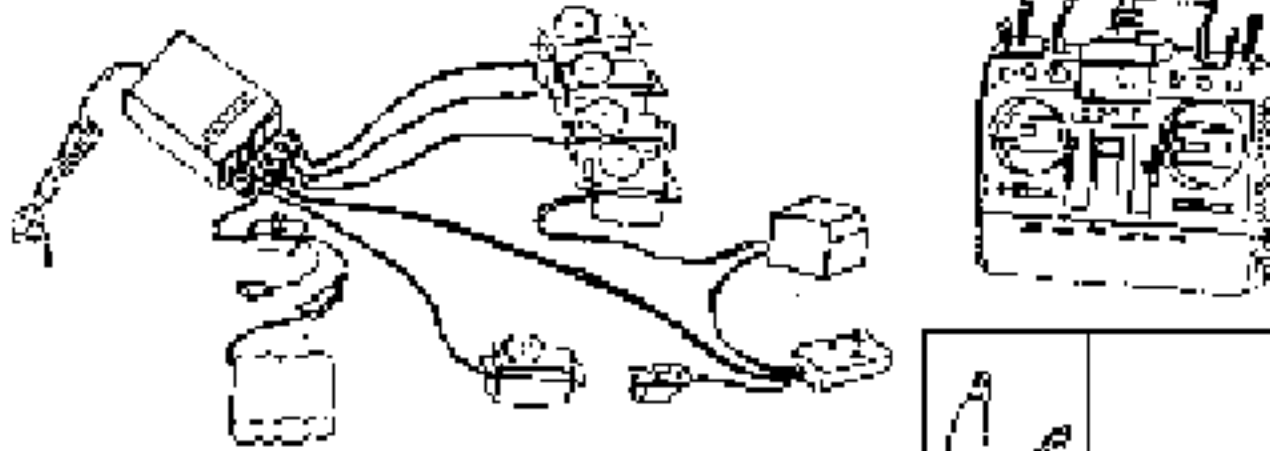


NECESSARY ITEM 'NOT INCLUDED IN THE KIT

5 CHANNEL RADIO SET & GYRO



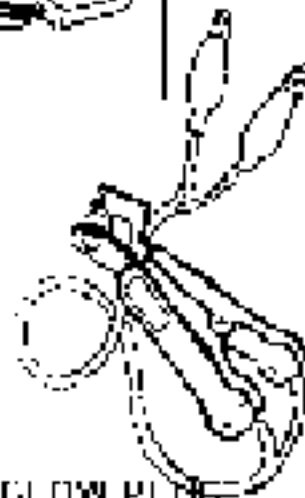
12 VOLT STARTER



12 VOLT BATTERY



GLOW PLUG CONNECTOR



GLOW PLUG BATTERY



2 FUEL PUMP, FILTER & FUEL LINE



15 30% HELI FUEL



#3033 BLACK TORPEDO MULTIPLIER



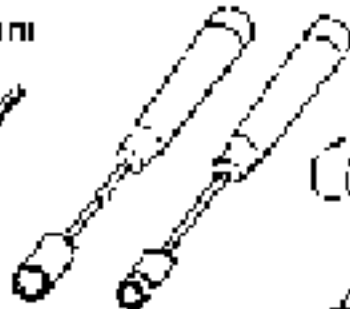
32-46 HELICOPTER ENGINE

NECESSARY TOOLS FOR ASSEMBLY AND ADJUSTMENT

3.0/2.5/2.0/1.5mm ALLEN KEY



4mm/3mm NUT DRIVER



#2031 4 WAY WRENCH



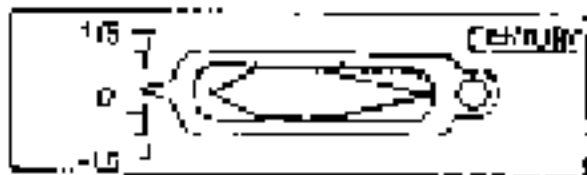
2.5mm/2.0mm/1.5mm ALLEN DRIVER



POINT NOSE PLIER



CUTTER PLIER



**#2026A 15 DEGREE PITCH GAUGE
#2026 B.B PITCH GAUGE**



#2033 BALL LINK REMOVE PLIER



LOCTITE



LUBRICATION



JB WELD EPOXY



CANOPY GLUE



HOBBY KNIFE



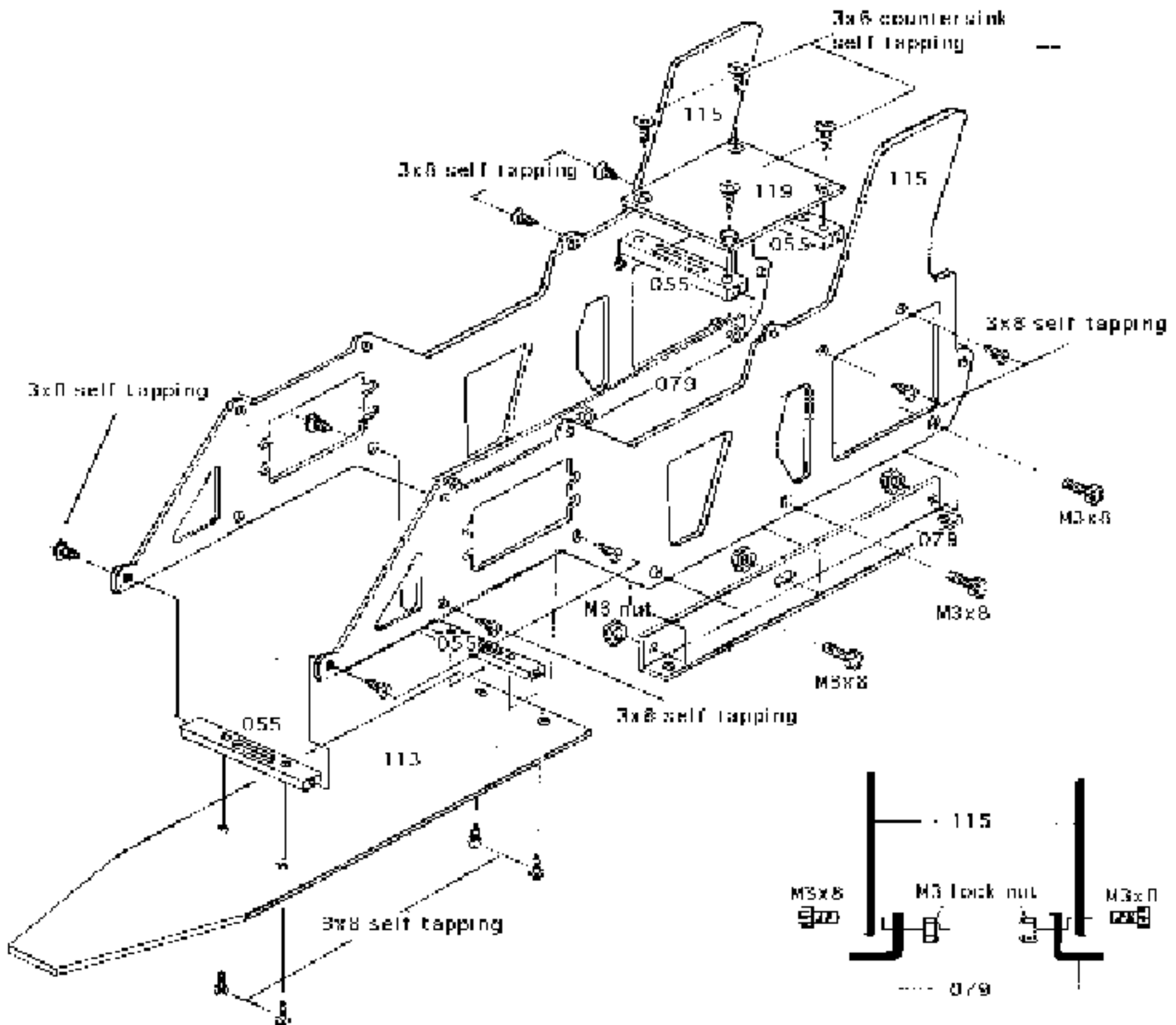
HOBBY SCISSOR



HOBBY PAINT

Step 1 Lower side Frame Assembly

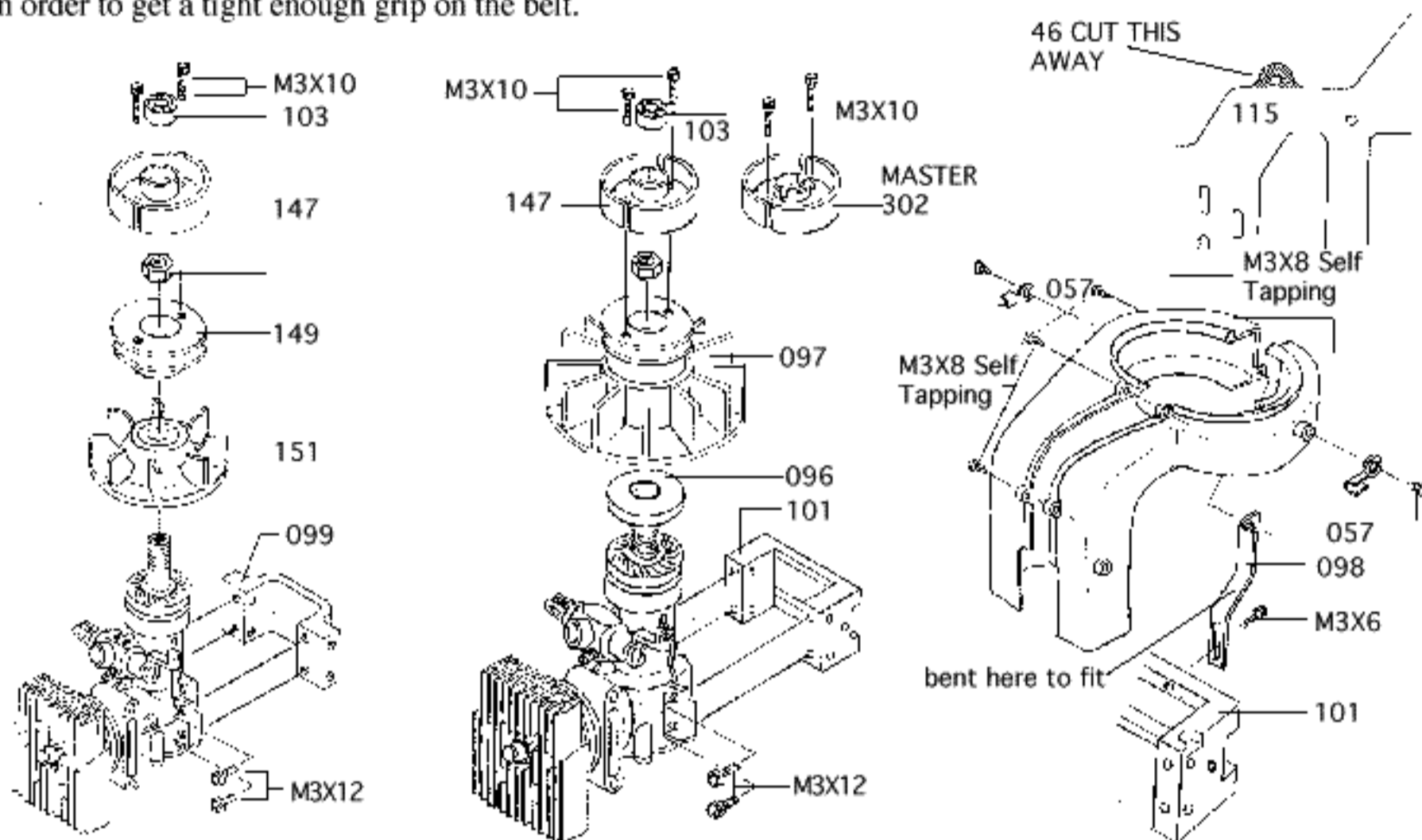
1. Attach the 90 degree aluminum angle support (2002-079 Bag #1) to the "inside" of the lower side frame. See drawing below. Do this for the left and the right side. Each bracket is held on with three M3x8 cap head bolts and Locknuts.
2. Attach two plastic battery tray mounts (2002-055 Bag #4) between the two lower side frames using four M3x8 self-tapping screws. Install the battery tray plate (2002-113 Bag #1) using four M3x8 self-tapping screws. Please note that there has been a change in the servo tray length. The mounts must be located at the very front and rear of the available locations. Double check to make sure that the hole provided for the front cannot mount is on the proper side of the battery tray.
3. Attach the two gyro plate cross members (2002-055) between the side frames using four M3x8 self-tapping screws. Add gyro plate (2002-119 Bag #1) on top of the cross members with four M3x6 countersink screws. An optional gyro location would be on the battery tray. This should only be considered if a center of gravity change is deemed necessary.



Step 2 Engine/Clutch Assembly

Slide the cooling fan (2002-115 Bag #1 for 30-size and 2002-097 Bag #2 for 46-size) onto the engine crankshaft. Then slide the starter pulley (2002-149 Bag #4) on top of the fan. Add the engine nut and tighten it, but do not use any Loctite. Install the centrifugal clutch (2002-147 Bag #4) to the pulley with two M3x10 bolts. Put the ball bearing (2002-103 Bag #4) in the center of the clutch.

For 30-size engine: Install the engine to the engine mount (2002-099 bag #2) using four M3x12 bolts. Take the engine assembly and slide it into the side frames from the top side. Use four M3x10 bolts and four washers to secure the engine mount to the side frames. Do not tighten the four bolts completely. The position will be adjusted later. Drop the fan shroud over the fan and between the lower frames. Use two M3x8 Philip head self-tapping screws to secure the starter belt retaining clips (2002-057 bag #8) and the fan shroud to the side frames. The front end of the fan shroud is secured by a M3x8 Philip head screw on each side of the frames. Now, hang the engine starting belt (2002-109 Bag #4) around the fan shroud and secure in the starter belt retaining clips. It may be necessary to slightly squeeze the clips in order to get a tight enough grip on the belt.

