

INSTRUCTIONS
HUGHES 500 ELECTRIC HELICOPTER
 Manufactured Exclusively for
Hobby Lobby International
 by
Ultra Efficient Products, Inc.

We think that Hughes 500 Electric is an outstanding RC helicopter. Hughes 500 Electric is particularly good for teaching a helicopter newcomer how to fly.

IMPORTANT: DON'T RUSH! Take your time and assembly will go easy and flying will be a joy. When assembling parts, check for proper fit and alignment. Do not force assemblies. Clean mold flashing or burrs to make assembly go smoothly. These instructions are long to give you as much information as possible to help you avoid problems.

RADIO:
 Any small 4 channel with 3 micro servos and a speed controller. We have used the Attack 4 by Futaba with 3 micro servos and built-in speed controller, and it worked good.

GYRO:
 A gyro will help dampen tail swing, but it is not a necessity.

MOTORS:
 We recommend the Speed 600 BB 8.4 to 9.6 volt motor (GR3316), or any 70 to 100 watt (output) motor.

BATTERIES:
 Any 8.4 to 9.6 volt 1700 mah SCK pack. (Note: 8.4 volts is adequate. 9.6 volts will give fantastic performance if your speed control can handle 9.6 volts.)

CHARGERS:
 Any brand 8.4 — 9.6 volt fast-type charger.

GLUE:
 5-minute type epoxy and cyanoacrylate (CA) thin & medium viscosity.

PAINT:
 Krylon or any epoxy or enamel base. Spray is recommended.

TOOLS:
 Modeling knife with 1/2" wide flat blade and sharp point blade. Drill bits: 1/16", 5/64", 3/32", 7/64", 1/8". Soldering iron pencil type; small screwdrivers (standard and Phillips); ruler, regular & needle nose pliers, two small files (one flat & one round 1/4" diameter).

6. Cover all blades (NL501, NL502, and NL601) with one piece of covering film, wrapped. Start under the trailing edge and wrap over the top, around the leading edge, and back along the bottom to the trailing edge. Cut the film of clean at the trailing edge. (See figure #1 and photo #6). (Note: The wood dowels (NL102), dowel caps (NL103), and screws will be installed in the control assembly, section #700.

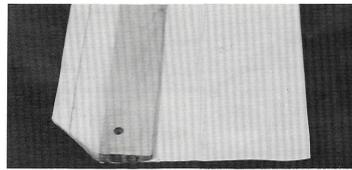
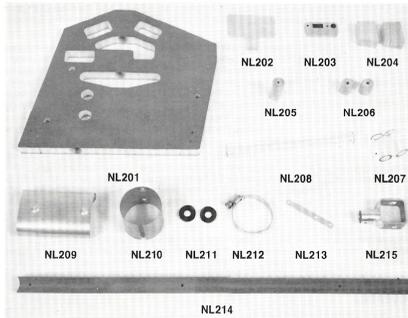


Photo #6



FIGURE 1



Parts Group #200

CHASSIS/TAIL BOOM ASSEMBLY—PARTS GROUP #200
 (Note: Use 5 minute epoxy on all chassis gluings)

1. Using a 1/2" wide, straight edge knife blade, remove foam in the chassis (NL201) from wood blocks (NL204). (See photo #7). Test fit the wood blocks and remove any excess foam to achieve a good fit. Glue in the wood blocks, then drill out holes using a 7/64" drill bit.

2. Carefully, using medium CA, glue the flange together between tapes. Start at the back end of the battery/landing gear cut out area. Go forward to the nose, up over the cockpit, and back down along the top of the tail boom to the back of the tail boom. Leave the under side of the tail boom open to the back of the battery/landing gear cut out. Use small tabs of tape to hold this area at all times, to ease body attach/removal.

3. Paint the body as you wish. (Windows glass black).



Photo #7

1. Glue the 1" long wood dowel (NL205) in flush with the bottom of the chassis, leaving the hole exposed for the battery mount screw.
 2. Test the 9/16" long wood dowels (NL208) through the chassis. Sand the sides to achieve a flush fit, then glue.
 3. Insert the bottom main bearing tube (NL207) through the top of the chassis and push it down with the other bearing tube. Glue it in flush with the top of the lower gear cutout.
 4. Glue in the top main bearing tube (NL207) flush with the top of the chassis.
 5. Glue in the tail bearing tube (NL208), front end flush with the gear cutout.
 6. Using the #6 x 3/4 flathead screws (NL903), mount the rear of the battery clip (NL209), then align the front hole over the wood block. Then drill a pilot hole for the forward screw with a 3/32" drill bit (See photo #8). Then remove the rear screw. Using a sharp knife blade or a 3/8" drill bit, carefully countersink the excess wood around the holes to allow the battery clip to sit flush with the chassis bottom, then re-insert screws.



