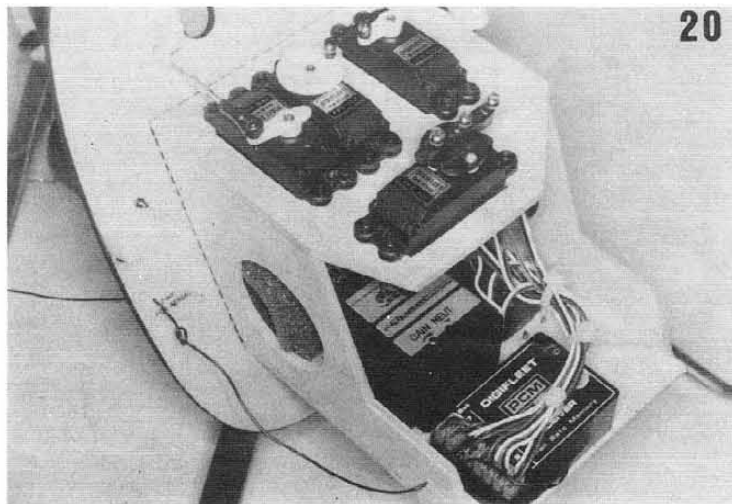
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Holder Retaining Washers (CO.12) under each head. Fit the four Blade Holder Plates (CO.21) with four M3 x 25 screws & nuts, then the two Pitch Arms (CO.14) retaining with four M3 x 5 screws. Fit the four brass balls with four M2 x 12 screws & eight nuts to the two Blade Cranks (CO.30). Attach these to the pitch arms with the M3 x 19 (no slots in their heads) Blade Crank Pivot Pins (CO.30) and four M3 nuts, Fig.13. We recommend that the Rotor Head (CO.1) is glued (Cyano Glu or epoxy) into the blade joiner to minimise play, when doing this, check the slot in the rotor head is at right angles to the blade joiner.

11. Cover the rotor blades as before but, the amount of uncovered blade at the roots should be 45mm. Remember, as before, to heat the covering gently if it does not stick down in places. Fuel proof or paint black the uncovered root sections. Temporarily attach the top and bottom Blade Reinforcing Pieces (CO.23), note the curved inner section of the top ones, to each rotor blade with an M4 x 25 screw & nut. Check they are straight, then drill through the smaller holes with a 3mm drill, Fig.14. Remove the 4mm screws and re-attach the reinforcing pieces with M3 x 20 screws & nyloc nuts through the just drilled holes (nuts underneath). The blade roots can be trimmed as Fig.14 to allow the blades to swing back or to be folded back for transport (MFA supply a support for this purpose, pt.no.770).

12. Attach the main rotor blades with M4 x 25 screws & nyloc nuts, tighten to allow the blades to move reasonably freely. Balance the rotor assembly by resting the fly bar across a convenient support (an engine box is illustrated in Fig.17). As before, apply coloured trim tape to the lighter blade tip until perfectly level.

13. Attach the Fly bar assembly to the rotor head with the Fly Bar Pivot Pin (CO.8) and retain with an M4 x 4 grub screw in the top. Hook up the fly bar links, Figs.15 & 16. Screw the Mixer (CO.27) to the top of your aileron servo (select an appropriate disc) with the two small self tap screws, Fig.18.

14. Cut out and drill F.1, F.2, F.3, F.4 and F.8 and glue together, Fig.19 (alternatively just cut out and fit F.8 and raise the holes in F.1 as mentioned at the beginning). Attach your four servos as Fig.20 noting the information printed on F.8 also, note which way round the servos go. Re-fit the brass balls on the discs/arms to give 12mm RADIUS (if necessary) EXCEPT the COLLECTIVE servo which should be 10mm RADIUS. Replace the throttle servo and receiver etc. (if new servo/radio mount has been made).