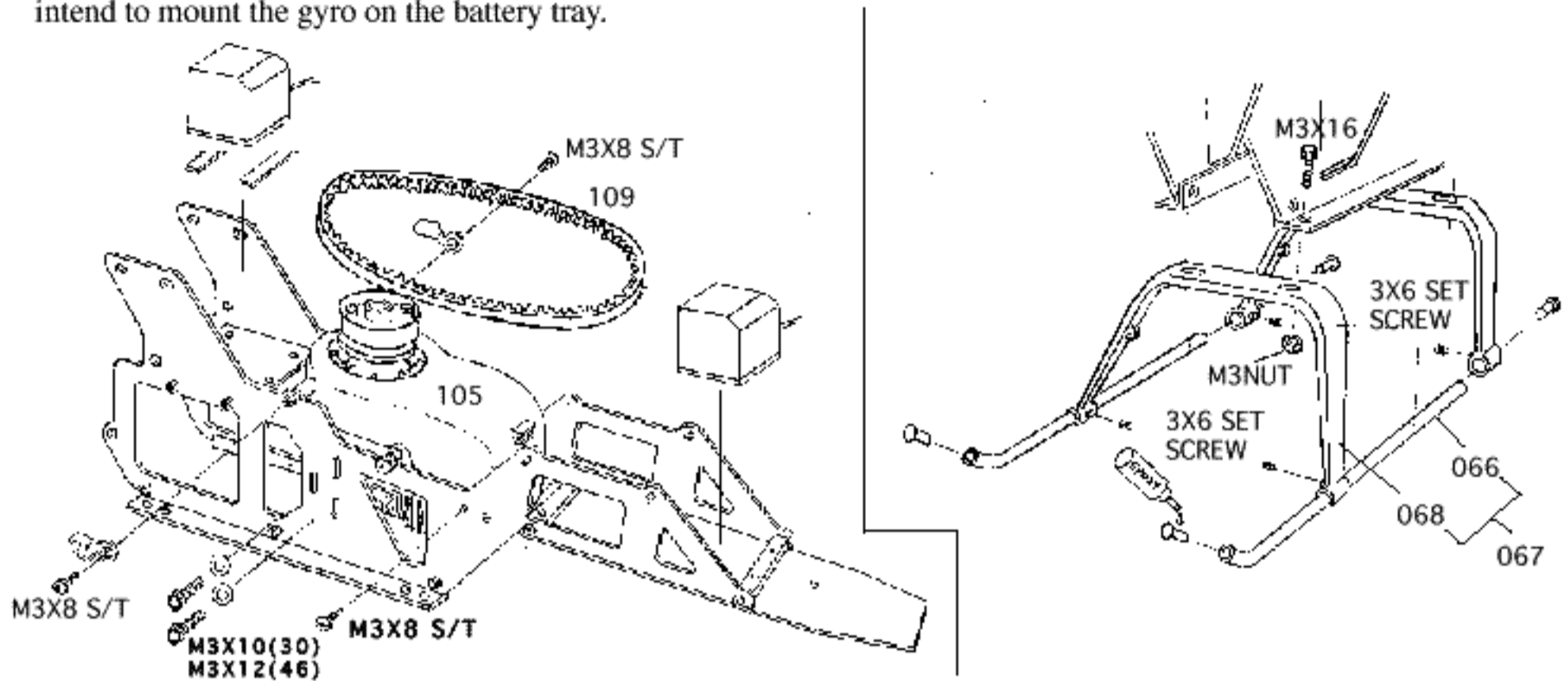


For 46-size engine: Install the engine to the engine mount (2002-101 Bag #2) using four M3x12 bolts. Take the engine assembly and slide it into the side frames from the top side. Use six M3x12 bolts and six washers to secure the engine mount to the side frames. Do not tighten the four bolts completely. The position will be adjusted later. The fan shroud for the 46-size engine is different from the 30-size. The 46-size shroud (2002-107 bag #2) comes in two pieces. Screw the two pieces together using two M3x8 Philip self-tapping screws. Add the fan bracket (2002-098 Bag #2) between the rear of the fan shroud and the engine mount and adjust the fan to proper height. The bottom of the fan should be flush with the bottom of the shroud. Add the two starting belt retainer clips (2002-057 Bag #8) on the fan shroud using two M3x8 Phillips screws and two washers. Now hang the engine starting belt (2002-109 Bag #4) around the fan shroud and secure the belt in the clips.

The **Pro Master** has the addition of a top start system. This system is assembled and installed as a complete unit.! Do not use any ABC engine for shaft start system. Start by sanding the inside of the clutch bell (2002-303 BAG #4M) with 220 grit sandpaper to aid the bond when installing the clutch lining. Thoroughly clean with solvent. Trim the liner so it fits snugly in the bell. Remove and reinstall using JB weld epoxy or slow CA to hold the liner in place. Press the 4x9x4 ball bearing (2002-103 BAG #4M) into the inside of the clutch bell. Lightly grease the start shaft (2002-306 BAG #4M) and insert into the clutch bell from the bottom. Take the double bearing block (2002-307 BAG #4M) and slip over the pinion shaft. It is advisable to use a little Loctite on the pinion shaft where it makes contact with the ball bearing. Clean off the end of the start shaft and slide the one way start adapter (2002-304 Bag #4M) in place. Install the set-screws that hold the adapter in place. Take note that one of the set-screws must seat on the flat on the start shaft and Loctite must be used.

Step 3 Installing the Rate Gyro

Use two layers of 1/8 inch thick double-sided foam tape to install the electronic rate gyro to the gyro mounting plate. The double sided tape can be found at your local hobby shop or at hardware stores. Use the same procedure if you intend to mount the gyro on the battery tray.



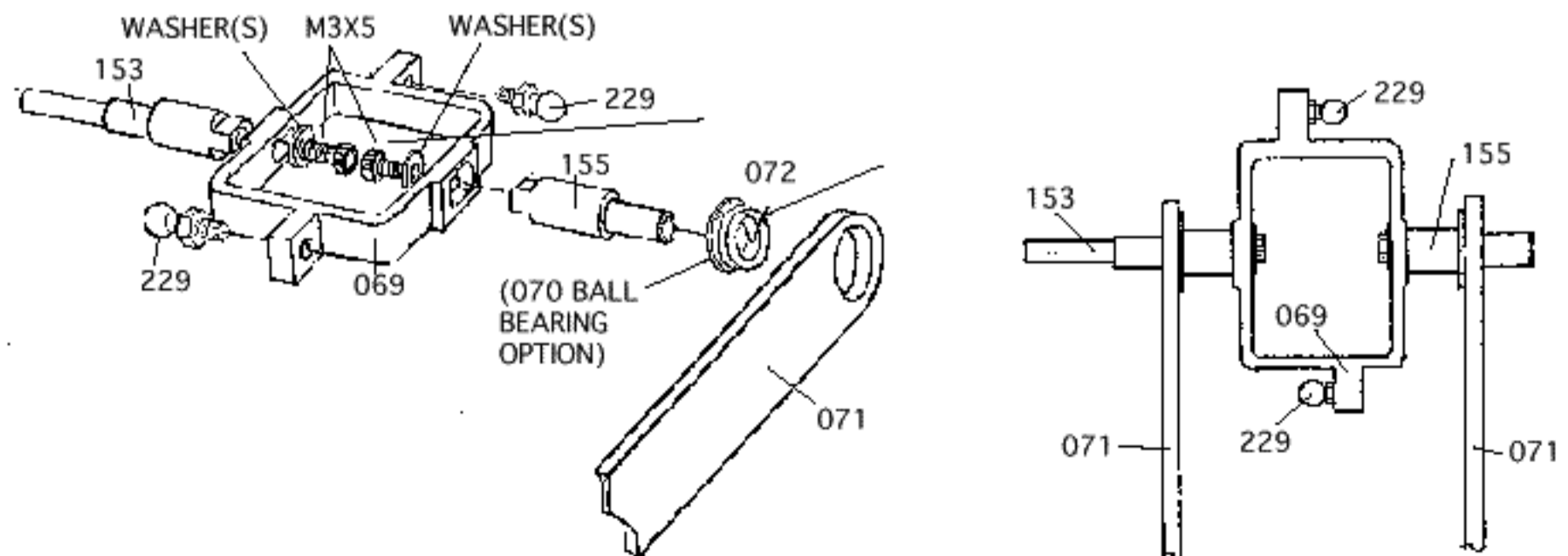
Step 4 Landing Gear

Attach the two landing gear struts (2002-067 Bag #1) onto the lower frames using four M3x16 bolts 3mm Lock-nuts and washers. Slide the landing skids into the landing gear struts. Install four M3x6 set screws to the struts to prevent the skids from moving. It is advisable to pre-thread the struts by running a M3x8 screw into them before installing the skids.

Step 5 Collective and Cyclic Control

Now put the lower side frame assembly aside. We will start on the upper side frame assembly now.

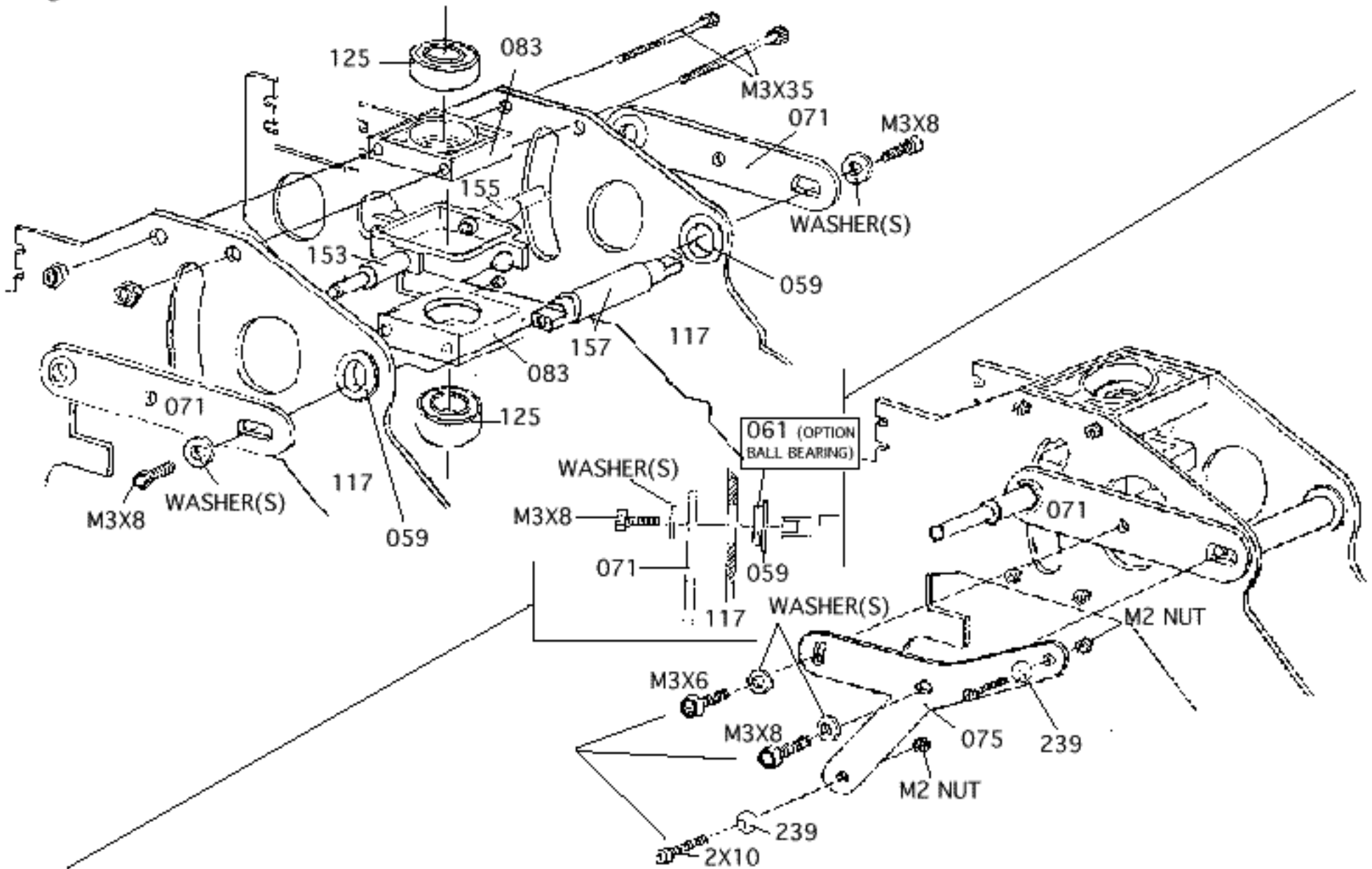
Fit the elevator axle (2002-153 and 2002-155 Bag #3) to the elevator lever (2002-069 Bag #3). Use a M3x5 bolt and a small washer to hold each axle; use a drop of Loctite on the M3x5 bolt. Use two steel ball end (2002-229 Bag #3) and loctite to hold the steel balls in place. Install a plastic bushing (2002-072 Bag #3) onto each of the two collective pitch levers (2002-071 Bag #3). The 2002-072 bushings can be replaced by optional ball bearings 2002-070. The plastic bushing flange must rest against the face of the pitch lever. If not, it will be necessary to slightly bevel the edge of the hole in the lever. Please note that all the plastic bushings should rotate freely on their mating shafts. If not than the bushings should be reamed out slightly until they do. This can easily be done by rolling some 400 grit wet or dry sandpaper and working it in and then out of the bushing until the proper fit is achieved.



