

Photo #31

10. Route and anchor the motor and battery leads. Plug the servo leads into the receiver. Use regular cable ties (NL702) to secure loose wires. Route the antenna wire as shown (See photos #28, 29, 30, 32). NOTE: For upper rear chassis antenna guide mount, use the left over #4 x 1/4 A pan head screw (NL901) from section #100. Using a 3/32" bit, drill a pilot hole and mount as shown, using the other two modified tie wraps. Firmly tighten the first tie wrap at the receiver end of the antenna wire and the battery lead to keep these from pulling on receiver. NOTE: Power transmission can be broken in at this time. See information on this in "note" at end of section #400 (Power/Transmission).

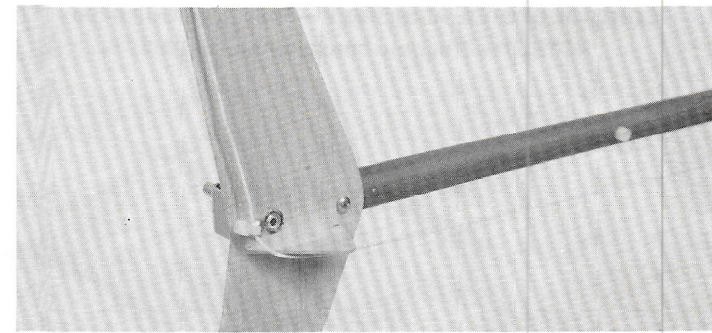


Photo #32

11. Prepare Swash Plate:
(A) First take the top hub (NL712) and the bottom hub (NL713) and scuff with sand paper. Also scuff the inside of the swash plate bearing. (NL711).
(B) Set the bottom piece of the swash plate hub (NL713) on a hard flat surface and press the plastic bearing (NL711) down over the hub until both are flush at the bottom (See photo #33).

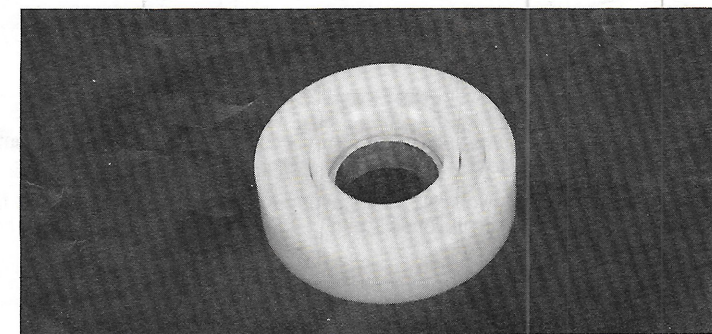


Photo #33

(C) Drop in place on top of the bottom hub piece, the 5/8" nylon washer (NL714).
(D) With the hole on top, press in the top swash plate hub (NL712) until it firmly bottoms out on top of the nylon washer. (See photo #34).

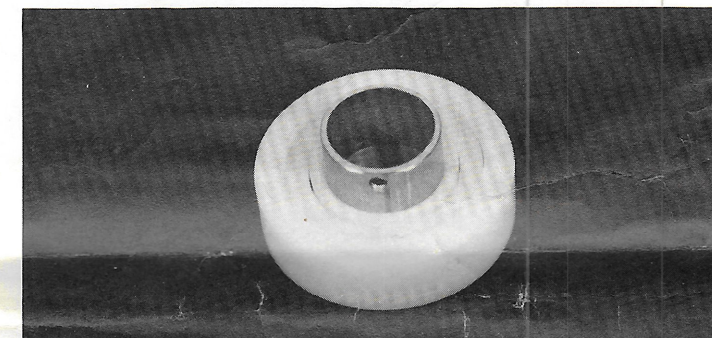


Photo #34

(E) Using thin CA, carefully control small dabs around where the top hub meets the plastic swash plate. Also glue in the bottom hub in the same manner. Place small dabs of glue inside the hubs at the outer edge of the nylon washer, top and bottom.
(F) Place one nylon (nut type) spacer (NL508) on three of the six ball joints (NL706) and thread these into the holes in the swash plate. Do not over tighten. (See photo #35). NOTE: Clear the loose plastic drill shavings in the plastic bearing by spinning and shaking the bearing until it spins freely.

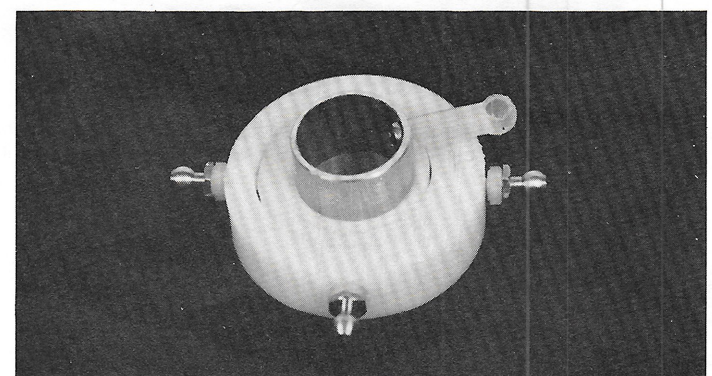


Photo #35

(G) Attach one nylon socket arm to the top swash plate hub using one of the (4) 2-56 x 3/8 p.h. screws. (NL904). (See photo #35). The swash plate is now ready to be installed.
12. Prepare the rubber swash plate grommet (NL716) by placing it on a 1/8" wood dowel. Using a modeling knife, cut the grommet in half by rolling it back and forth on a flat hard surface. (See photo #36).