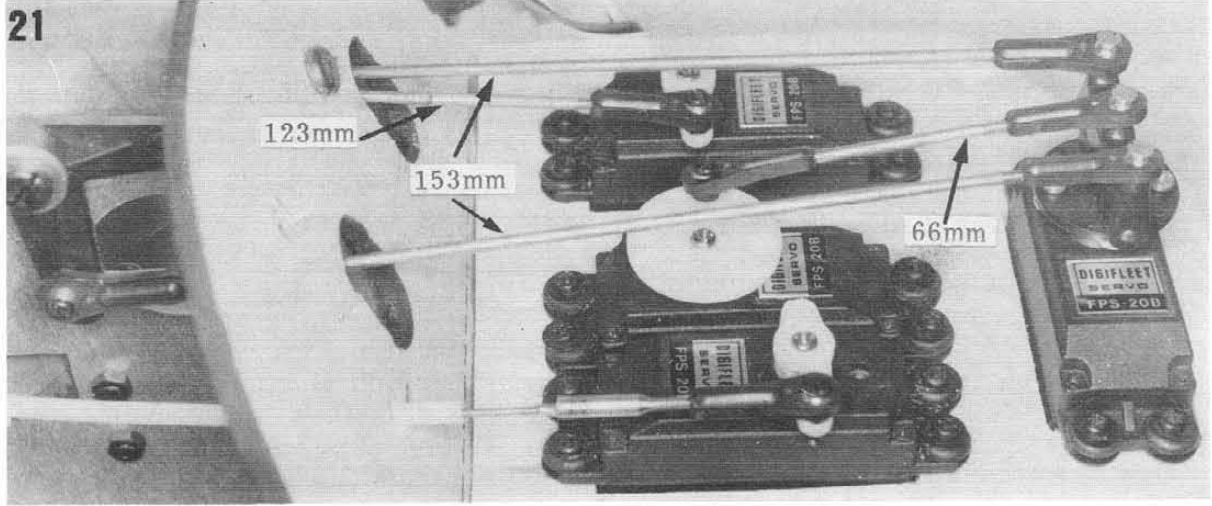
15. Using the appropriate links, hook up the three servos as Fig.21 & 22 and re-hook up the tail pitch (rudder) servo. Note that due to slight variations caused by different makes of servos, these links may need adjusting slightly, just make sure the bellcranks are level when the servos are neutral. Note, the mixer on the left/right cyclic (aileron) servo should lean back slightly.

16. Re-fit the Swash Plate Driver (H.36), don't tighten yet. Attach the rotor assembly to the mast with M3 x 22 Rotor Retaining Bolt (CO.29) & nut. Connect up the two 97mm links, checking that when the swash plate is level, the fly blades are too. Now connect up the two 56mm links, Figs.23 and 24. Note the swash plate driver hooks into one of the 56mm links and is 90 degrees to the rotor. For the correct height of the swash plate driver, switch on your radio and operate the THROTTLE, tighten it so that at full extremes of travel of the swash plate, the swash plate driver clears the ball clevis at each end, Fig.24. While doing this also check the for/aft cyclic (elevator) T bellcrank clears the upper mast bearing block when at full throttle.

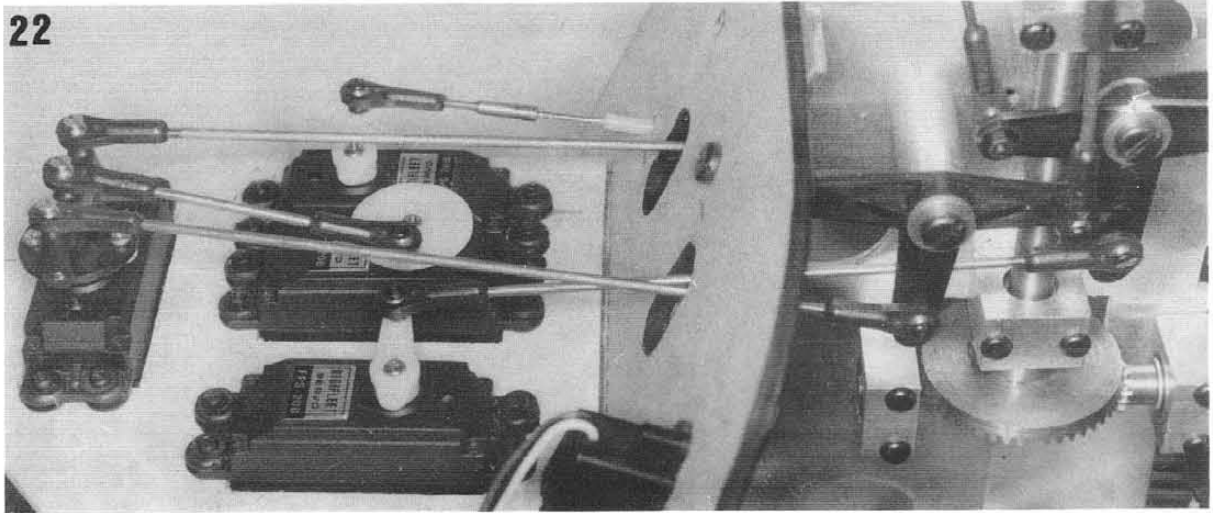
17. SETTING THE PITCH: Wedge a couple of pieces of scrap 4mm ply into the gap under the fly bar holder (arrowed in Fig.25) to lock the fly bar at 90 degrees to the mast. Cut out the Pitch Gauge, fit the two halves together with an M3 x 12 screw, nut and washers. IMPORTANT: USE ONLY THIS GAUGE!! NO OTHER!! Other pitch gauges will give a false reading due to the Sport 500's flat bottom aerofoil. Set the gauge to -1 degree. Turn on the radio and set the throttle to low. As before, line up the gauge with the fly bar, Fig.25 and adjust the appropriate 56mm link as necessary to correct. Repeat with the other blade. Now set the throttle to full and check the pitch, this time setting the gauge to match the pitch which should be between +7 and +8 degrees. If it is not, it will be necessary to use another disc/arm hole on the collective servo to alter the movement as necessary. On helicopter radios, 'collective travel' can be adjusted via the transmitter for this purpose.