Step 6 Upper Main Frames Assembly

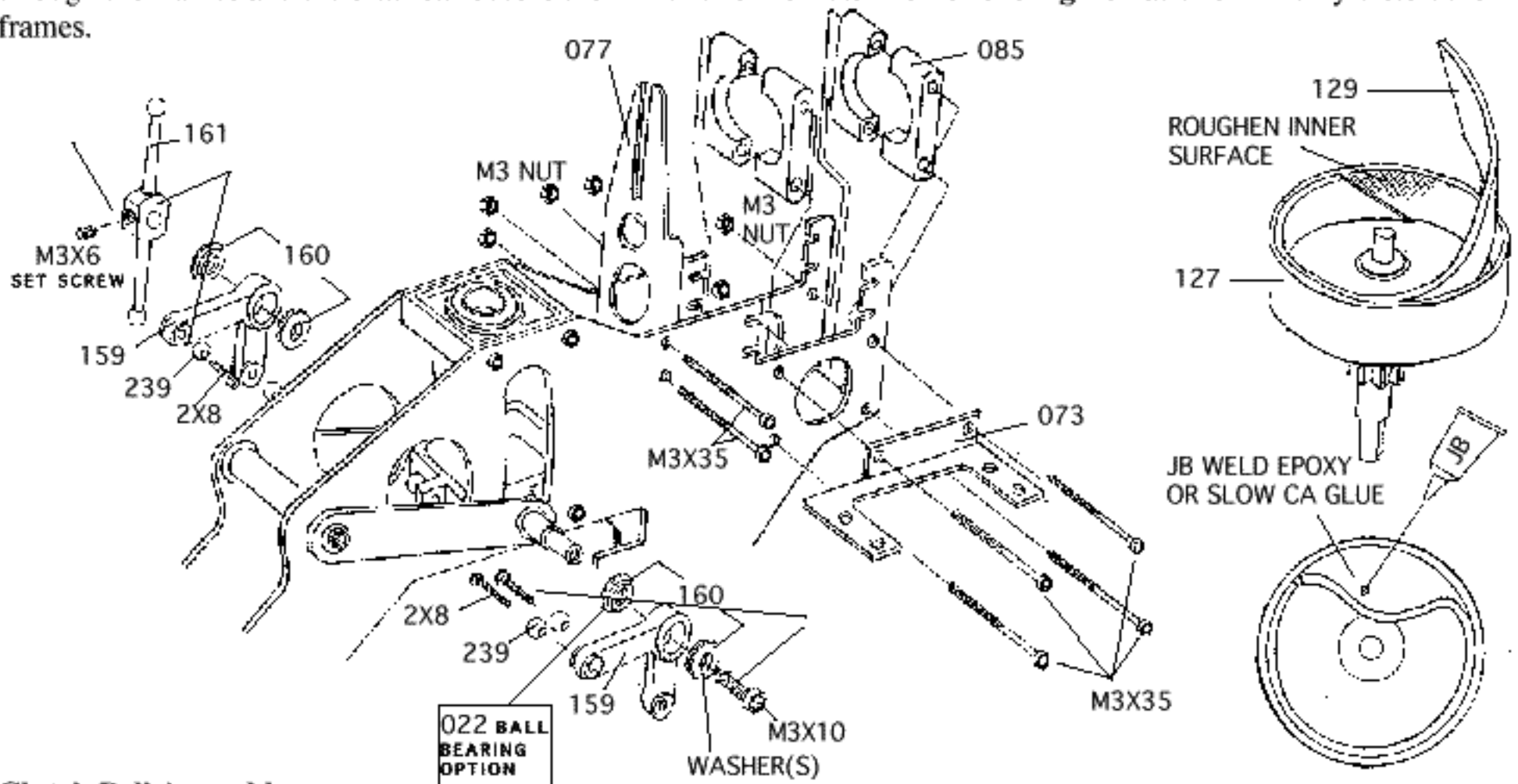
Fit the elevator control lever set and collective control axle (2002-157 Bag #3) between the top left and top right side frames (2002-117 Bag #1). Press a plastic flanged bearing (2002-059 Bag #3) for the collective control lever axle into inside of each side frame. The shorter elevator axle should be on the left side of the helicopter. Install two main bearing blocks (2002-083 Bag #4 or Bag #4M) onto the top side frames using four M3x35 bolts and four 3 mm nuts. The top bearing block should have the ball bearing facing up. The bottom bearing block should have the ball bearing facing downward. After insert the collective control lever axle into the flanged bearing. Add the collective lever (2002-071 Bag #3) to the collective axle. The lever needs to slide onto the elevator axle (2002-153 and 2002-155 Bag #3) with the flange bearing facing toward the elevator lever. Please see the drawing.

The 2002-059 bushings can be replaced by optional ball bearings (2002-061). Please note once again that these bushings or ball bearings must move freely and with minimal freeplay in order for your helicopter to operate properly. It is imperative that the retaining screws be set at the proper tension. Too tight will bind the bearing and too loose will create unwanted freeplay. Fit the plastic tail boom holders (2002-085 Bag #4 or Bag #4M) in-between the upper side frames. Also add the tail rotor servo mount plate (2002-073) outside the left side frame. The tail boom holders and servo mount are held by four M3x35 bolts and four nuts. Do not tighten the four nuts and bolts completely. They will be tightened later, after the tail boom is installed.



Take the Y- shaped push-pull collective lever and install the 5mm control balls (2002-239 Bag #8) using M2x10 screws and 2mm nuts. Now add the lever (2002-075 Bag #1) on top of the right side aluminum arm (2002-071 Bag #3). Use a M3x8 bolt and washer to secure the Y-shaped lever at the collective axle, and a M3x6 bolt to secure the Y-shaped lever to the 2002-071 arm. Install two M3x6 flanged plastic bushings (2002-160 Bag #3) The 2002-160 bushings can be replace by optional ball bearing 2002-022 on each 90 degree bell crank (2002-159 Bag #3). Install two steel balls onto each bell crank using two M2x8 bolts, take care not to have any excess bolt protruding the opposite side of the bell cranks. There are two 90 degree bell cranks, do this for both left and right side bell cranks. Slide a 90 degree bell crank onto the left side elevator axle (2002-155 Bag #3) Use a M3x10 bolt and Loctite to retain the bell crank onto the elevator control axle. Do not overtighten this M3x10 bolt; the bell crank should be able to pivot freely, but there should not be any free play.

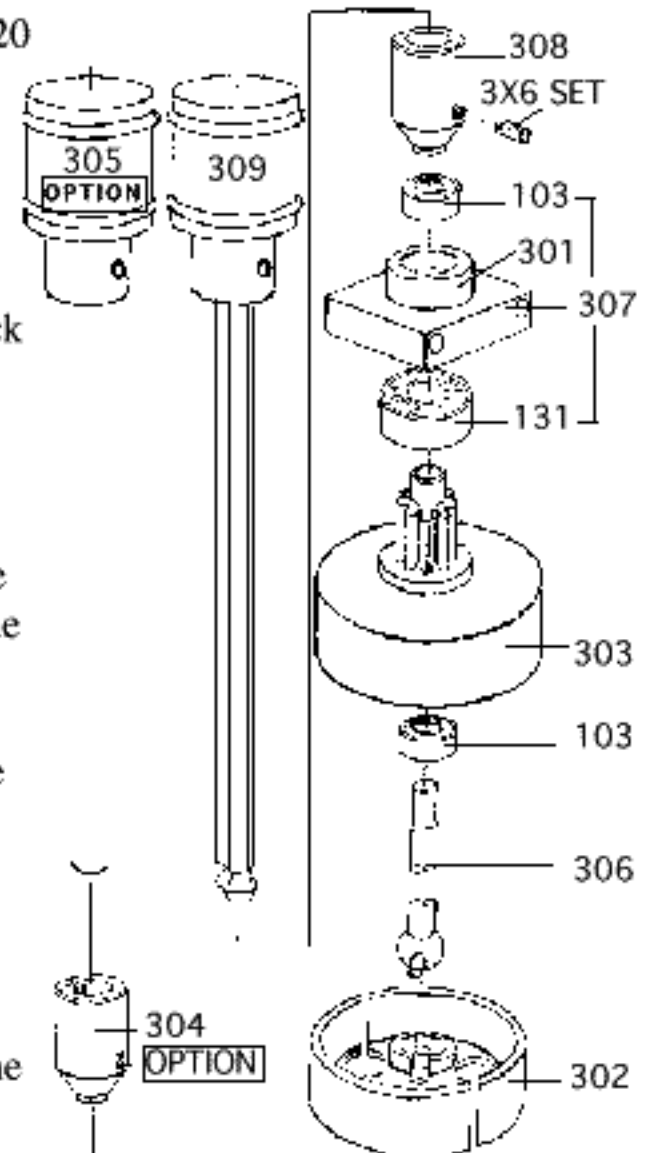
Now, install a similar 90 degree bell crank to the right side. Install the steel elevator bell crank (2002-161 Bag #3) on the right side elevator axle (2002-153 Bag #3). We suggest that you file a flat on the elevator axle where the set screw makes contact. Put a 3x3mm set screw in the steel bell crank. Do not tighten the set screw very tightly yet, because the exact angle will be adjusted later. When permanently tightened be sure to use a drop of locktite on the elevator bell crank. Fit the swashplate anti rotation bracket (2002-077 Bag #3) between the upper side frames. Fit two M3x35 bolts through the frames and the bracket. Secure them with two M3 nuts. **Do not overtighten** as this will only distort the frames.

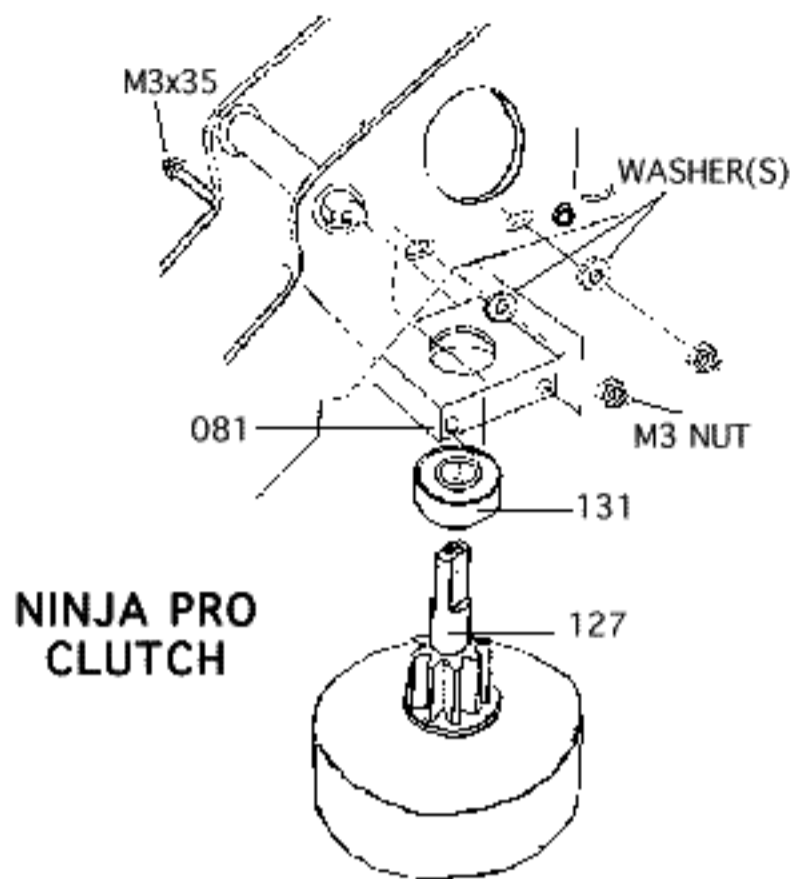


Clutch Bell Assembly

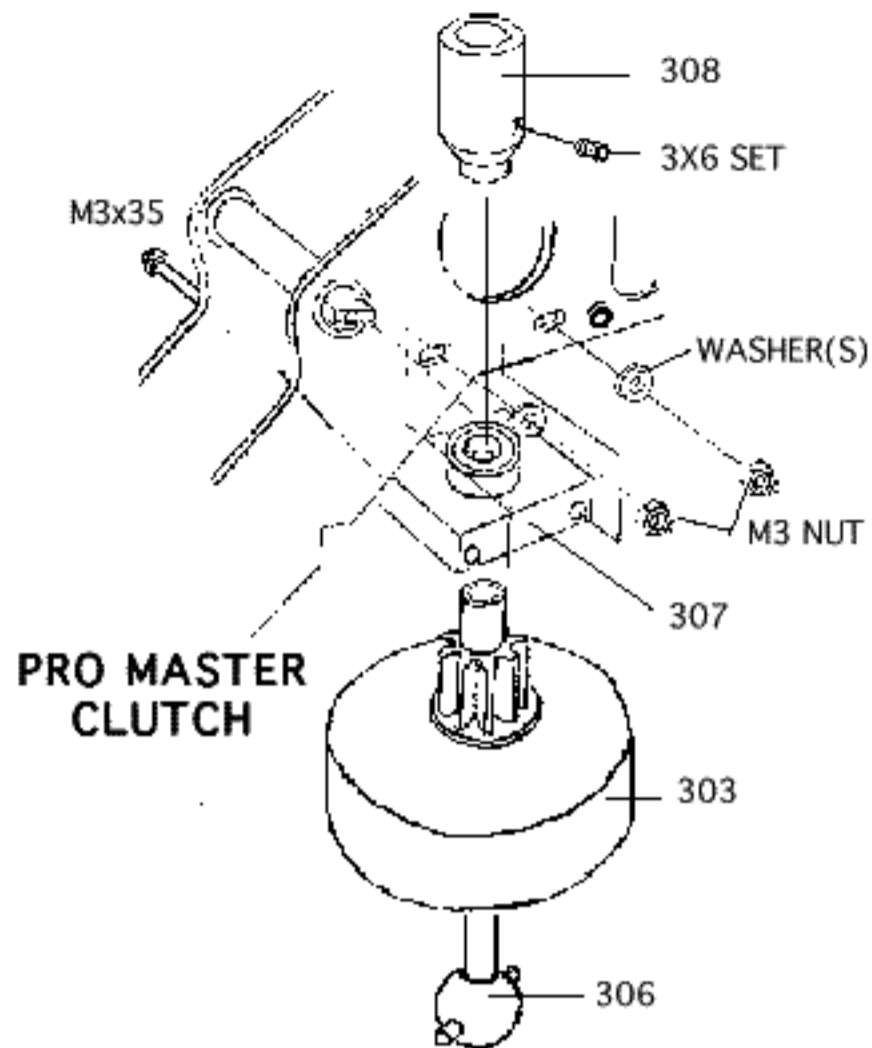
Roughen the inner surface of the clutch bell (2002-127 Bag #4 or #4M) with #220 grit sand paper. Then, clean off the debris. Trial fit the clutch lining (2002-129 Bag #4 or #4M) to the clutch bell, make sure it fits snugly. Once you are satisfied, then remove the lining and permanently glue it back in using JB weld Epoxy, or slow CA glue. Fit the clutch bearing (2002-131 Bag #4 or 4M) and block (2002-081 Bag #4 or #4M) in-between the upper side frames. The ball bearing should face downward. Use two M3x35 bolts to secure the bearing block in place. Insert the clutch bell in the clutch bearing. It is recommended to apply a little locktite to the pinion shaft where it inserts into the bearing.

The **Pro Master** has the addition of a top start system. This system is assembled and installed as a complete unit. Start by sanding the inside of the clutch bell (2002-303 Bag #4M) with 220 grit sandpaper to aid the bond when installing the clutch lining. Thoroughly clean with solvent. Trim the liner so it fits snugly in the bell. Remove and reinstall using JB weld epoxy or slow CA to hold the liner in place. Press the 4x9x4 ball bearing (2002-103 Bag #4M) into the inside of the clutch bell. Lightly grease the start shaft (2002-306 Bag #4M) and insert into the clutch bell from the bottom. Take the double bearing block with ball bearing (2002-307 bag #4M) and slip over the pinion shaft. It is advisable to use a little Locktite on the pinion shaft where it makes contact with the ball bearing. Clean off the end of the start shaft and slide the adapter (2002-304 Bag #4M) in place. Install the set screws that hold the adapter in place. Take note that one of the set screws must seat on the flat on the start shaft and Locktite must be used. Slide the assembly into place and secure the bearing block to the frames with two M3x35 screws and nuts. Take note that the heads of these bolts **must be** on the same side as the Y shaped collective bell crank.





