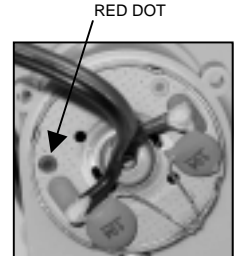


GWS 370 Gear-drive Hop-up

Most small electric motors are designed to rotate **Counter-ClockWise** (facing Pinion gear end). The brushes are positioned so that they encounter the least resistance when the armature is spinning **Counter-ClockWise** and motors are typically timed to be more powerful and efficient in that direction as well. Using a two gear drive causes the propeller shaft to rotate opposite of the motor shaft, which is the wrong direction for the prop. Therefore the factory motor connections must be wired in reverse so the resulting propeller shaft rotation is correct.

The GWS motor and drive assembly comes with the negative lead connected to the side of the end bell with the small red dot (positive terminal), causing the motor to run backwards from the direction originally intended. This causes rapid brush wear and improper timing, resulting in noticeably less thrust and reduced motor life. As seen in the chart below, this set up can be improved greatly with a simple modification which will allow the motor to turn in its natural **CCW** direction.



MOTOR ROTATION	RPM	AMP DRAW	PROPELLER
CW as shipped	5400-5700	Hot Fresh pack= 6+Amps 1 st 30sec / 5+Amps after	GWS 8X6
CCW after hop-up	6500-6900	Hot Fresh Pack=7+Amps 1 st 30sec / 6+Amps after	GWS 8X6

(THESE ARE APPROXIMATE FIGURES BASED ON THE "B" RATIO OF 4.43:1 AND AN 8 CELL PACK WITH 700MA AAA NIMH BATTERIES)

The following is a guide to modify the gearbox to maximize its potential. You will see noticeable improvements in thrust, speed and motor life.

TOOLS AND MATERIALS NEEDED:

Pliers

Dremel with cutoff disc (or similar tool)

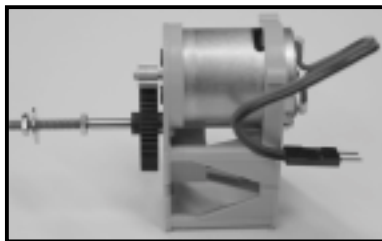
File or small grinder

3/16" x 1/2" long (medium) aluminum rivet or metal tubing to fit shaft

CA or epoxy

stiff wire for pinning gear

BEFORE HOP-UP



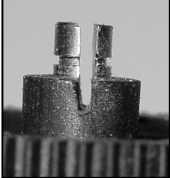



AFTER HOP-UP



The motor remains mounted in its original factory location for this modification.

- 1) Remove prop nuts and washers from drive shaft
- 2) Remove c-clip and washer from rear of shaft.
- 3) Carefully remove drive shaft from gear box (don't lose the bearings).
- 4) Cut off extra portion of plastic gearbox as shown in picture above being careful not to cut into the bearing housings.
- 5) Carefully remove gear from splined area of shaft. You might have to use a length of tubing that will fit over the shaft and gently tap the gear off the spline.
- 6) Carefully grind or file down the splines in the shaft where the gear was located until you can easily slide one of the bearings over the splined area. Remove minimum material to accomplish this step.



- 7) Locate the end of the shaft that has the groove for the c-clip (opposite end from the threads). Install the gear (flange side towards c-clip groove) onto the drive shaft. Position gear one washer thickness from c-clip groove. You can drill a hole through the gear and the shaft, or slot the end of the shaft and the flange of the gear using a Dremel cutoff wheel. Using a small piece of stiff wire to pin the gear and shaft, reassemble the washer and c-clip and glue this all together with CA or epoxy.

- 8) Install the bearings back into their holes and insert the drive shaft back through the gearbox so that the motor pinion gear and secondary gear mesh. Gears should line up and spin freely like the original configuration.

- 9) Remove the mandrel (shaft) from the rivet saving the rivet (hollow body). Slide the rivet onto the threaded end of the drive (flange towards the prop). You may also use a piece of metal tubing that just fits over the shaft. The rivet or tube is used as a spacer to control slack in the shaft assembly. Install 1 nut and run it down the shaft to the last thread. Holding gear, tighten nut against last thread. If this causes the shaft to bind at all, check to see if the gear is flush with the washer and c-clip and that there is no space between the gear and the bearing. If these parts are flush and tight, shorten the rivet or tubing a little at a time until the assembly has a slight amount of longitudinal movement (Approximately .005" to .015").

- 10) Next add the prop, washer and finally the last nut. Check again that there is no binding and the assembly rotates freely.
- 11) The final step is to switch the polarity of the motor. This can be done at the connector between the motor and the ESC or you can reverse the wires on the motor.

Gearbox modification is now complete and should look like this. Have fun.