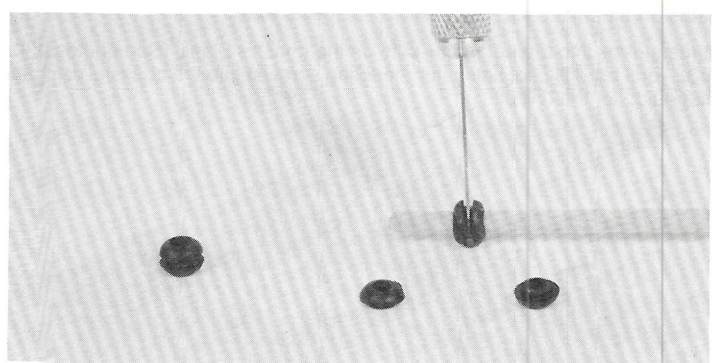


Photo #36

13. Mount the swash plate to the main shaft by first sliding on one of the fiber washers (NL715). Then, using a thin soap film, slide on half of the rubber grommet with the dome side up. Then slide on the swash plate, and follow with the other half of the rubber grommet dome side down, followed by the second fiber washer. (See photo #37).

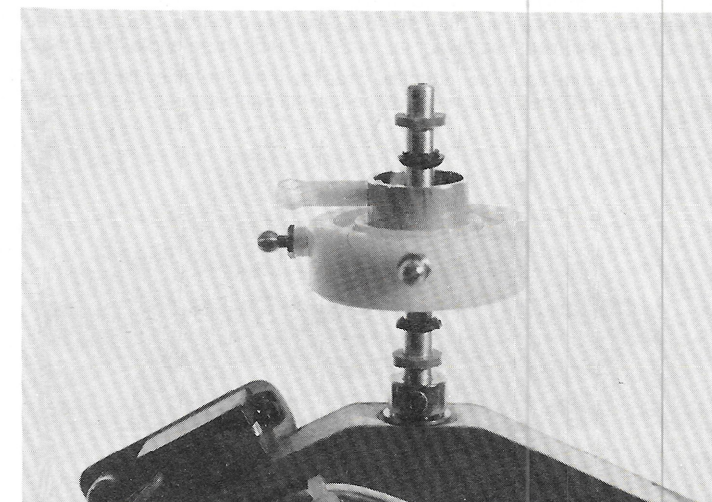


Photo #37

14. Prepare push rods:

(A) Taking the two push rods (NL703) with the 2-56 threaded ends, cut one to approximately 1-1/2" long. Take the other and cut it so that the threaded area is about 1/2" long. Then cut the over-all length to about 2-1/2" long. Then put a bend on the threaded end in about 3/4" as shown in photo #38.

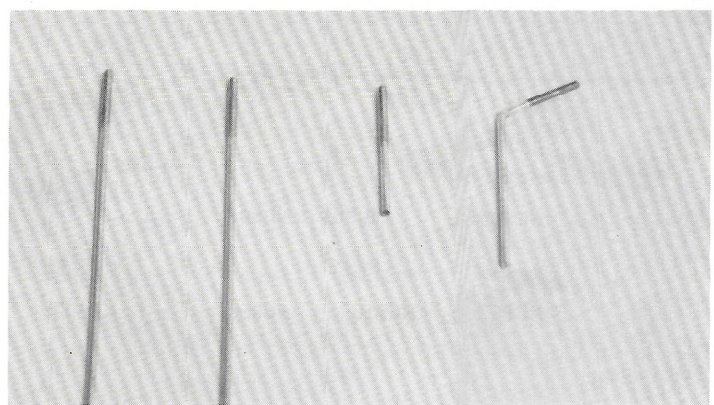


Photo #38

(B) Take the .032 tail control rod (NL705) and bend one end to 3/16" up and 3/16" over. These bends are 90° bends. (See photo #39).

(C) Cut the pitch control rod (NL718) to approximately 3-1/2" long, then bend the bellcrank end down 90° 1/4" long. (See photo #39).

(D) Cut the 2-56 threaded rod (NL710) about 2" long. This is the swash plate stabilizer rod.