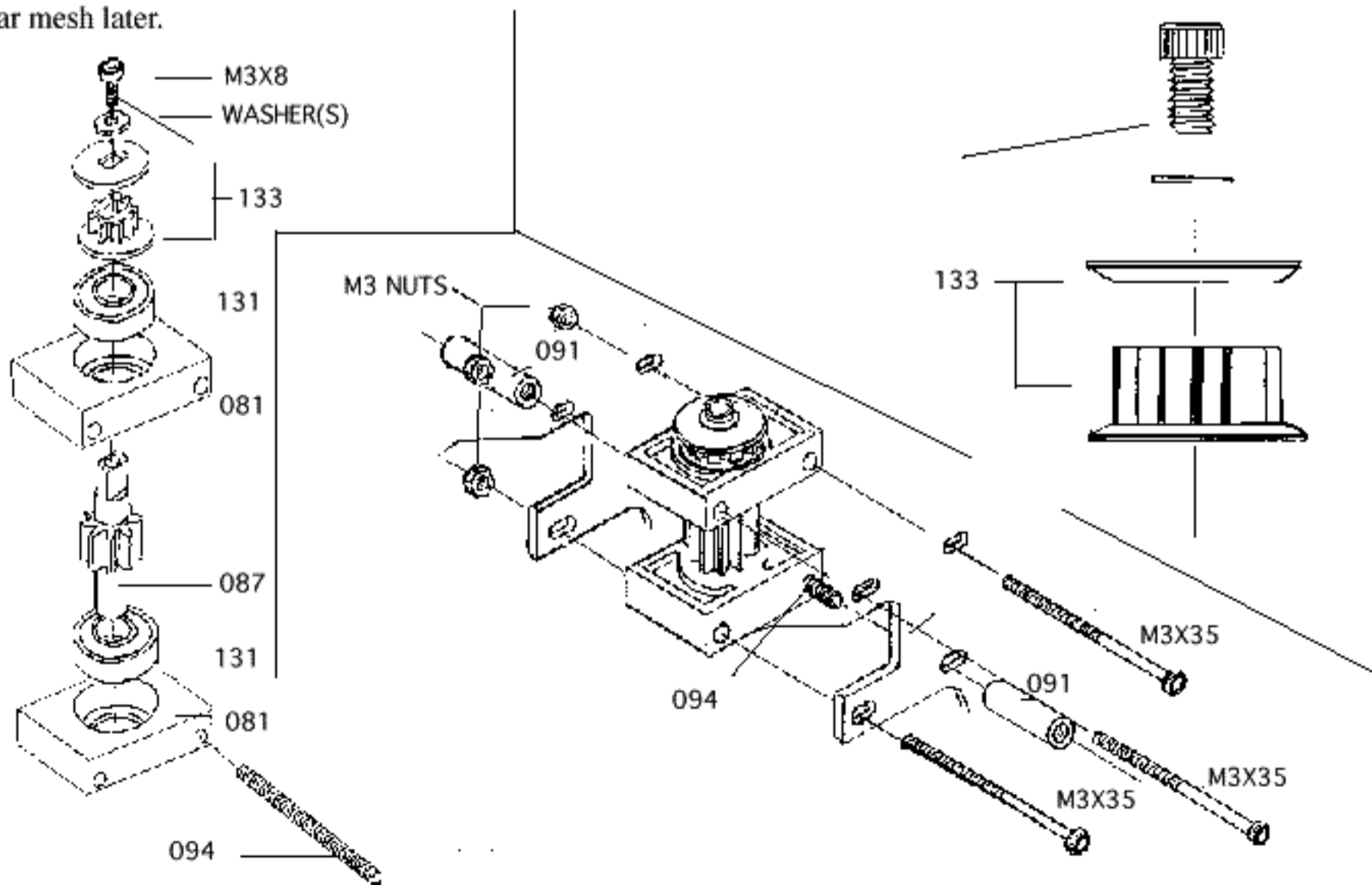
NINJA PRO CLUTCH



PRO MASTER CLUTCH

Step 7 Tail Rotor Drive

Insert the steel pinion shaft (2002-087 Bag #4 or #4M) into two bearing blocks (2002-081 Bag #4 or #4M). The ball bearings should face upward for both bearing blocks. Carefully smear a small amount of slow CA glue around bearing (2002-131 Bag #4 or 4M) before pushing bearing into bearing block (2002-081 Bag #4 or #4M). Add the plastic pulley (2002-133 Bag #4 or #4M) onto the pinion shaft. Insert a M3x8 bolt and a washer on top of the plastic pulley. Now fit this pulley assembly in-between the upper side frames. Use three M3x35 bolts and three locknuts to secure it to the frames. Fit a 40 mm long 3 mm stud (2002-094 Bag #3) into the rear hole of the bottom bearing block. Add a threaded spacer (2002-091 Bag #3) on each side of the 3 mm stud. Leave this assembly slightly loose so you can adjust the gear mesh later.

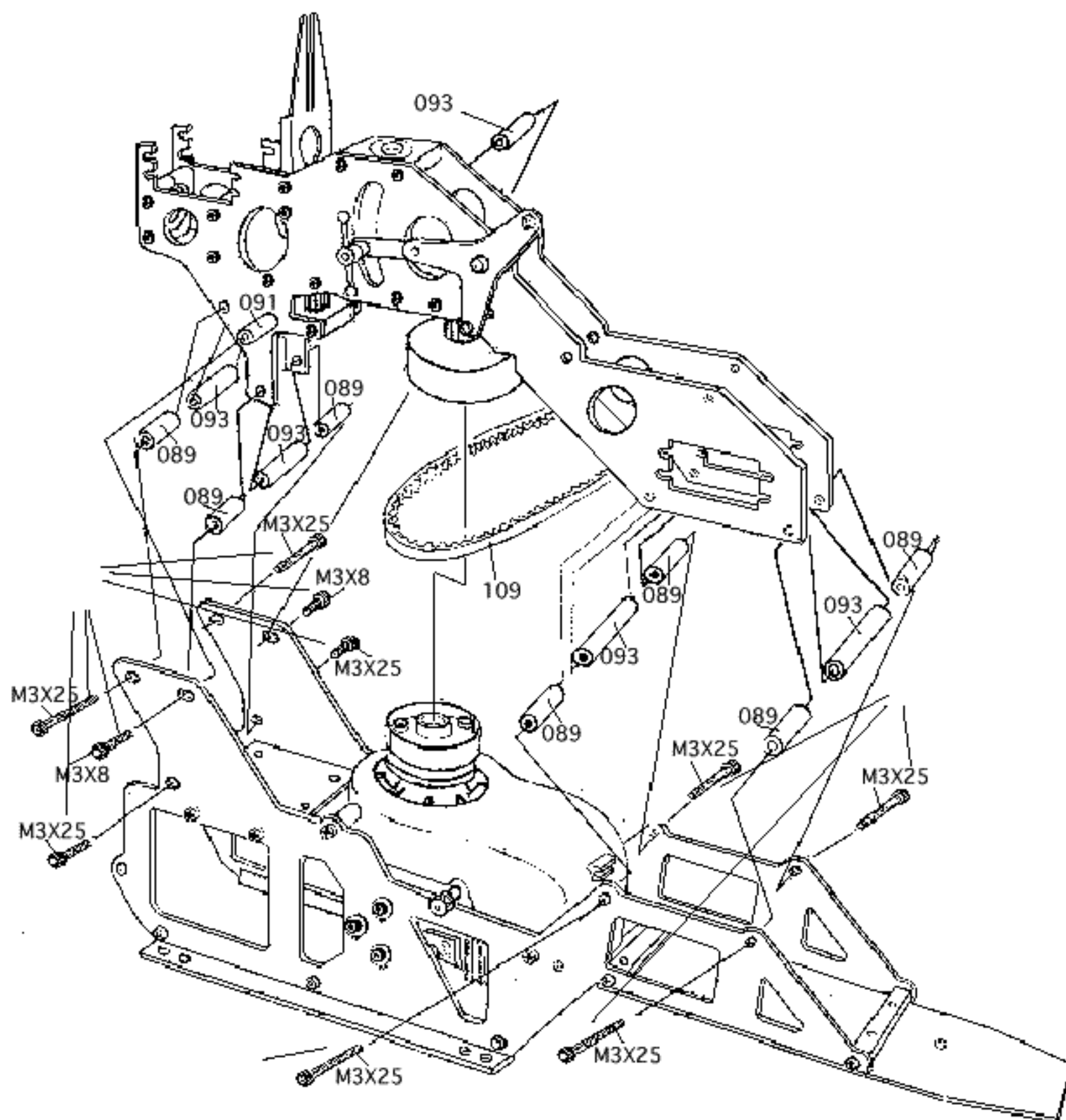


Step 8 Mating The Upper and Lower Main Frames

Find the four 26 mm long threaded aluminum spacers (2002-093 Bag #3). Fit them in-between the upper side frames in the locations shown in the drawing.

Mate the upper frame assembly onto the lower frame assembly. Fit the clutch bell onto the clutch first. Add eight 14 mm long aluminum spacers (2002-089 Bag #3) in-between the upper and lower side frames. See drawing for their locations. Use eight M3x25 bolts to go through these eight spacers. Then add two M3x8 bolts to the two spacers that are on the pulley bearing block. Use blue Loctite on these bolts.

Ninja Pro don't forget the engine starting belt (2002-109 Bag #4) Or if building a Pro Master don't forget to grease the uniball at the base of the start shaft.

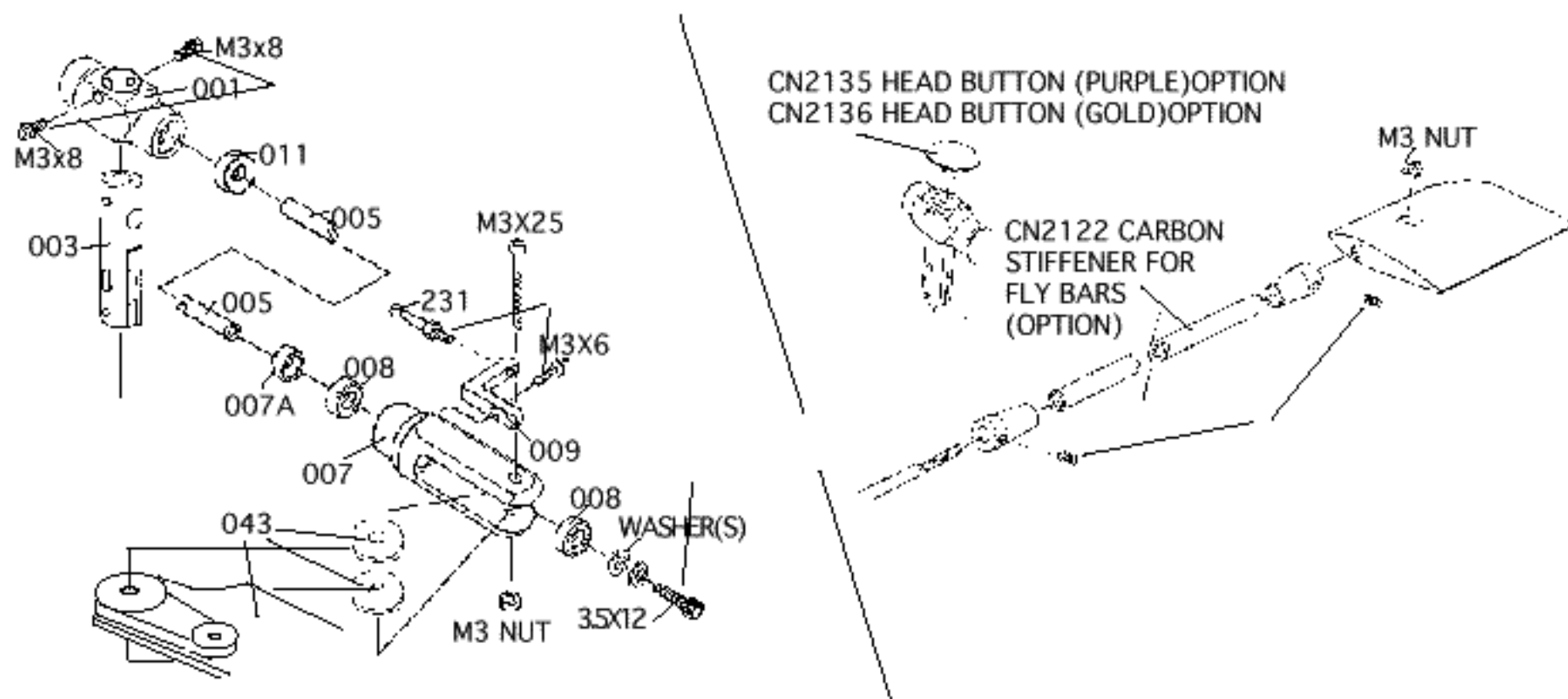


Step 9 Main Rotor Head

Insert the metal center hub (2002-003 Bag #5) into the metal center yoke (2002-001 Bag #5). Add a M3x8 bolt on each side of the yoke. Use blue Locktite on the two bolts. (2002-001, 2002-003) Smear some Vaseline on the two rubber dampers (2002-011 Bag #5). Then insert one damper on each side of the yoke. Slide the feathering spindle (2002-005 Bag #5) through the rubber damper and the yoke.

Find the two blade grips (2002-007 Bag #5) note that the four main blade bearings (2002-008 Bag #5) are pre-installed in the blade grip. Add the metal pitch control arm (2002-009 Bag #5) onto the blade grip using a single M3x6 bolt. Add the steel pitch control ball stud (2002-231 Bag#1) to the pitch control arm (2002-009 Bag #5). Use Locktite on the pitch are and pivot control ball.

Slide the completed blade grip onto the feathering spindle (2002-005 Bag #5). Insert a M3.5x12 bolt and a washer through the blade grip to secure the hub to the spindle. Use Locktite on this bolt ! Do not over tighten as this will only mushroom the shaft and make bearing removal difficult.