Photo #8

8. Loosely attach the screw clamp (NL212) to the motor clip (NL210) with the screw head facing rear. Insert the 6-32 flathead screws (NL915) through the motor clip. Add nylon saddles (NL211) and mount through the wood dowels in the chassis. Attach the flat washers (NL917) and the 6-32 lock nuts (NL916) and tighten. (See photo #9).



Photo #9

10. Prepare the tail boom (NL214) using the 6-32 x 1" screw (NL914) as a tap. Using a Phillips screwdriver, turn the tapping screw through the two holes near the center of the tail boom to tap out holes.
 11. Prepare the nylon cap screws (NL911) by drilling a 1/16" hole through the head of each. Then cut out the threaded end of two of these screws to leave 1/8" of thread remaining. Install these two screws in the tapped holes in the tail boom, aligning the 1/16" holes for the tail control push rod. The remaining nylon screw will be used in step #12 of section #400.
 12. Check the fit of the tail gear housing (NL215) to the tail boom. If too tight, sand out the tail boom with sand paper. Align holes and use the #4 x 1/4" A-point screw (NL901) to cut threads into the tail housing, then remove screw/housing. (Note: The switch mount and the receiver mount (on plywood) die-cast housing (NL202) and the extra #4 x 1/4" A-point pan head screw (NL901) will be mounted during the control installation (Section #700). The tail boom (NL214), tail gear housing (NL215), and the two #4 x 1/4" B-point pan head screws (NL902) will be mounted during the power transmission installation. (Section #400).

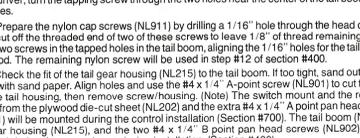
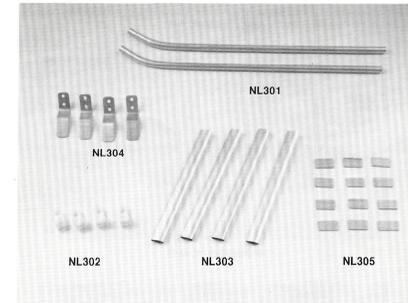


Photo #10



Parts Group #300

LANDING GEAR ASSEMBLY — PARTS GROUP #300

1. Prepare all four strut brackets (NL304) by scuffing their surface (on end without holes, both sides). Then, with thin CA, glue a balsa pad from the balsa die-cut sheet (NL104) to each side. (See photo #10)

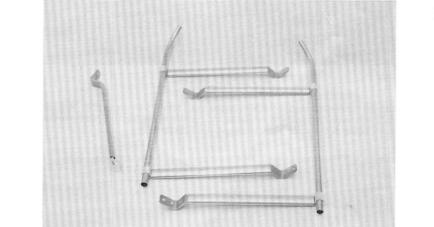
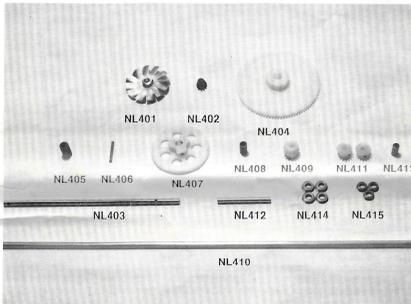


Photo #10

2. Prepare the skid struts (NL302) by sanding between the nylon legs. Then sandwich in a balsa pad (from balsa die cut sheet), and insert them into the bottom of each strut tube (NL303). Note the swivel and the airfoil shape. 2 rights and 2 lefts. (See photo #10)
 3. Install the strut brackets to the top of the strut tubes. Again, note right and left.
 4. Slide the strut tubes onto the skid tubes (NL301) noting the direction and the angle of the skid tube ends to mounting face of the strut brackets. Adjust the spacing of the struts to match the distance between the mount holes in the chassis. (See photo #10). (Note: To secure all joints, soak in thin CA.)
 5. Mount the landing gear to the chassis using the 4-40 x 1 pan head screws (NL909) and the 4-40 lock nuts (NL910).