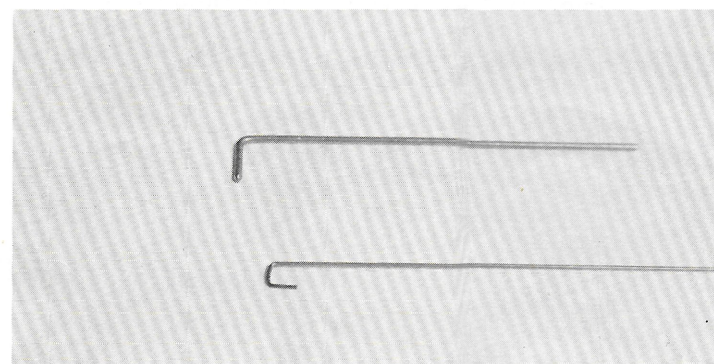


Photo #39

15. Attach the push rod connectors (NL704) to small X type servo arms using the nearest hole to the center. Cut off unused arms and center as shown. (See photo #40). Attach the push rods to the nylon socket arms and push rod connectors. Snap the nylon socket arms to the swash plate ball joints and adjust to level the swashplate. (See photos #40 & #41).

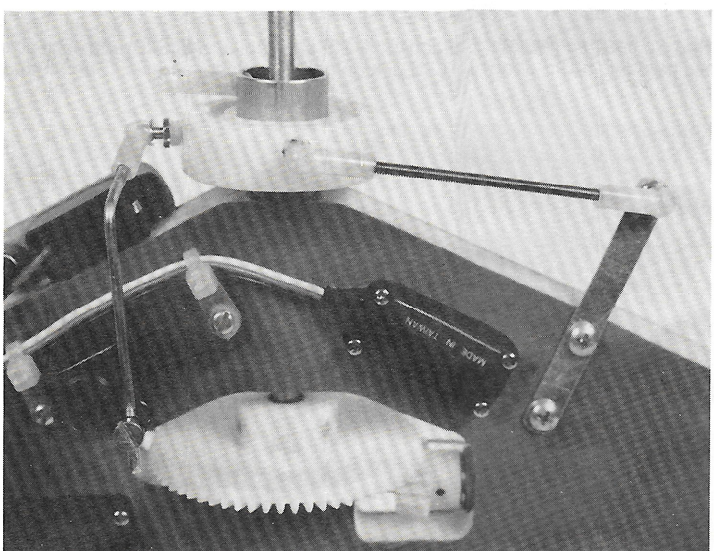


Photo #40

16. Attach one ball joint to the swash plate stabilizer (NL213). Mount the nylon socket ends to the stabilizer rod, and attach it to the swash plate and stabilizer. (See photo #40).

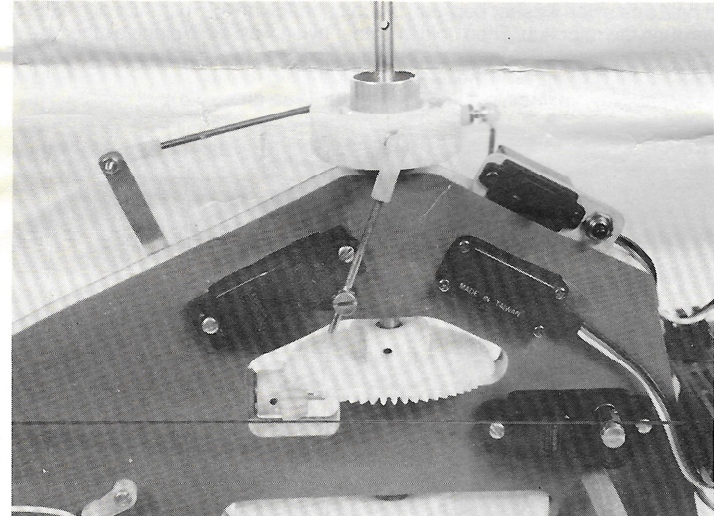


Photo #41

17. Slide the .032 tail control rod (NL705) through the drilled nylon guides in the tail boom and on up to the servo connector. Attach the tail control rod to the nylon bellcrank (NL717) through the small hole next to the large hole. Attach the pitch control rod to the other end of the bellcrank and mount the bellcrank to the mount plate using the 2-56 x 1/2" pan head screw (NL906) and the 2-56 lock nut (NL907). The bellcrank is shown in the neutral position. NOTE: When the nylon bellcrank is in the neutral position, the pitch control rod should enter the tail shaft at the rear side of the hole. Adjust the pitch control rod a little at a time, 1/4" in from the 90° bend, until this alignment is achieved. Remove the rod each time to make this adjustment. (See photo #42). Before final installation, attach a 1/2" piece of heat shrink tube to the pitch control rod, about 7/8" in from the straight end of the pitch control rod. Shrink the tube on tight using a wood match or a propane torch. Heat the tube until it is clear.