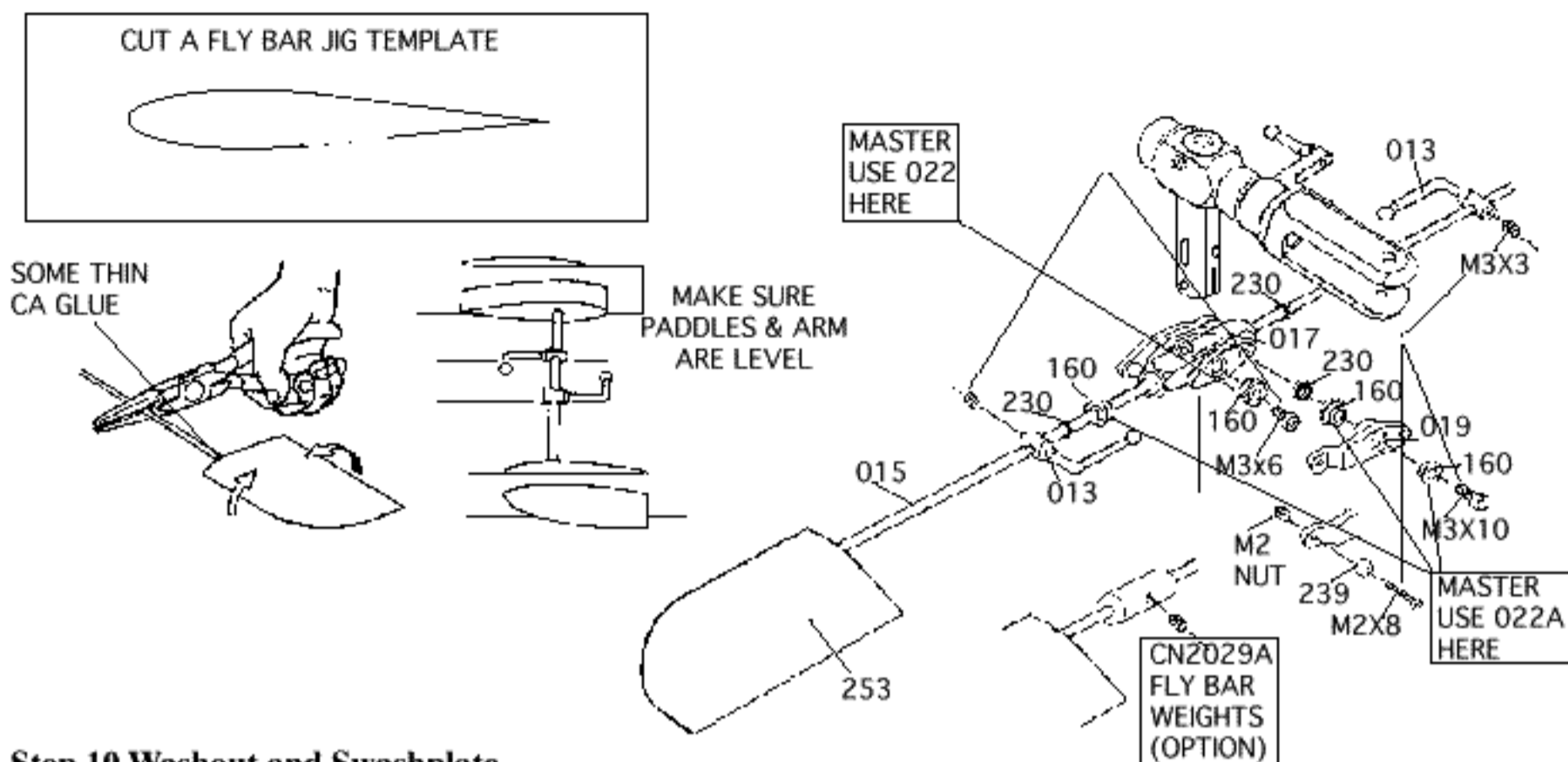


Slide the seesaw (2002-017 Bag #5) onto the center hub. Fit two flanged plastic bearings (2002-160 Bag #3) or the flanged ball bearings (2002-022 OP) if you are building a Ninja pro master , into the center hole of the seesaw. Secure the seesaw to the hub by using a M3x6 bolt through each flanged bearing. Tighten the two M3x8 bolts sufficiently to remove all free play, but the seesaw should still be able to move smoothly ! Use Locktite on the bolts. On this and the following steps it cannot be stressed enough the importance of the seesaw and mixing arms pivoting freely without excessive play. The use of Locktite is mandatory during these steps.

Fit two flanged plastic bearings (2002-160) or non-flanged ball bearings (2002-022A Bag #4M) if building a Pro Master onto each mixing arm (2002-019 Bag #5). Add the two mixing arms (2002-019) onto the seesaw. Use a M3x10 bolt with Locktite to secure the mixing arm to the seesaw. Tighten the M3x10 bolts sufficiently to remove all free play, but the arms should still be able to move smoothly. Fit steel ball (2002-239) onto mixing arm (2002-019) use M2x8 screw with nut and Locktite.

Insert two plastic flanged bearing (2002-160) or (2002-022A) if building a Pro Master on the seesaw. Slide the flybar (2002-015 Bag #10) through the flanged bearings and the seesaw ! Use a ruler to check to make sure equal length sticks out on either side of the seesaw. Add a flybar control arm (2002-013 Bag #5) on either side of the seesaw. Coat the threads of each M3x6 set screw with Locktite, then fit a set screw inside each control arm. Make sure both arms are level ! Insert a 3mm locknut into the underside of each control paddle (2002-253 Bag #5) Then screw the paddles onto the flybar. Wick some thin CA glue into the paddle hole after threading it onto the flybar ! Make sure the two paddles are at same distance from the control arm and are level with the control arms. This is an extremely important step you can follow the picture to cut a flybar jig template. Check the flybar balance by letting the seesaw pivot on its bushings. Add tape to the light paddle until balance is achieved.

The **Pro Master** has all of these plastic bearings replaced with ball bearings. The installation is the same except that some small micro washers 3x4.5x0.5T are used in-between the ball bearing and the part it mates against.



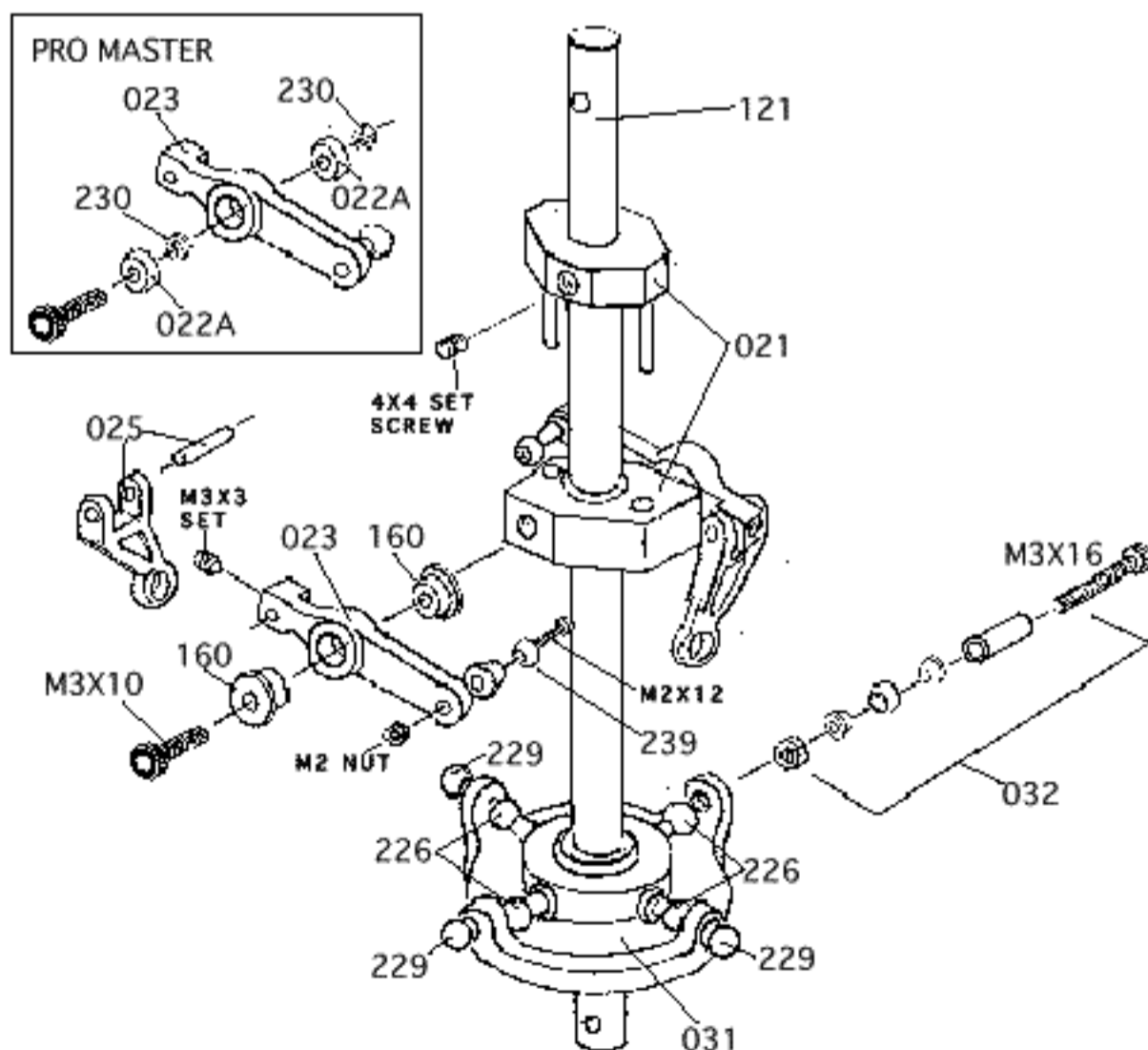
Step 10 Washout and Swashplate

Find the metal washout mixing base (2002-021 Bag #6) and the two metal washout arms (2002-023 Bag #6). Insert a plastic flanged bearing (2002-160) Or 2002-160 ball bearing if building a Pro Master onto either side of the washout arm. Attach the washout arm to the mixing base with a M3x10 bolt. Tighten the M3x10 bolts sufficiently to remove all free play, but the arms should still be able to move smoothly.

Put a plastic radius link (2002-025 Bag #5) on each washout arm. Slide a 2 mm pin through the radius link and the washout arm to secure them. Insert a 3 mm set screw in the washout arm. This set screw is used to secure the pin. Add a metal spacer and steel ball and a M2x10 bolt on each washout arm. Secure the M2x10 bolt with a 2 mm nut (2002-239 Bag #8).

Fit three short threaded steel balls (2002-229 Bag #3) onto three outside arms on the swashplate ! Use Loctite on all these threaded balls. Be careful not to scratch or overtighten the balls. They are easily damaged during installation. For the swashplate antirotation arm (2002-032 Bag #6) fit a M3x16 bolt with the plastic sleeve, a brass spacer, and special threaded steel ball and another brass spacer; see drawing ! Use Loctite on the bolt.

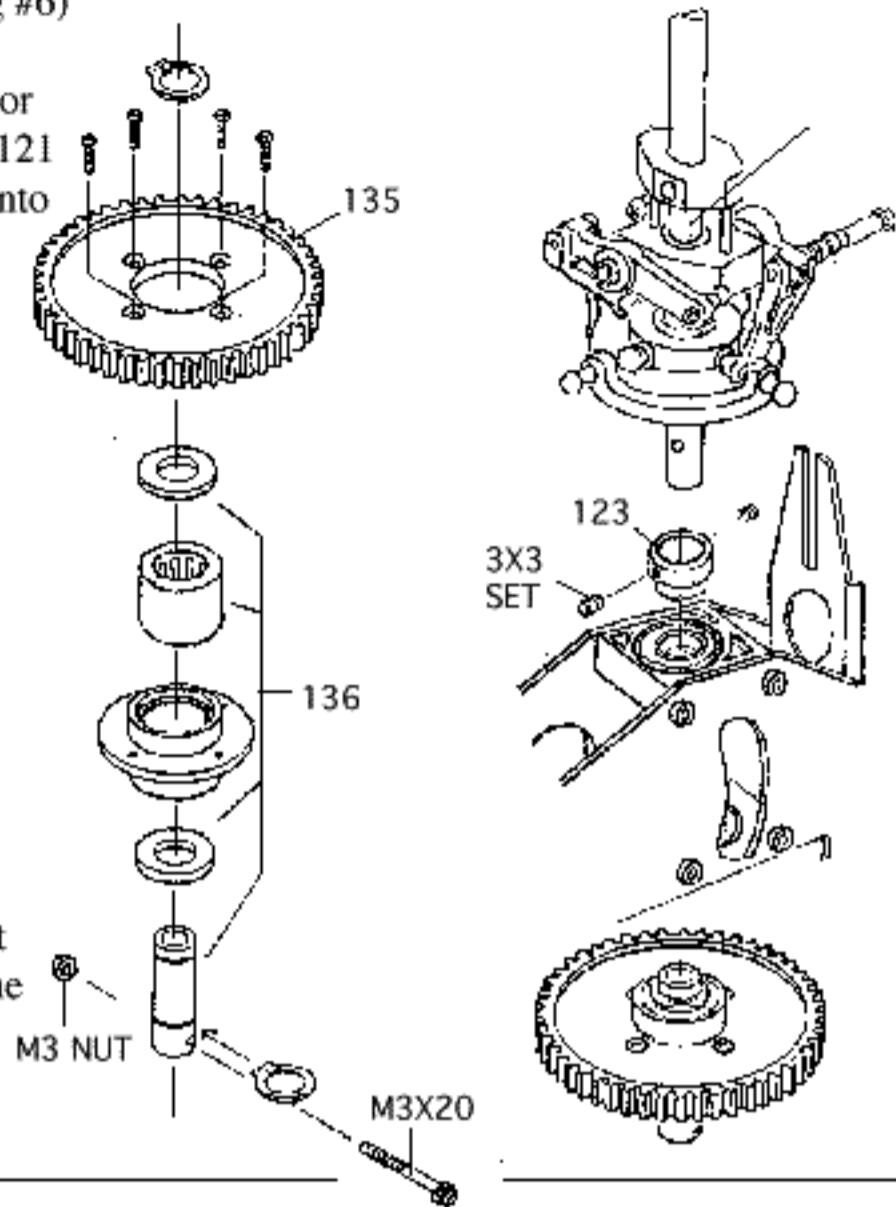
Fit four long threaded steel balls (2002-226 Bag #5) onto the four holes on the inside swashplate ring. See drawing below. Use Loctite on all these threaded balls.



Step 11 Main Gear and Main Shaft

Slide the aluminum main shaft stopper (2002-123 Bag #6) onto the main shaft from the bottom. Hold the plastic main gear (2002-135 Bag #6) underneath the main rotor shaft bearing block. Slide the main rotor shaft (2002-121 Bag #6) from the top through the bearing blocks and into the main gear. Install a M3x20 bolt through the main gear auto rotation hub and through the main shaft and secure with a 3mm Lock-nut. Note that the end of the shaft with the most distance between the hole and the end is the top end of the shaft. Insert two 3x3 mm set screws into the mast stopper (2002-123) and tighten them. Make sure the main shaft has no freeplay up or down.