18. Fit the new tank clips (CO.32) to the top M4 x 25 screw, Fig.26, using an M4 nut either side to retain (set the outer nut level with the end of the screw). Fit the other tank clip using another M4 x 25 screw and 3 nuts through the chassis hole provided (set the outer nut about 3mm in from the end of the screw). Put a strip of foam seating tape round each clip for the tank.

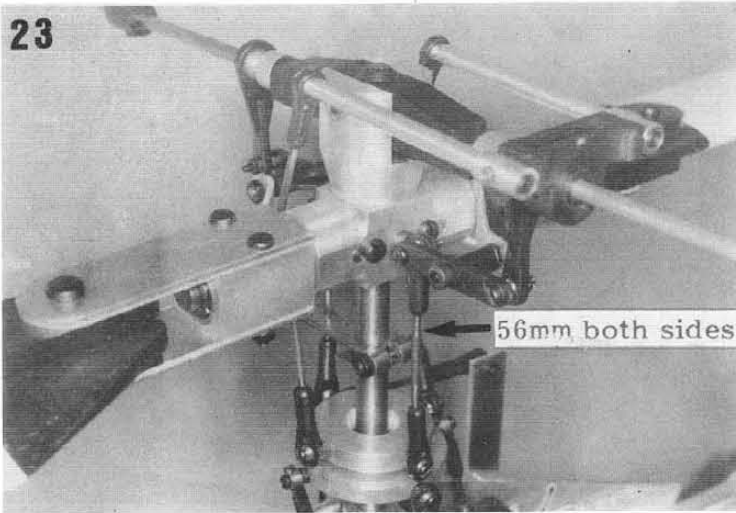
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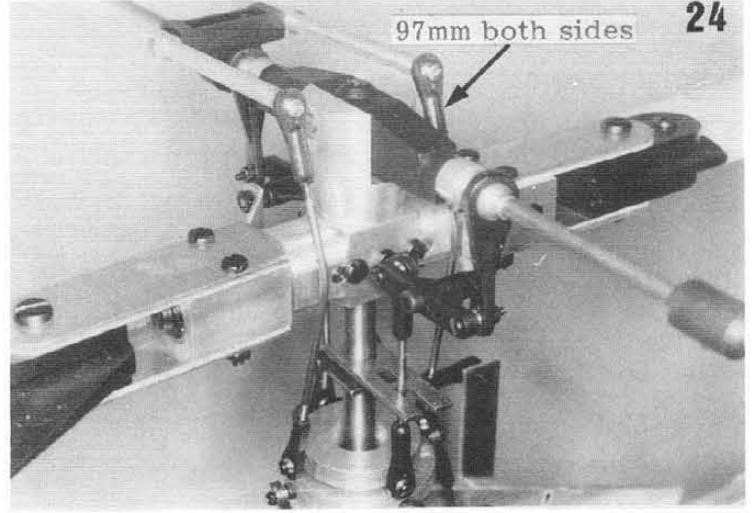
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