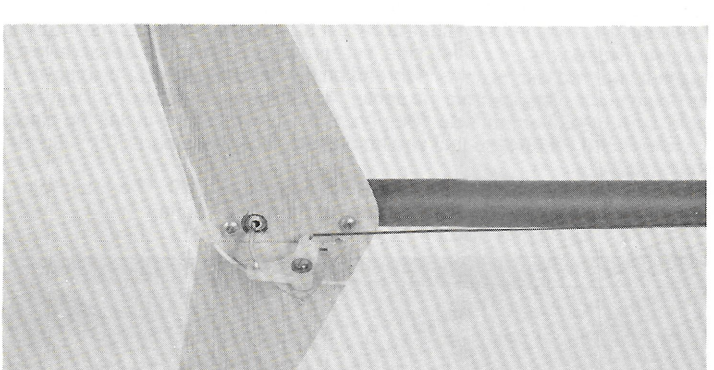


Photo #42

18. Attach the tail rotor hub to the end of the tail shaft and lock the set screw. Do not overtighten.

19. Mount the last two ball joints to the inside of the tail rotor blade control arms. Then attach two nylon socket arms to the ends of the pitch control plate (NL720) with 2-56 x 3/8" pan head screws (NL904). (See photo #43).

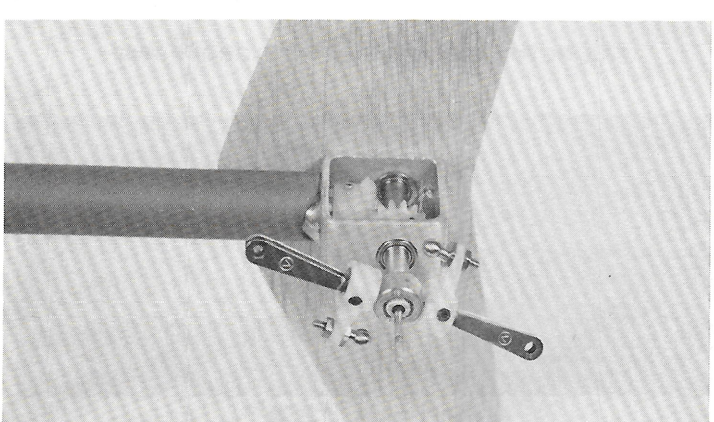


Photo #43

20. Slide one 1/16" shaft collar (NL920) on the pitch control rod. Then slide on the pitch control plate and socket arms toward the tail hub, and slide on the other 1/16" shaft collar. Adjust the nylon socket arms to match the ball joints and snap them in place. See that these move freely. NOTE: If the ball joints are tight in the nylon socket arms, snap them together and squeeze around the nylon socket arm with needle nose pliers to stretch the nylon sockets.

Rotor blades

21. Adjust the shaft collars on both sides of the pitch control plate so that the control arms are facing 90° away from the shaft when the bellcrank and servo are in the neutral position. Lock the set screws on the shaft collars, and tighten the screw at the servo push rod connector. (See photo #43-A).

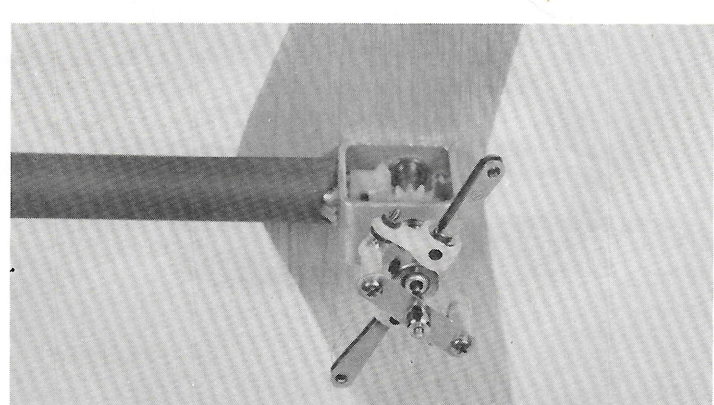


Photo #43A

22. Set the main rotor on the main shaft. Check to see if the holes align. You may have to file down the fiber washer (NL715) on top of the swash plate grommet until the screw holes line up. Then mount with the 2-56 x 1/2" cap screw (NL905) left over from section #500 and a 2-56 lock nut (NL907). Do not over tighten, as this will distort the nylon driver fork.

23. Attach the last nylon socket arm to the fly bar control arm, with a 2-56 x 3/8" pan head screw (NL904).

24. Prepare main rotor control rod:
(A) Snap the drilled ball joints (NL707) into the nylon socket arms on the swash plate and on the fly bar control arm. Then adjust the swash plate to level.
(B) Adjust the fly bar socket arm level, 90° away from the main shaft. (See photo #44).