Slide the swashplate and the washout assembly onto the main rotor shaft. Snap the two radius links (2002-025 Bag #6) onto the inner swashplate long steel balls (2002-226) 180 degrees from one another. Add the washout retaining block (gold part with two steel pins) with the pins pointing downward. Temporarily use a 4x4mm set screw to secure this part to the main shaft. Then, add the main rotor head on the shaft. Insert a M3x20 bolt and locknut through the main rotor hub and shaft, and tighten it.



Step 12 Tail Rotor System

Tail Rotor Gearbox

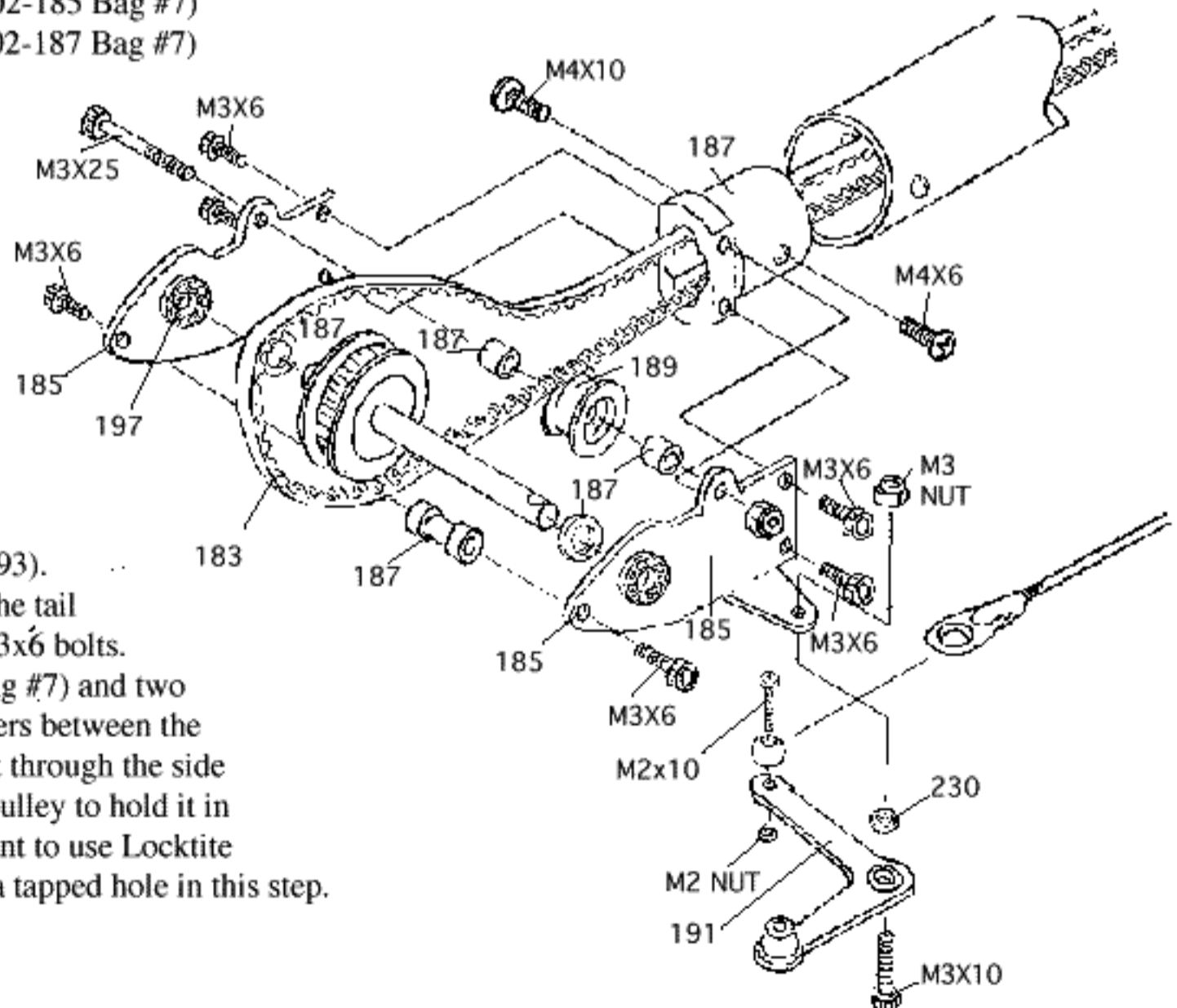
Install the right side plate (2002-185 Bag #7) onto the gearbox housing (2002-187 Bag #7) with two M3x6 bolts.

Fit the tail rotor drive shaft (2002-193 Bag #7) and a thin (2002-187 Bag #7) spacer to the right tail plate.

Now fit the tail rotor drive belt through the hole in the tail rotor gearbox housing (2002-187), then loop the tail rotor drive belt (timing belt) (2002-183 Bag #4 or 4M) around the tail pulley (2002-193).

Add the left side tail plate to the tail gearbox housing using two M3x6 bolts.

Fit guide pulley (2002-189 Bag #7) and two thick (2002-187 Bag #7) spacers between the side plates. Use a M3x25 bolt through the side plates and through the guide pulley to hold it in place ! It is extremely important to use Loctite to all screws that thread into a tapped hole in this step.



Tail Rotor Blade Grip

Sliding Tail Rotor Pitch Control Mechanism

Slide a ball bearing (2002-209 Bag #7) onto the tail hub (2002-199 Bag #7) followed by a spacer (2002-211 Bag #7) then another bearing. Secure the bearings and spacer to the hub with a small washer and a 3mm lock-nut. Repeat for the next side. Fit the tail blade grips (2002-207 Bag #7) to the bearings with four M2x10 screws and nuts ! Note that one of the grip halves has a nub for the pivot ball to be mounted to the grip. Repeat for the next side. Attach a pivot ball on each assembly with a M2x10 screw and nut.

Install a ball bearing (2002-204 Bag #7) on either side of the tail pitch plate housing (2002-205 Bag #7). Insert the tail pitch plate inner sleeve (2002-203 Bag #7) into the tail pitch plate housing. Note that the pivot pin is offset and the brass slider must be inserted into the side with less distance between the pin and housing edge. .

Attach the tail pitch plate (2002-201 Bag #7) to the brass tail pitch slider. Press the locking ring onto the brass pitch slider to hold the pitch control plate in place. It is advisable to add some

JB Weld epoxy to the locking ring for some added security. Add two small plastic ball links (2002-235 Bag #8) on the tail pitch control plate. Secure them with (2002-202 Bag #7) special screw and pin, slide the entire assembly onto the tail rotor shaft. Attach the tail pitch lever (2002-191 Bag #7) to the tail rotor gear box with a M3x10 bolt two micro shims (2002-230 Bag #5) and a lock nut. The steel pin on the tail rotor control housing (2002-205 Bag #7) fits into the steel ball pressed into the end of the bell crank.

Fit the tail rotor hub (2002-199 Bag #7) with the tail grip onto the tail rotor shaft (2002-193 Bag #7). Put two 3x3mm set screws in the tail rotor hub, and use them to secure the hub to the shaft. Use Loctite on these set screws.

Fit the tail rotor blades to the blade holders with a 3mm washer on each side of the blade. Secure each blade with a M3x16 bolt and a 3mm nut.

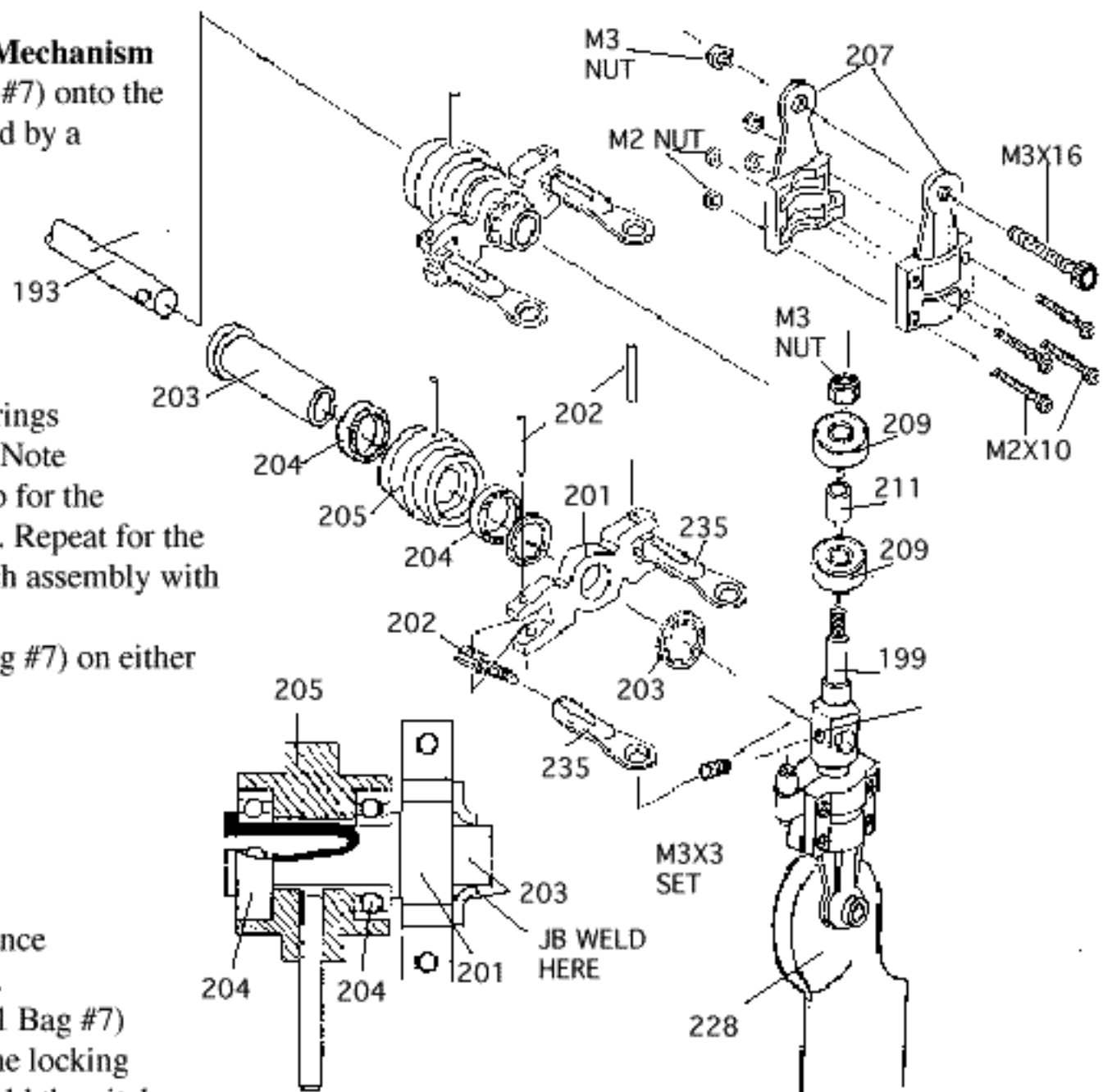
NOTE: make sure the tail blades are facing the proper direction

Step 13 Tail Fins

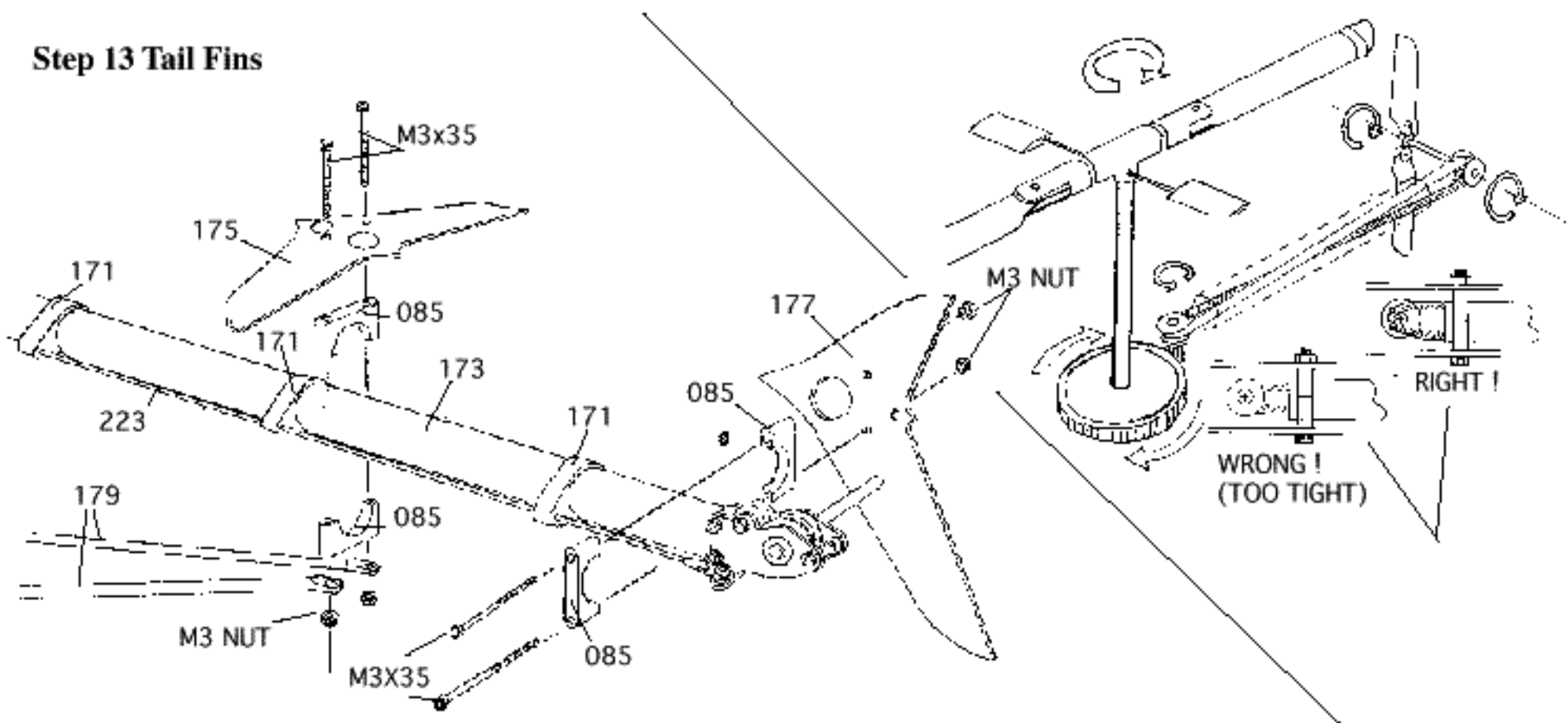
Put the two half pieces of plastic fin mount (2002-085 Bag #4 or 4M) on the tail boom (2002-173 Bag #10). Put the horizontal fin (2002-175 Bag #1) on top of them. Insert two M3x35 bolts through the fin and the plastic mounts. Add the two tail boom support rods (2002-179 Bag #10) under the plastic mount (2002-085 Bag #4 or 4M). Use two M3 lock nuts to secure all of them, but do not tighten them completely, yet. We will tighten them later.