Parts Group #400

POWER TRANSMISSION SYSTEM — PARTS GROUP #400

1. Prepare the gears needing bushings and holes.
 (A) Pinion gear: (See photo #11)

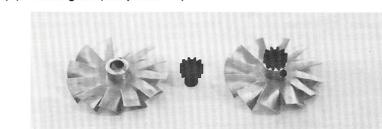


Photo #11

Remove the set screw from the fan hub (NL401). Install the pinion gear (NL402) and drill through the set screw hole with a 1/16" drill bit and into the gear. Then remove the gear and enlarge the hole with a 7/64" drill bit. Now the gear is ready to be installed in the fan hub. Re-insert the set screw. The pinion gear is now ready to be mounted to the motor shaft.

(B) Spur gear and bushing: (See photo #12)

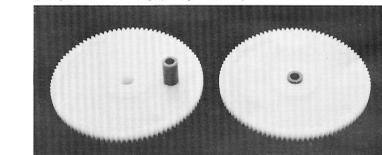


Photo #12

Prepare the spur gear bushing (NL405) by chamfering around the top edge so that it will ride on the inner bearing race. Then install the bushing into the spur gear (NL404) so that the bushing extends above the gear about 1/32". Glue in using thin CA. Then drill through the hole in the gear through the bushing on each side using a 3/32" drill bit. The spur gear is now ready to be installed on the main shaft.

(C) Large bevel gear and bushing: (See photo #13)

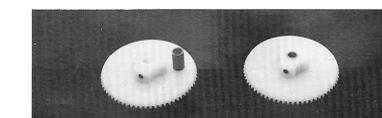


Photo #13

Remove the set screws from the large bevel gear (NL407) and install the bushing (NL408), centered in the gear. Drill through all three set screw holes and into the bushing with a 1/16" drill bit. Remove the bushing and enlarge the holes in the bushing with a 7/64" drill bit. Align the bushing back into the gear and carefully glue it in with thin CA. Let the glue dry, then install the set screws. The large bevel gear is now ready to install.
 2. Install all four of the 3/8" diameter ball bearings (NL414). 1 top, 1 bottom, 1 each end of tail tube. The bearings should not be too tight or too loose. If loose, paint bearing tube inside wall with thin CA. If tight, carefully sand out with sand paper on a wood dowel. (Note: lightly oil all bearings.)

3. Install the main shaft (NL403), with the 3/32" hole at the bottom, through top bearing. Hold the large bevel gear (NL407) in place, teeth down, and slide the shaft through to the bottom bearing. Then, hold the spur gear (NL404) in place and slide the shaft through. Align the 3/32" hole in the gear and shaft and install the roll pin (NL406). (See photo #14).

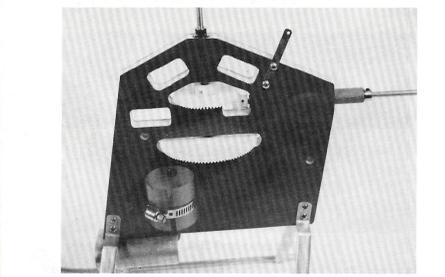


Photo #14

4. Next, chamfer the bottom edge of the 3/16" shaft collar (NL922), so when installed on the main shaft, it will ride on the inner bearing race of the top bearing. Install the collar and lock with the set screw. Do not over tighten. There should be some up and down play. When spun by hand, the shaft should coast about 10 seconds.

5. Install the tail drive shaft (NL410) through the tail bearing tube. Hold the small bevel gear (NL409) in place and slide the shaft through into the gear. The shaft should extend past the gear about 1/8". Lock with set screws. Do not over tighten. (See photo #14).

6. Chamfer one side of the other 3/16" shaft collar (NL922), and slide it onto the back of the drive shaft, up to the back of the rear bearing. There should be about 1/32" end play. (See photo #14).

7. Now, lower the large bevel gear to the small bevel gear and adjust so that the gears mesh properly. There should be some movement at all points of rotation. (See photo #14). Lock with set screws. Do not over tighten.

8. Slide the tail boom onto the tail bearing tube. Align the nylon cap screw push rod guides on the right side. The fit should be snug. Sand if too tight or paint bearing tube with CA if loose.

9. Clean the flashing around the holes in the tail gear housing (NL215) and install the three 5/16" tail bearings (NL415) from the inside.