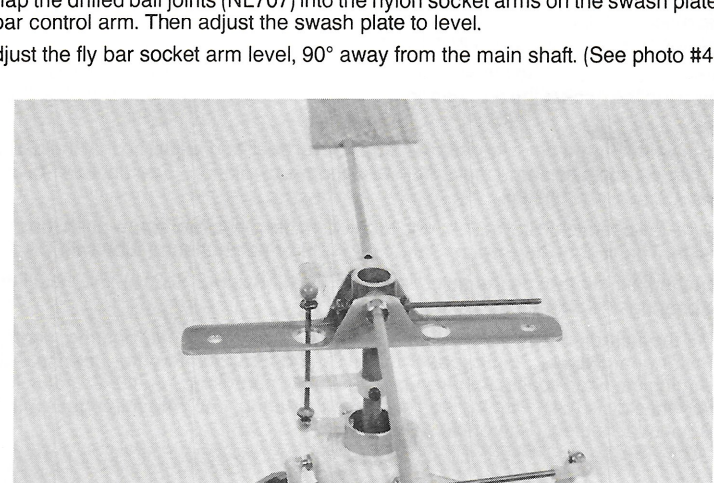


Photo #44

(C) File the brass control rod (NL708) to fit into the drilled ball joints so that the fly bar, nylon socket arm, and swash plate socket arm are level when the brass rod bottoms out in the ball joints.

(D) Remove the ball joints from the socket arms and solder them to the brass control rod. The control rod is now ready to be installed.

25. Turn on your radio and adjust the controls. When the right transmitter stick is pushed right, the right side of the swash plate should drop. When the same transmitter stick is pushed forward, the front of the swash plate should drop. When the left stick is pushed left, the pitch control servo should turn clockwise, pulling on the control wire. Adjust the servo rotation switches to correct.

BLADES — BALANCING, MOUNTING, ADJUSTING

1. To balance the fly blades, use straight pins on the inside end of the blade that is the lightest until it balances on the rotor head. (See photo #45). Remove the control rod to do this step.

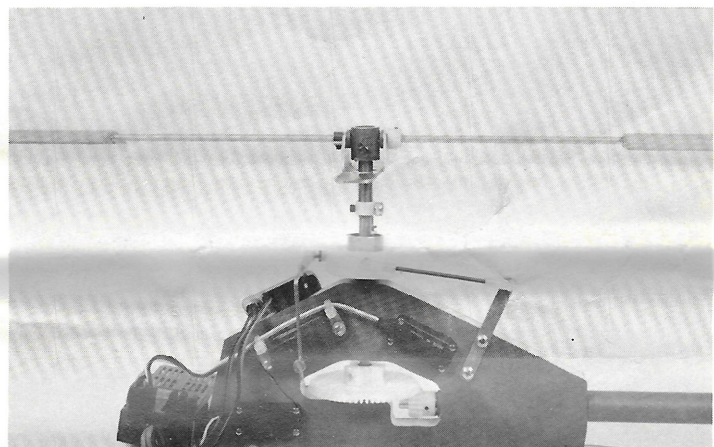


Photo #45

2. To balance the main rotor blades:
(A) Slide a 1/8" diameter dowel or rod through the mount holes, both with leading edge down. Hold to level and pin the trailing edges together. (See photo #46). Set across two level edges and balance the light blade by adding straight pins to the tip. Clip off the heads of the pins when installing them. Add an equal number of pins to the root as were added to the tip to improve the dynamic balance.

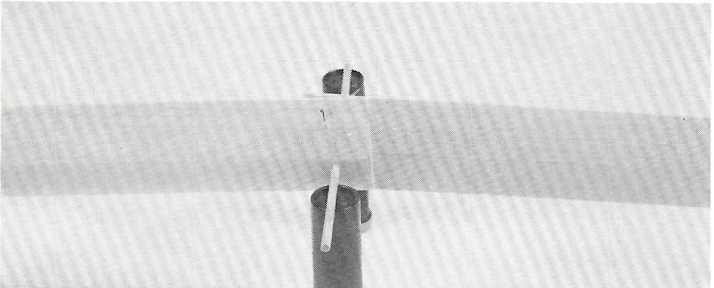


Photo #46

(B) To further improve dynamic balance, lay the blades side by side, root to root, tip to tip, across a round modeling knife or wood dowel. Roll the dowel until one blade tips. Add pins to the root end of the light blade until both blades tip at the same time. (See photo #47).

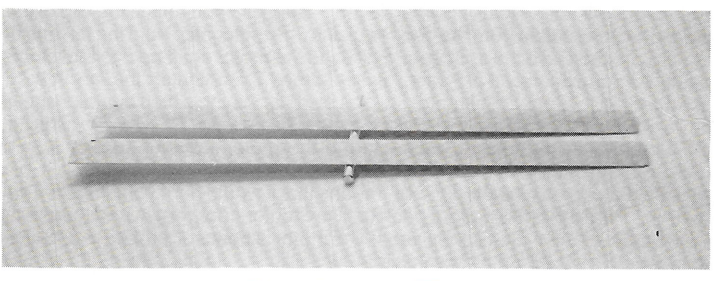


Photo #47

3. Balance the tail rotor blades in the same manner as the main rotor blades. (Note) After balancing the blades, coat the blade ends with thin CA to secure the pins.