Slide three tail pushrod guides (2002-171 Bag #4 or 4M) onto the tail boom: two are in front of the horizontal fin, and one is behind the horizontal fin.

Fit the two plastic mounts (2002-085 Bag #4 or 4M) for the vertical fin (2002-177 Bag #1) on the tail boom. Add the vertical fin. Insert two M3x35 bolts through the fin and the plastic mounts. Secure them with two 3 mm locknuts.



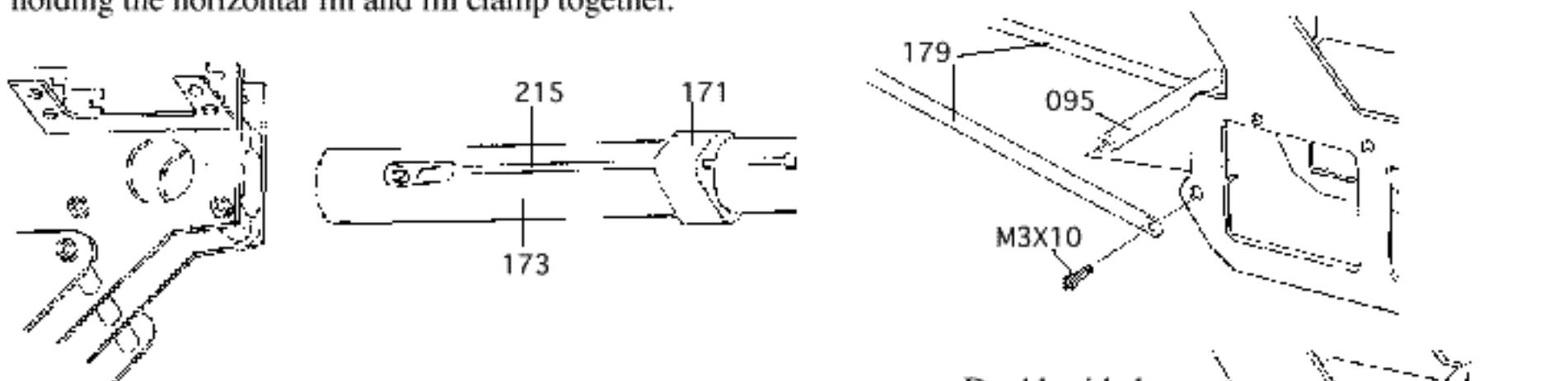
Step 13 Tail Fins



Step 14 Mating Tail Boom to the Main Frames

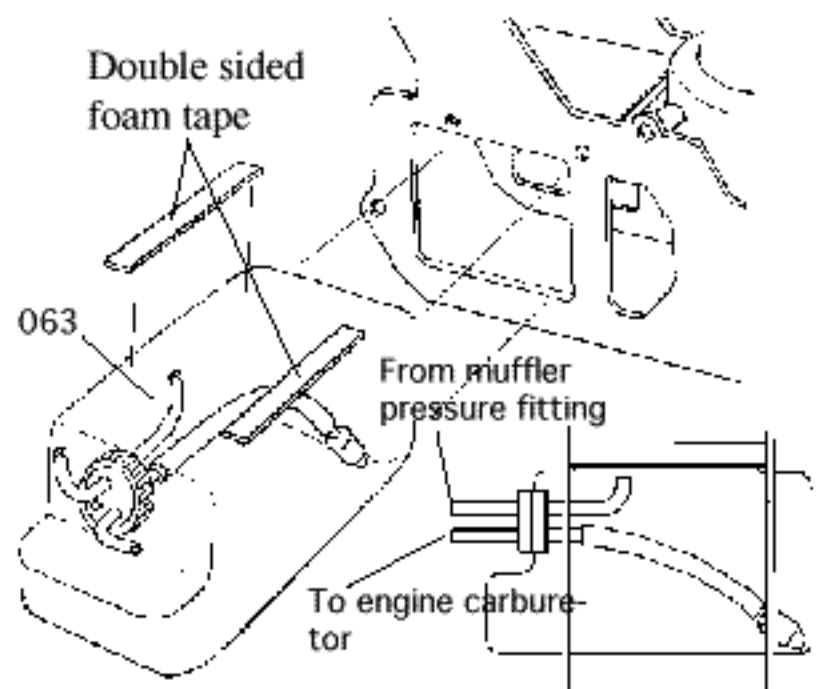
Feed the tail drive belt (2002-183 Bag #4) through the tail boom starting with the end with two holes. A piece of wire with a hook bent into it works well for pulling the belt through. Fit the tail boom (2002-173 BAG #10) into the upper side frames. Loop the drive belt onto the front pulley. The belt should have a 90 degree turn inside the tail boom ! Check to make sure when the main rotor is turning in the clockwise direction (viewed from the top), the tail rotor should turn counter-clockwise when viewed from the right hand side. Adjust the belt tension by pulling on the tail boom. Do not over tighten the belt, it should not be too loose so the belt slips. Slowly, tighten the four M3x35 bolts that hold the tail boom.

Attach the front of the tail boom support rods to the lower main frames. Use two M3x8 bolts and a 57mm threaded cross member (2002-095 Bag #3) to secure the front of the tail boom support rods to the frames. Mount the aft end of the boom-struts to the horizontal fin mounts, making sure the horizontal fin is level tighten the two M3x35 bolts holding the horizontal fin and fin clamp together.



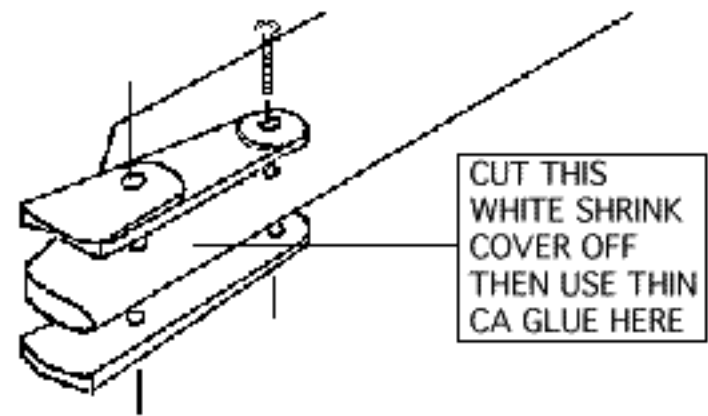
Step 15 Fuel Tank

Assemble the fuel tank (2002-063 Bag #9) carefully according to the drawing shown below. Use caution while bending the brass tubing. Do not use any pliers as this will kink the tubing use your hand and make a smooth flowing bend to avoid kinking. Add one strip of double sided foam tape to the top surface of the tank so it will make contact with the gyro plate mount. Slide the tank into the side frames from the right hand side. The fuel line should come out of the right hand side of the helicopter.



Step 16 Main Rotor Blades

The rotor blades that are included in your Ninja Pro kit come pre-finished and require no building. They however should be checked for balance before use. If you have a balancer follow the instructions that came with the balancer. Next attach the blades to the rotor head. Balance the Rotor head and blades on two drinking glasses suspending the whole unit by the flybar. The heavy side will hang lower than the light side. Add self-adhesive tape on the light blade on a location that will result in the proper CG shift. Add the tape until the rotor head hangs horizontally.



Step 17 Radio Installation

All five servos are mounted with the screws that came with your radio system with the exception of the aft two screws that hold the elevator servo. These two are replaced by two M3x8 self tapping screws. They are screwed through the cutouts in the frame and into the plastic servo mounting plates (2002-169 BAG #3) located with the plastic parts tree. Mount the five servos as illustrated in the instructions.

Step 18 Making Up the Control Push rods

Make up all the control push rods according to the specified length shown in the drawing. Please note that these dimensions are from end to end of the plastic rod-end and are only guidelines. You will have to fine adjust them according to your particular servos.

#2002-213 ELEVATOR: Total 91 mm for JR servos (2)
(Use 68mm rod,see FIG #7) Total 92 mm for Futaba servos (2)

#2002-217 COLLECTIVE: Total 117 mm for JR servos (2)
(Use 80mm rod,see FIG #2) Total 118 mm for Futaba servos (2)

#2002-215 ROLL(AILERON): Total 131 mm for JR servos (2)
(Use 100mm rod,see FIG #1 & FIG #3 Slightly bent 10 degree) Total 132 mm for Futaba servos (2)

#2002-221 SWASHPLATE: Total 69mm (4)
(Use 40mm rod, see FIG #3A & FIG#3B)

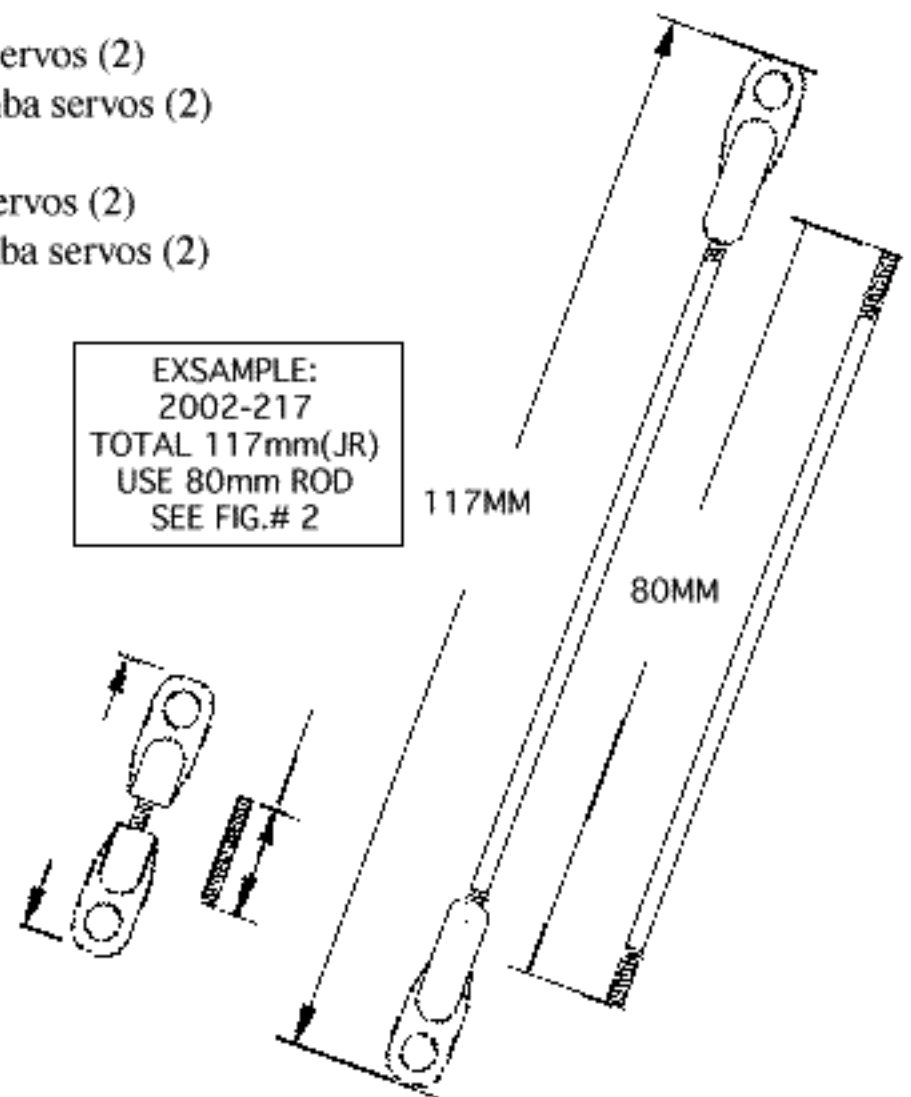
#2002-221 PITCH (long): Total 66mm (2)
(Use 40 mm rod, see FIG #4)

#2002-225 PITCH (short): Total 36mm (2)
(Use 10mm rod, see FIG #4)