10. Install the tail rotor shaft (NL412) into the gear housing through bearing, shaft spacer (NL413), miter gear (NL411), gear spacer (NL416), and through the other bearing. Adjust by filing or sanding the shaft spacer to have some end play, approximately 1/64". Adjust the shaft so that the right side is flush with the end of the right bearing. Lock the miter gear with the set screw. Do not over tighten. (See photo #15).

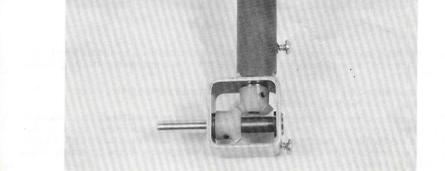


Photo #15

11. Hold the other miter gear (NL411) in the tail gear housing, meshed with other gear and slide the gear housing onto the shaft and the tail boom. (See photo #15). Take your time. Align the hole in the tail boom and gear housing and install the #4 x 1/4 B-point screws (NL902) through the tail fin, tail tube, and into the gear housing.

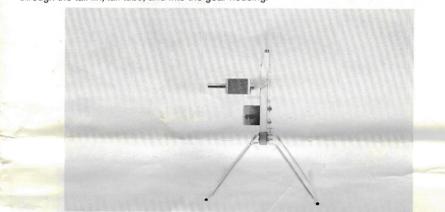


Photo #16

12. Now, align the tail assembly vertically with main shaft. (See photo #16). Carefully drill through the front hole in the tail boom and into the tail bearing tube, using a 7/32" drill bit. Let the bit do the work. Do not push so hard as to break through and damage the drive shaft. Take your time. (Use a stop collar on the bit 3/16" from tip.) Tap out the hole with the 6-32 x 1" screw (NL914) as you did last step of section #200. (Chassis/Tailboom). Now install the other miter gear (NL411) left over from section #200, about 1/8" into the tail boom. Align the push rod hole with the other push rod side holes. This will hold the tail boom in place. (See photo #16-A).

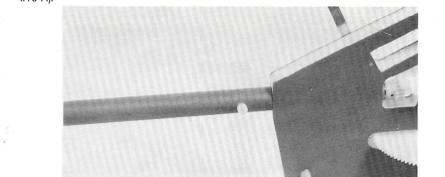


Photo #16A

13. Adjust the end play to about 1/64" on the tail drive shaft and lock the rear miter gear set screws. Do not over tighten. The gears should run freely about 3 — 4 seconds when the main shaft is spun by hand.

14. Remove the rear screw that is holding in the battery clip and adjust the clip to the right so that the motor can be installed from the bottom, up into the motor clip. Hold the fan and the pinion gear assembly, meshed with the spur gear, and slide the motor shaft up into the pinion gear so that the shaft is approximately 1/8" past the set screw. Then tighten the fan hub set screw. NOTE: It is important to break in the motor. Do this by determining which direction the motor will rotate in its use on the helicopter. Make a break-in battery pack of 4 "D" size dry cells connected in series. There should be nothing connected to the motor's output shaft during break-in. Connect this break-in pack to the motor and run the motor in the direction that it will rotate in the helicopter. If the motor gets too hot "too hot" means that it would burn your fingers if you held it during break-in, disconnect the battery pack until the motor cools down and then restart it. Let the motor run until the battery pack goes dead. The motor is now well broken in and will give you 30% more power than if you didn't break it in.

15. Adjust the motor so that the pinion gear engages the spur gear, keeping the top of the pinion gear approximately 1/32" below the top of the spur gear. Tighten the screw clamp (NL212) to hold the motor in place. (See photo #17).

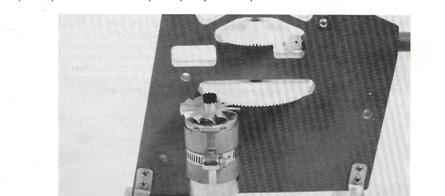
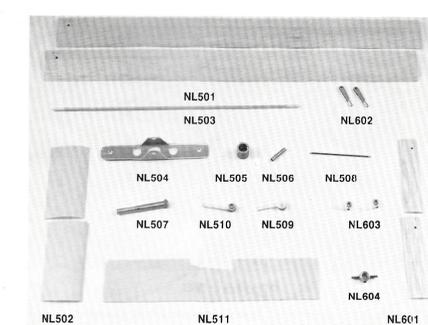


Photo #17

NOTE: Gear clearance should allow some movement between the pinion and spur gear. This movement should be minimal. If too tight, add heavy paper washers between the nylon saddles and the chassis to adjust. If too loose, sand the flat side of the nylon saddles and reassemble. If still too loose, disassemble and plug holes in the dowels with 1/8" dowels. Glue with thin CA. When dry, redrill with a 1/8" drill bit approximately 1/16" to the rear of the previous holes and reassemble.