4. Mount the tail rotor blades to the hub. Adjust the blade holders to hold the blades at a 0° pitch angle. Lock the set screws and remove the main rotor head and control rod from the swash plate. This is done to dynamically balance the tail rotor blades. Turn on your radio and start the motor slowly. Do not run over 1/3 throttle at any time as it will over-rev without the main blades attached. Balance the tail blades using 3/8" long pins at the tip. Balance to achieve minimal shaking of the tail fins. Some movement here is normal due to the light construction of the tail. Coat the tips with thin CA to secure any pins added. (See photo #48).

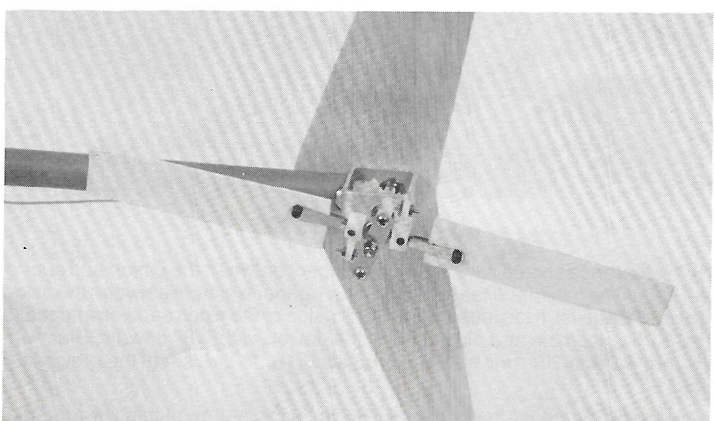


Photo #48

5. Mount rotor head with the fly blades only. Connect the control rod to the swash plate and balance similar to tail rotor, noting the vibration of the tail section. Again, do not run over 1/3 throttle at any time. Coat the tips with thin CA to secure any pins added.

6. Set the pitch of the tail rotor blades to about 15°. Always adjust each blade the same so as not to disrupt the balance of the tail rotor. (See photo #49).

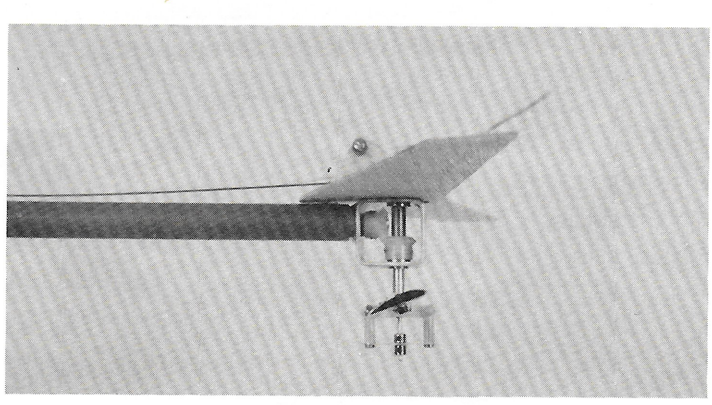


Photo #49

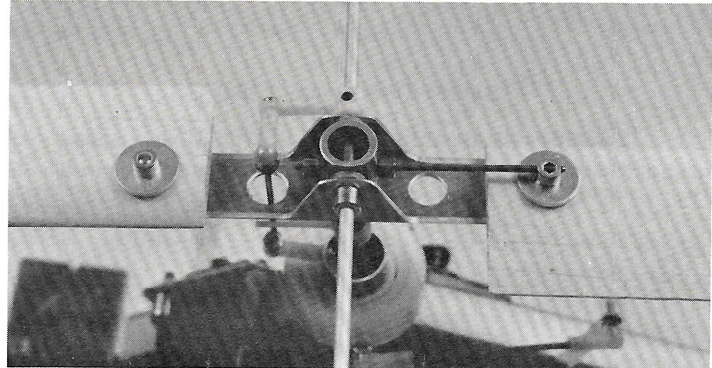


Photo #50

7. Mount the main rotor blades (NL501) to the main rotor. (See photo #50). Adjust the main rotor head pitch using pitch gauge. Adjust to line up with the fly bar rod. (See photo #51). Use needle nose pliers and regular pliers to adjust. (See photo #52).



Photo #51

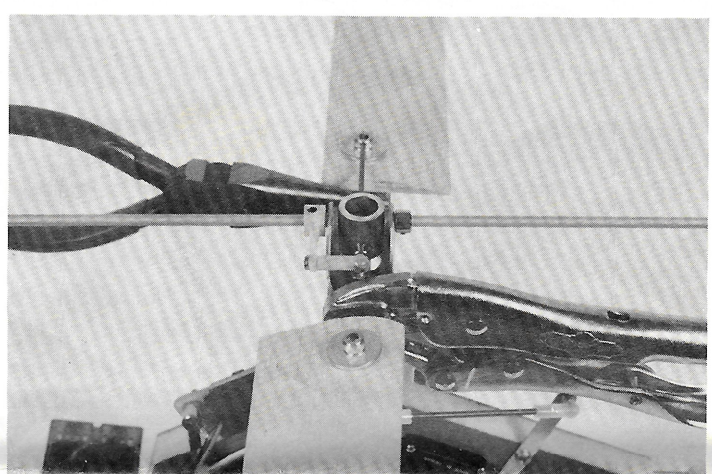


Photo #52

8. Paint one blade tip black to help in tracing the blades. A felt tip marker works well for this. NOTE: Put on safety glasses at this time.