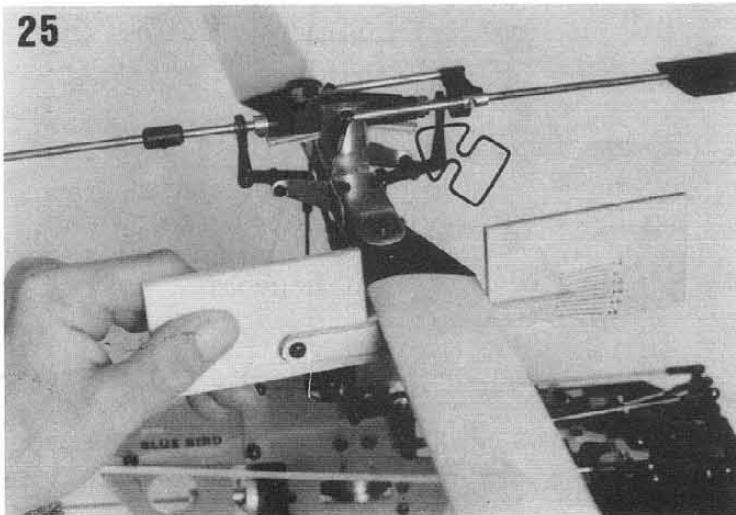
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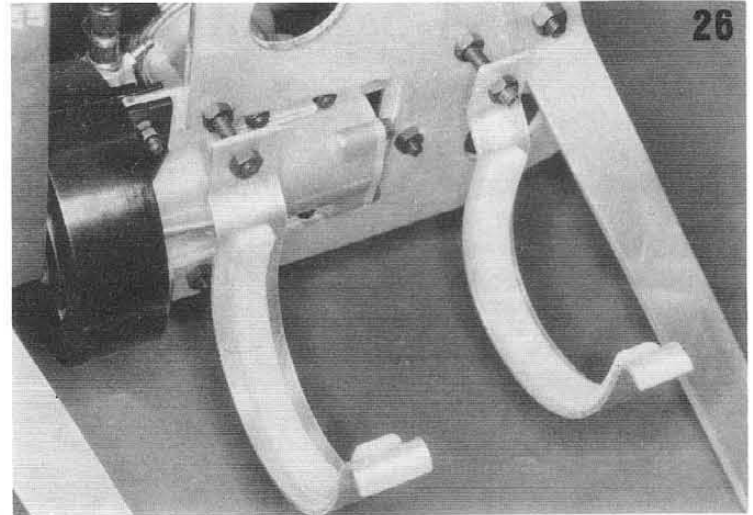
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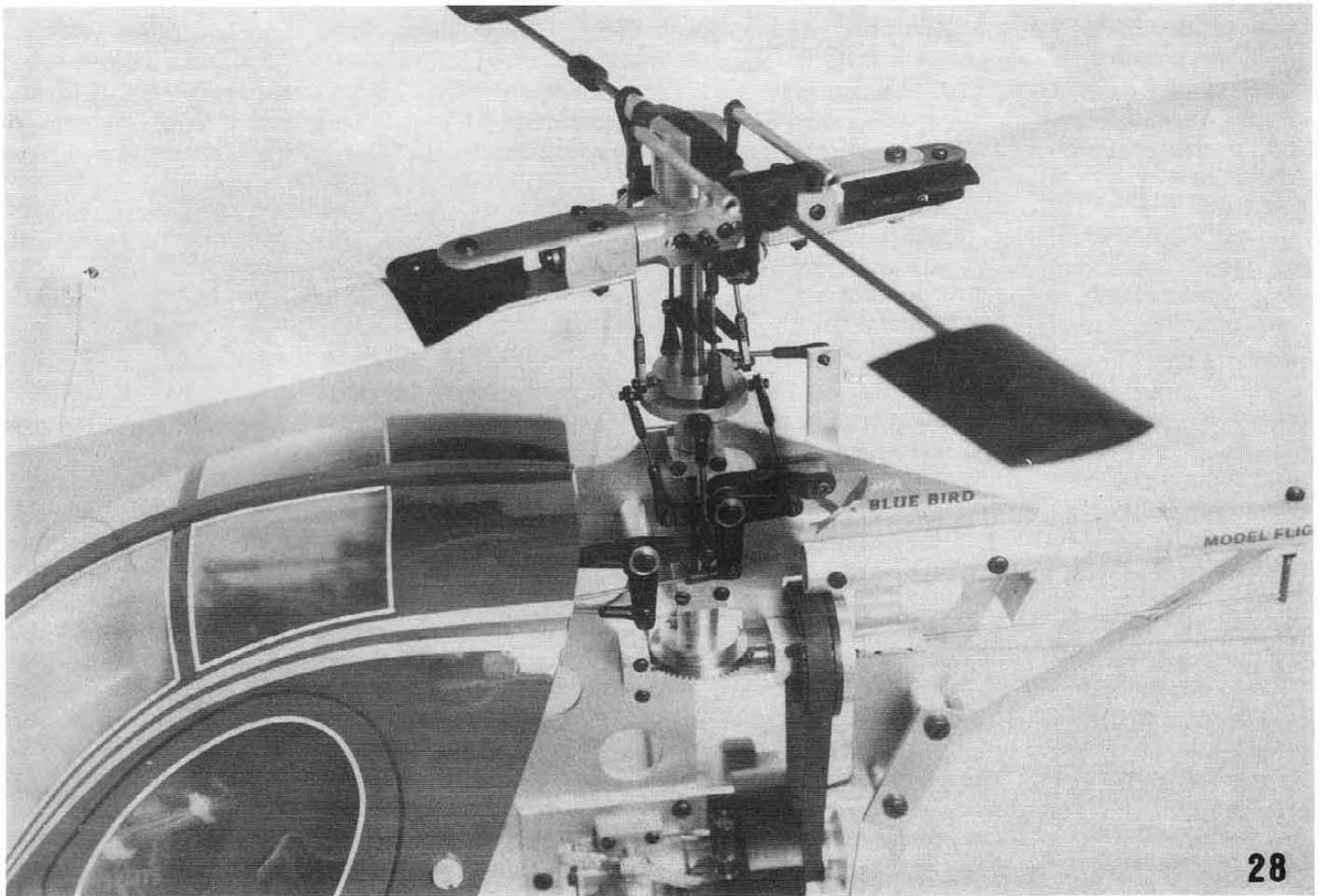
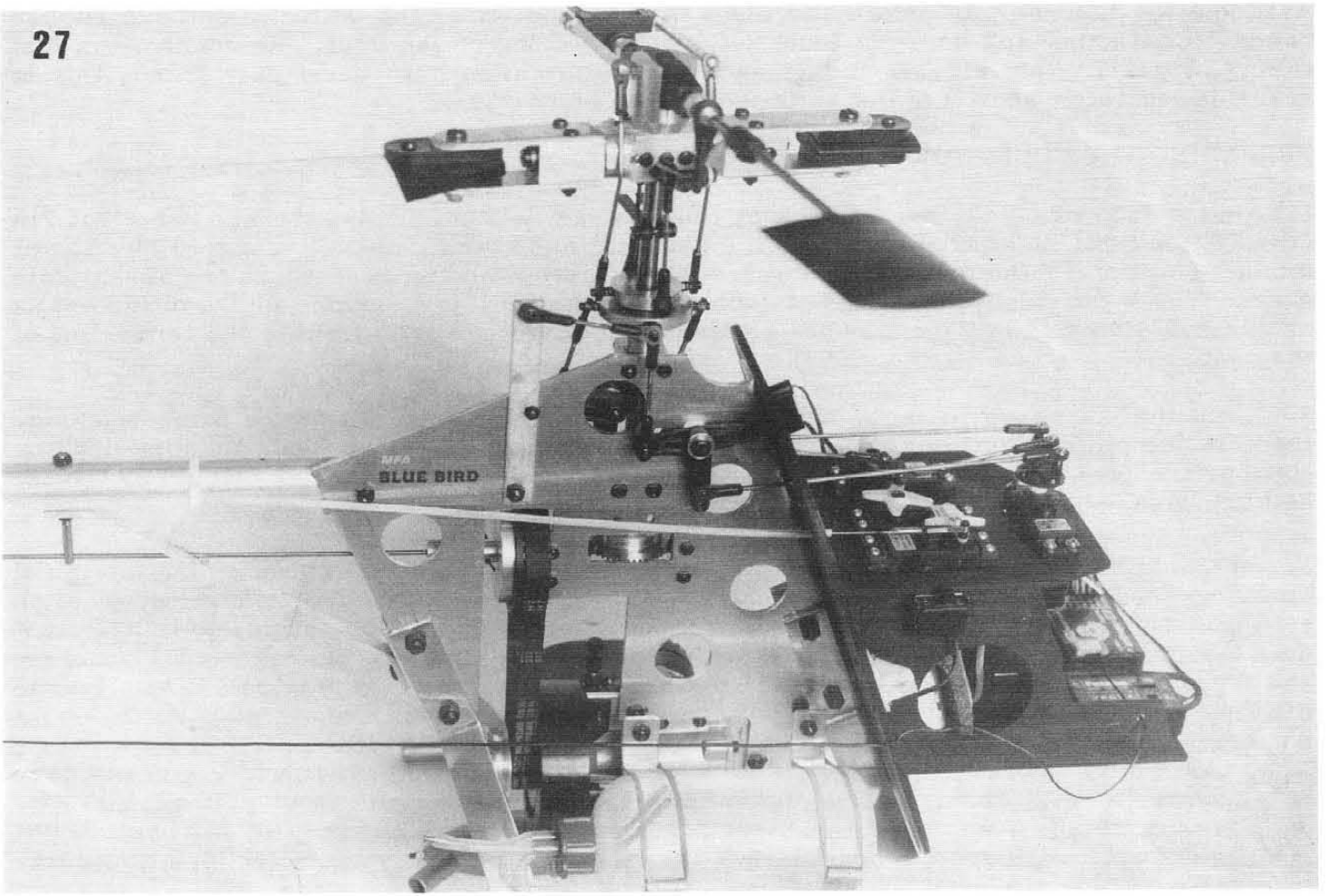