16. Once proper clearance has been achieved, place a drop of thin CA under the nylon saddles where the nylon saddles meet the chassis. Glue both of the saddles to lock the motor clip alignment. Be careful to control the glue.
 NOTE: The power drive train is now ready to break in. This will be done after your radio has been installed and with charged battery packs. Turn on your radio and run up the drive train to about 1/4 throttle and let run for about 1/2 hour. Very lightly oil all the gears and oil the shafts at the bearings. Check gear clearance and run again about 15 minutes at 1/2 throttle. The power train is now broken in.



Parts Group #500

Parts Group #600

MAIN ROTOR ASSEMBLY — PARTS GROUP #500

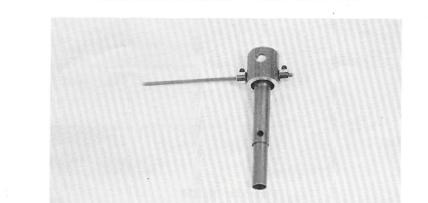


Photo #18

1. Holding the rotor hub (NL505) with the 1/16" holes at the bottom, slide the rotor shaft (NL507) up inside. Aligning the 1/16" holes, slide the rotor stabilizer pin (NL508) through both. (See photo #18). NOTE: The rotor shaft will not fit inside the hub, carefully sand both ends until it fits. Take your time, as you do not want a loose fit here.

2. After the pin has been installed, attach the 1/16" shaft collars (NL920) and align so one end of the pin is past one collar about 1/16". Lock on collars with set screws. (See photo #18).

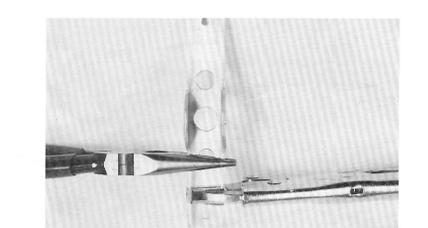


Photo #19

3. Set the pitch in the rotor head by twisting as shown (See photo #19) to approximately 7° on both sides. Then slide the rotor head (NL504) onto the rotor shaft from the bottom and align the holes for the brass bushing tube (NL506). Install the brass bushing into one side of the rotor head and hold one nylon washer between the rotor head and the rotor hub and slide the brass bushing through the rotor hub. Then hold the other nylon washer in place as the first, and push the brass bushing in place. File the brass bushing flush with the rotor head sides. NOTE: Adjust the fit between the rotor head and the rotor hub by bending the vertical ears on the rotor head to eliminate excess play, yet maintain free movement. (See photo #20).

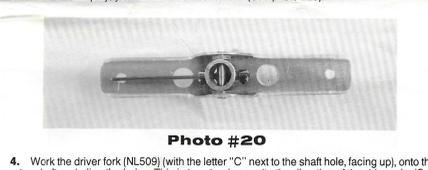


Photo #20

4. Work the driver fork (NL609) (with the letter "C" next to the shaft hole, facing up), onto the rotor shaft and align the holes. This is to extend opposite the direction of the driver pin. (See photo #21).



Photo #21

5. Slide the fly bar rod (NL503) through the brass bushing and center it. With the driver pin pointing away from you, slide the 1/8" shaft collar (NL921) on the right side, and the control arm (NL510) pointing toward you, on the left side, set screw up. Tighten the set screws to lock in place. Hold the fly bar rod with pliers and thread on Fly bar blades (NL502) to cover threads. Both should be an equal distance from the center. Adjust the fly blades to level with the control arm horizontal over the driver fork side. (See photo #22). At this time, install the blade attach hardware to rotor head (NL504) so that you do not displace these parts: (2), 1/8 x 9/16" flat metal washers (NL917).

NOTE: The rotor head assembly will be installed in Section #700. The main rotor blades (NL501) will be mounted after the control adjustments have been done.