9. Turn on the radio transmitter, then receiver, making sure that the throttle stick and trim lever are in the "off" position, and push the start button. Holding the helicopter by the back of the chassis and well above and away from your head, slowly run up to 1/4 — 1/2 throttle. Carefully sign the blade tips. The blade that looks short is the black painted blade. The blade tips must track accurately. Stop rotation, turn off the radio and adjust, repeating this procedure until the blades track accurately.

10. At this time, set the model on the floor and lay a 2 x 4 board 3' long through the landing gear struts. Run up to 1/2 throttle and balance the blades using pins in the tips, by noting the vibration at the tail. Adjust the vibration to a minimum. Again, using thin CA coat the blade tips to secure any pins added.

11. Remove the 2 x 4 board and run up the throttle until the model is light on the landing gear. The tail should move slightly to the left and then stop when blade acceleration is stabilized. Stop the blades. Turn off the radio and adjust the tail rotor blade holders to lighten the reaction when powering up to lighten the helicopter on the landing gear.

12. At this time, finish cutting the tail area on the body. First, drill a 1/8" hole through the rear body mount dimple in the body shell. Then drill 1/16" holes in the forward dimples. Measure the distance from the left rear dowel screw to the front of the tail gear housing. Then measure the same distance back from the rear mount hole on the body, back to the tail, and make a mark.

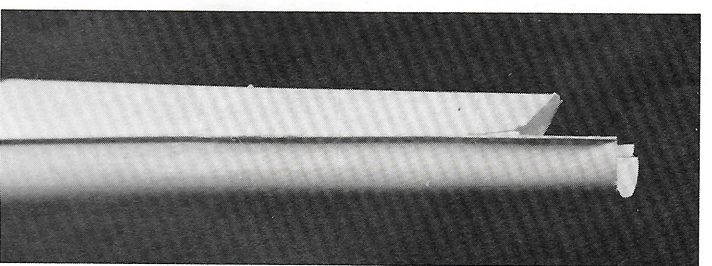


Photo #53

13. Cut off the tail all the way around at this marked length. Then, notch out for fin and control rod as shown. (See photo #53 & #54).

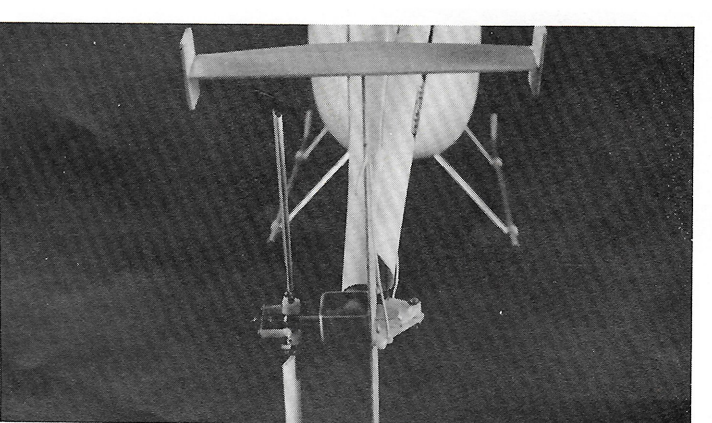


Photo #54

14. Remove the rotor head and the control rod from the swash plate.
15. Spread open the bottom of the body shell and rock the body back and forth over the dowel mounts. Then spread open the tail and snap it over the tail boom. Tape together the under side of the tail boom. (See photo #55).



Photo #55

Seamless

16. Mount the rear #4 x 1/4 pan head screws into the rear mount dowels, then use 1/16" wire or pins. Check the alignment of the forward holes and drill out with a 1/8" drill bit to adjust. Finish mounting the body with the other #4 x 1/4 pan head screws. NOTE: It is recommended that flight testing and training be done with the body shell removed. (See photo #56).