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Assemble the fuel tank as before and place in the clips, retaining with two suitable rubber bands. Check the tank does not touch either the U/C leg or fan duct. Re-connect the fuel tubing, Fig.27. Note Figs.27 and 28 show the autorotation main bevel gear fitted, this is available separately as part of the Autorotation Kit (pt.no.769).

PREPARING THE MODEL FOR FLIGHT:

1. Put a drop of oil on the bearings of the Fly Bar Holder (CO.4), the Fly Bar Pivot Pin (CO.8), the Head Mixer Mount (CO.5), the Blade Cranks (CO.19), also it is a good idea to put a touch of oil on all the ball links. Put a smear of grease on the mast where the swash plate slides. Check the existing bearings as detailed in the original instructions and re-oil/grease as necessary. Check the balance, as before it should be fractionally in front of the centre line of the mast.

2. Run the engine up to about 1/2 throttle as before and check the rotor blade tracking. Increase the pitch slightly on the low blade and decrease on the high blade by adjusting the appropriate 56mm links, Fig.23. Re-set (if necessary) the tail rotor pitch as before (gyro off), just before take off.

3. COLLECTIVE PITCH SETTING: After the model is set up as above and after initial hovering checks, try briefly climbing at full throttle to ascertain the full collective pitch setting. The model should climb quite rapidly without the engine labouring too much. If it does labour, reduce the overall pitch (via the 66mm servo link, Fig.21) by about 1/2 degree and try again (do make sure the engine is running properly first). If the model is reluctant to lift when the engine and rotor appear to be revving high, increase the overall pitch by about 1/2 degree and try again. NOTE: YOUR ENGINE MUST BE RUNNING PROPERLY because a sick, too tight or too rich engine will cause excessive pitch for take off (because you will have advanced the throttle further to try and gain more power!) which will result in too low r.p.m. on the main and tail rotors causing poor control of both! A sure sign of too low r.p.m. in flight is a slight for/aft oscillation in hover. However, if your engine is not very powerful, you may have to live with slight labouring at full collective pitch.

4. Note, for simplicity, this model does not incorporate any mechanical mixing of the collective pitch and tail rotor pitch i.e. if the collective pitch is increased, the tail pitch increases also to automatically compensate for the increased torque. However, this can be done via the transmitter if yours has this ('ATS' - automatic tail compensation) facility. Set this at about clockwise on the knob, to start. Increase (clockwise) if the model tends to rotate to the left vertical ascent (from hover) and vice versa, this is checked with the gyro off. However, no need to worry if your radio doesn't have this facility, it is not essential and the gyro copes very well on its own!

5. AUTOROTATION: This is available as a simple add-on kit (MFA pt.no.769) and full instructions are included with it for fitting and flying.

OPTIONAL EXTRAS:

NYLOC NUT SET. A complete set of M3 and M4 replacement nuts for the Sport 500 collective for those who prefer to use these. Pt.no.773.

AUTOROTATION KIT: Pt.no.769.

HUGHES 500E scale body conversion kit: Pt.no.737.

EXTENDED U/C LEGS (by 30mm) for rough terrain use or greater silencer to ground clearance: Pt.no.H.53.

ROTOR BLADES SUPPORT (when transporting the model): Pt.no.770.

CAMERA CRADLE. To take a simple electric wind 35mm compact camera for aerial photography: Pt.no.772.