Photo #22

TAIL ROTOR ASSEMBLY — PARTS GROUP #600

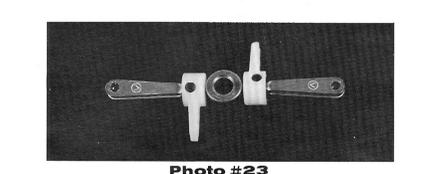
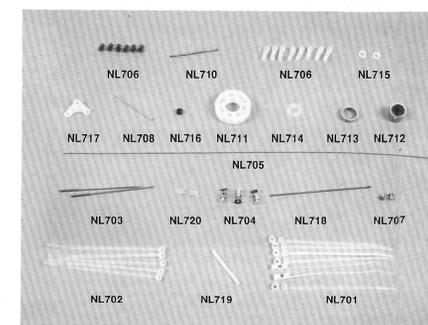


Photo #23

1. Install the blade holders (NL602) into the control arms (NL604) and into the exposed shaft collar side of the control arms. Lightly tighten the set screws. NOTE: These will be adjusted in the control assembly. (SECTION #700).
 2. Thread the blade holder and the control arm assembly onto the tail rotor hub (NL603). (See photo #23). At this time, install the blade attach hardware to blade holders (NL602) so that you do not displace these parts: (2), 2-56 x 3/8" cap screws (NL919), and (2), 2-56 lock nuts (NL907). NOTE: The tail rotor blades (NL601) will be mounted after the control adjustments have been made.



Parts Group #700

CONTROL SYSTEM ASSEMBLY — PARTS GROUP #700

NOTE: Use 5 minute epoxy for steps 1 & 2



Photo #24

1. Glue in the receiver mount plate and the switch mount plate from the plywood die-cut sheet using 5 minute epoxy. (See photo #24).

2. Install and glue the wood dowels (NL102). Cut upper front to 6-1/16". Cut lower front to 5-7/8". Cut rear to 5-3/16". Glue on the end caps (NL103). Then drill 3/32" pilot screw holes in the dowel ends. (See photo #24).

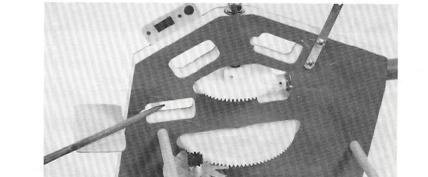


Photo #25

3. Using a round file, open up the servo cut-outs for the servo lead wires. (Always file into the holes to keep from chipping out the plastic.) (See photos #25 & #26).

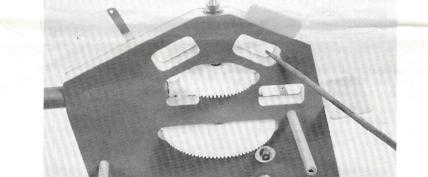


Photo #26

4. Center and mount the receiver with double sided foam tape to mount plate, not touching the chassis. (See photo #28). If your speed control is not built in with your receiver, mount it to any available area on the chassis.

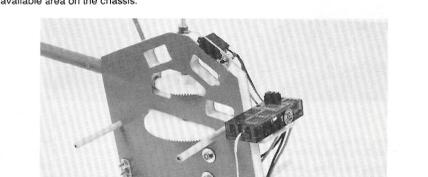


Photo #28

5. Install the on/off switch and servo button. (See photo #28).

6. Insert the servos into the start cut-outs on the chassis blank. (See photos #30 & #31). Using a 3/32" drill bit, drill pilot holes (for mounting screws) into the chassis, using the servo mounts as a guide for the drill bit.



Photo #29

7. Modify the file mounted tie wraps (NL701) by cutting the excess material off of the extended side of the hole mounting area. (See photo #31). Do this to four tie wraps. Two are used at the fore aft cyclic control servo, (See photo #29) and two will be used at the rear chassis location and the rear tail mount screw for the antenna guide. (See photo #30 & #32).

8. Mount two of the modified hole mount tie wraps to the right/left cyclic control servo lead wires as shown. Mount under the screws for the fore/aft control servo. (See photo #29).

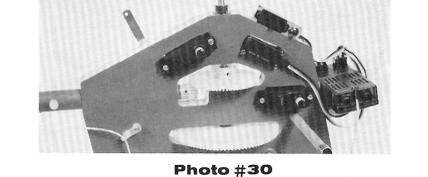


Photo #30

9. Install screws into the right/left cyclic control servo and into the tail pitch control servo. (See photo #30).