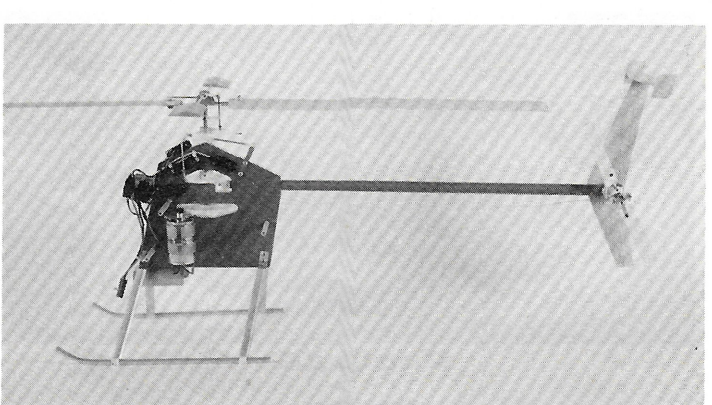


Photo #56

FLIGHT TRAINING

First adjust the landing skids so that the helicopter is sitting level, with the main shaft pointing straight up. Then bend the left skid up so that the copter leans slightly to the left to compensate for torque when training.

Kneeling down behind the copter, start the rotor. Bring up to 1/3 throttle (put on safety glasses) and sight along the blade track, then check the blade disk. Fore and aft movement of the right control stick should lean the main blade fore and aft. Adjust the swash plate stabilizer rod length to adjust the swash plate timing. Retard by shortening and advance by lengthening the rod. For hover practice you will have to retard the swash plate timing. For fast forward flight you must advance the timing, so that forward stick will lean the blade forward, and slightly to the right. Battery balance is important. At first you should adjust the battery so the copter does not lean forward or aft when picked up by the rotor head. The battery should be moved slightly forward when you start trying forward flight.

The first thing to practice is tail rotor control. Control corrections may seem to be backwards (stick right moves tail left) but get used to it, it takes practice. (Remember: that right stick also means "nose right"). Concentrating on the tail, start reving up until the model is light on the gear. This should be on a smooth flat surface so that the tail will easily slide from left to right (without lifting off the copter). Practice moving the tail from right to left, back and forth over and over again until corrections come natural.

You will notice when reving up that the tail will drift left, but when winding down it will drift right. Practice reving up keeping the tail straight and winding down doing the same. NOTE: It helps to think your mind that you are controlling the wind off of the tail rotor (stick right wind right) which pushes the tail in the opposite direction. Take your time at practicing tail rotor control. It is hard to restrain yourself and not lift off but you are better to wait until you have run through about 3 — 4 battery charges before you try to hover.

HOVERING:

1. Check balance by lifting rotor head. The model should hang straight.
2. The model should be sitting straight on the gear, slightly leaning to the left.
3. Rev up to 1/4 throttle and check the blade track and the disk movement.
4. Rev up to 1/2 throttle and practice tail control a few times.

5. Slowly rev up to lift off, climb to 1 foot maximum and note the drift. Slowly close the throttle and land. Adjust the battery in the clip to compensate for fore/aft movement. Then adjust the right and left stick control trims two clicks at a time to compensate for any side drift. NOTE: Do not over control, but you must stay ahead of it. Anticipate your control inputs and get ready to reverse. You must reverse control movement to stop the induced direction of travel. Then move the stick back to the center before it actually stops. Once the copter is trimmed for hover, it will always drift a little. Practice lifting off and keeping it 1' to 2' high over a point. Tape out a 6' ring and if it gets out of that ring, close the throttle and land. Practice until you can stay in the 6' ring. NOTE: A gyro will help stabilize the tail yaw. Learning to hover a helicopter is the most exciting part of learning to fly a helicopter.

Now try forward flight. First adjust the battery slightly forward about 3/4" and go through pre-flight check: Blade track, disk track and tail rotor practice. Back off to the side a bit if you are right handed stand to the left or if you are left handed, stand to the right. This seems to help. Rev up and climb to about 2' or 3' into the wind (0 — 5 MPH max.). Walk along with it about 10' and pull back gently on the main blade control stick to stop forward movement and land. Practice this until you can handle the landing easily. NOTE: Adjust swash plate timing for forward flight. Now practice flying a circuit around yourself. Do your pre-flight check first. Stand to the side that suits you. Always keep the model on that side of you. As the model turns, turn with it keeping it always to your side. Rev up and take off. Climb up about 10' to 20' pushing forward stick. As the model moves forward it will start to climb, so back off the throttle a little when it does. Let the model fly out about 50 to 100 feet and slowly turn with it. As it comes back around heading in the original direction, look back over your shoulder keeping your transmitter facing in the direction as the model in order to keep your controls oriented. As the model approaches, close the throttle to prepare for the landing descent. When the model is about 20 feet from the touch down point, move the main blade control stick back to slow down to near hover. As the model slows down it will descend, so start to come in with power to cushion the landing. After you feel comfortable doing circle flights, try a figure 8 pattern. The rest is up to you! Be careful and enjoy your helicopter.

SAFETY TIPS

1. Regularly oil the rotor head and bearings.
2. Regularly check gear clearance.
3. Pre-flight, check balance and blade track.
4. Replace the blades if the leading edge is damaged. Damaged tips are OK. If too bad, trim off, rebalance, and you're ready to go.
5. Don't get too close when hovering. Those blades can really hurt!
6. If anything seems abnormal, i.e. noise, flight characteristics, vibration, land and find the problem. Something must have changed.