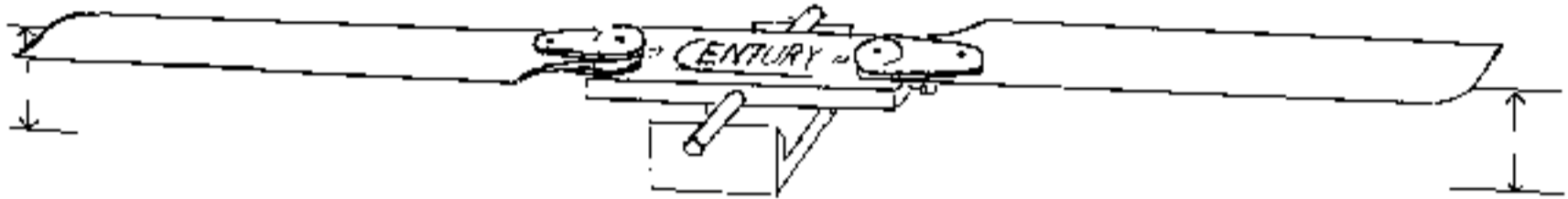
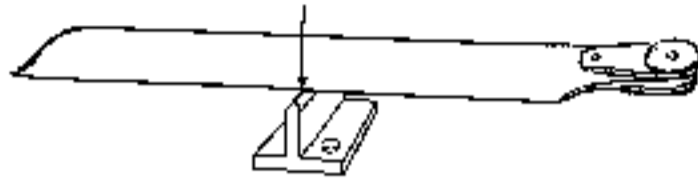
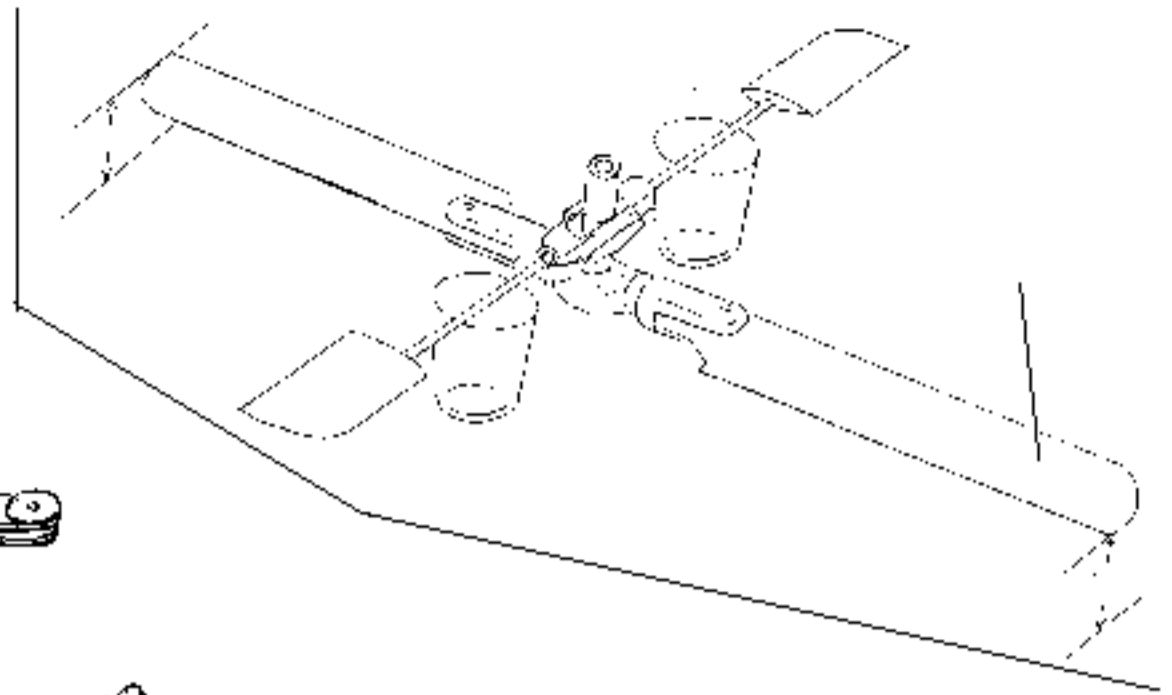
#2002-219 FLYBAR: Total 47mm (2)
(Use 25mm rod See FIG #5)

#2002-221 THROTTLE: Total 80 mm (1)
(Use 40 mm rod, see FIG #6)

2002-215 / 223 RUDDER: Total 618mm (1)
(Use 100 & 476 mm rod, see FIG #8)



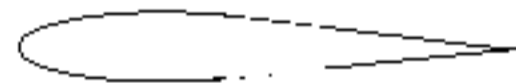
Accuratech main blade balancer with C.G checker (Option) # CN2052 can help you to find out the position of C.G and balance a pair of the main rotor blade.



Use this flybar jig template

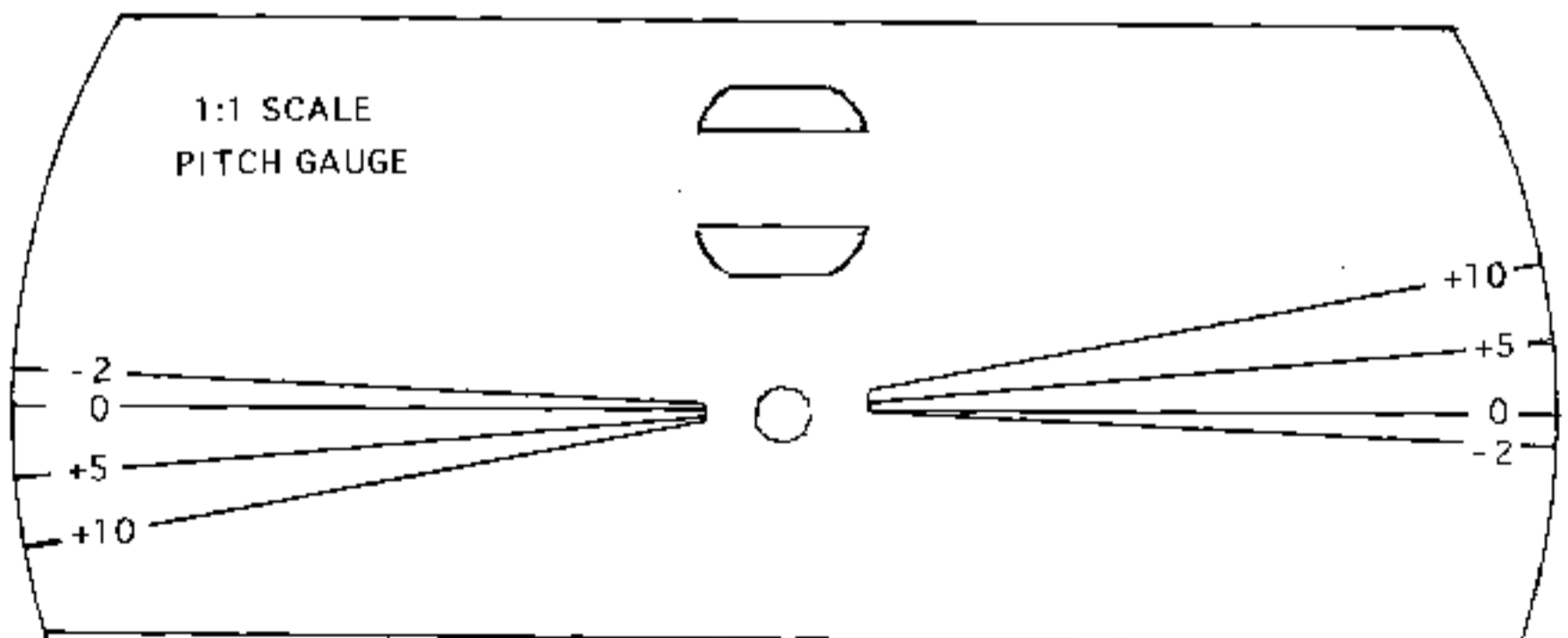
1. Cut two 1:1 template.
2. Referring step 9 main rotor head to setup.

CUT A FLY BAR JIG TEMPLATE

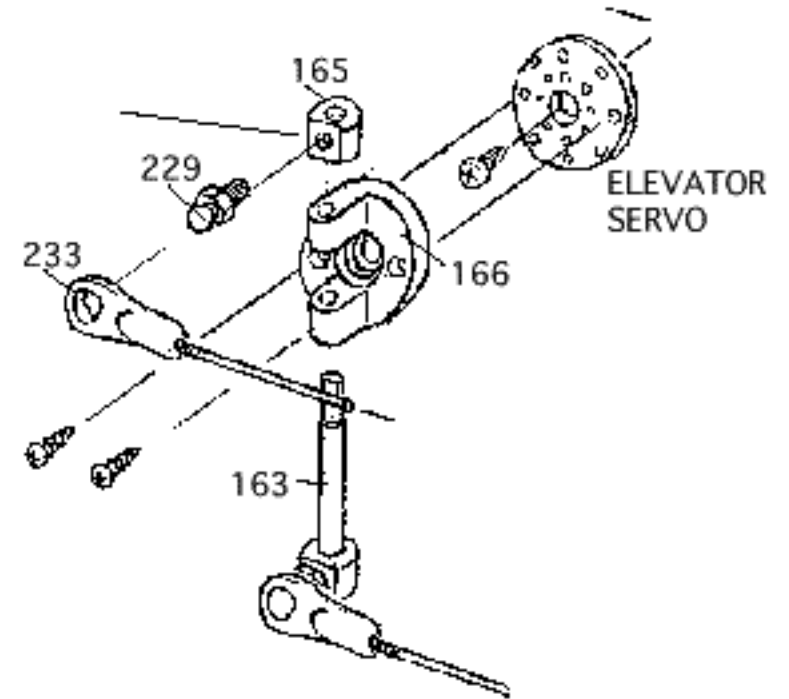
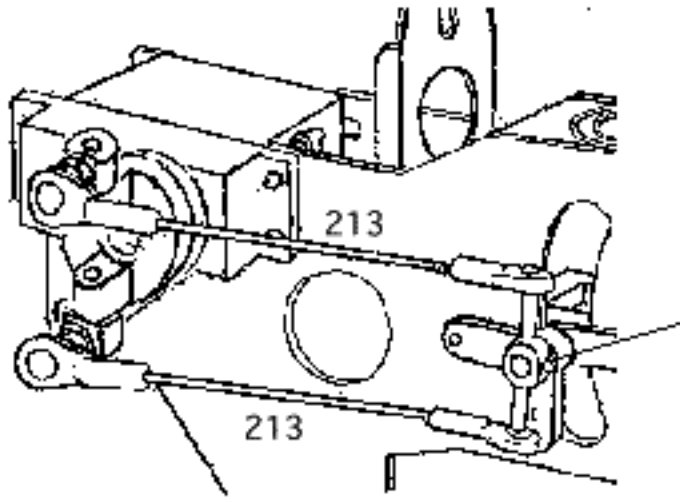


Use this pitch gauge

1. Cut a 1:1 pitch gauge
2. Put the gauge into the blade holder of the rotor head.
3. Make sure the flybar parallel to the tail boom.
4. Referring to the table below, set the flybar to each pitch gauge line, and read the pitch.
5. Adjust your transmitter referring to the data of next page.

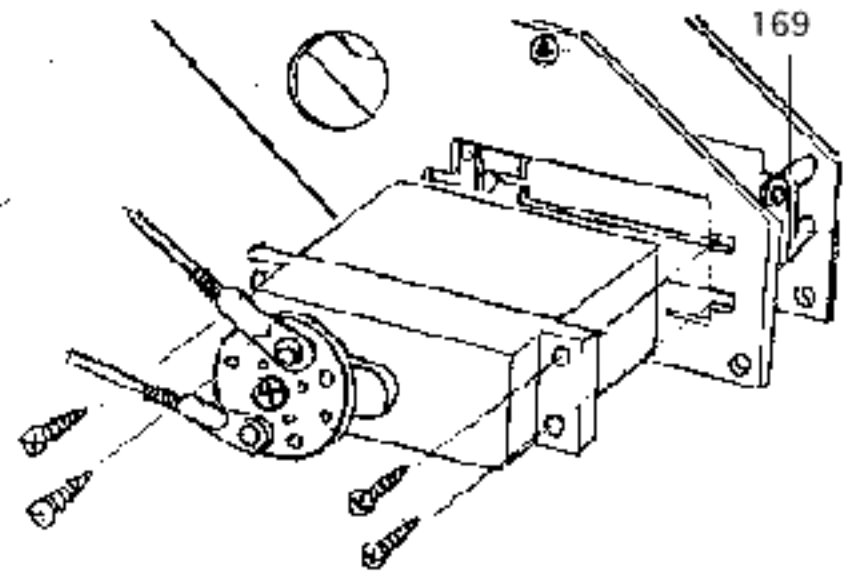
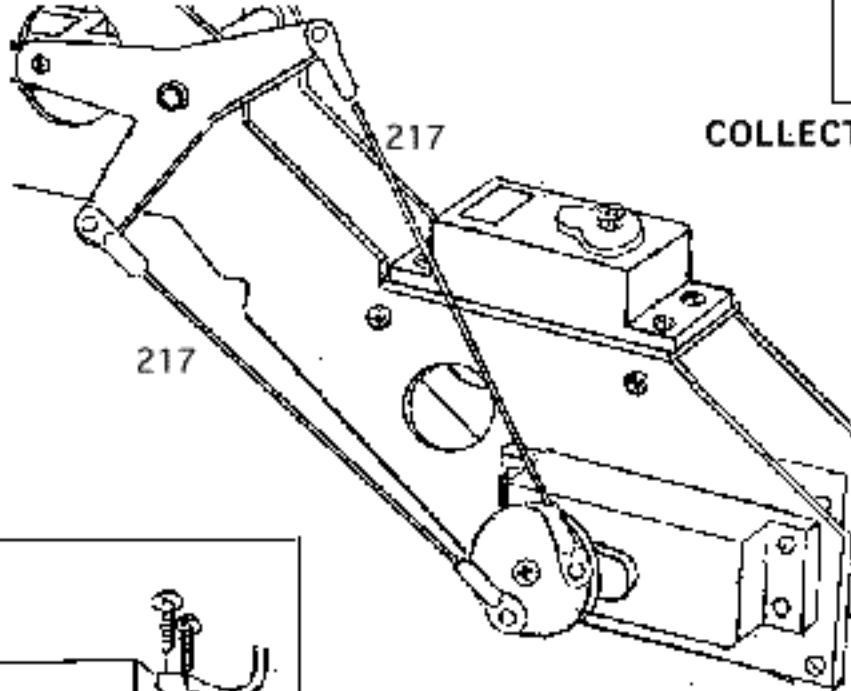


ELEVATOR LINKAGE

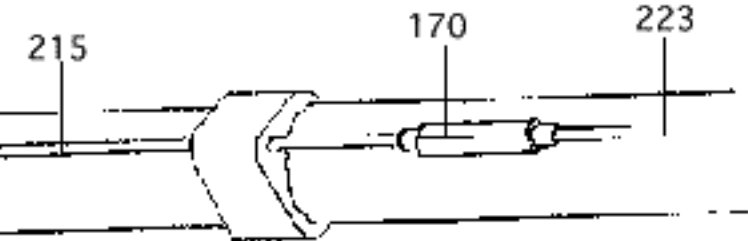
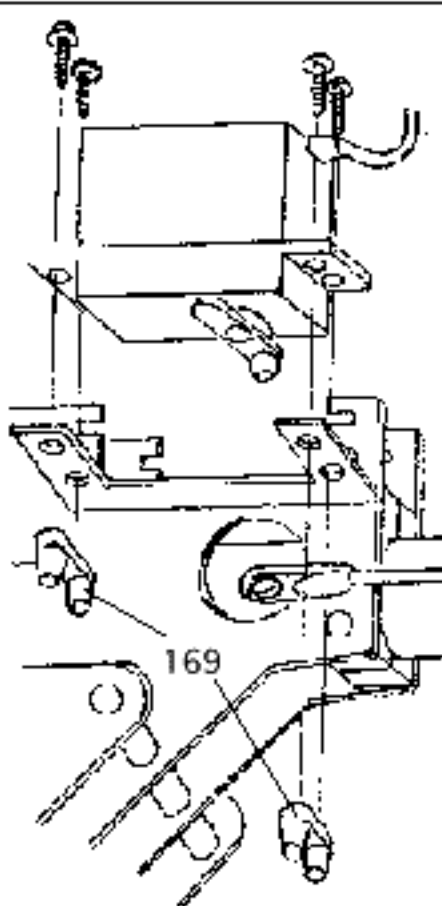


ELEVATOR SERVO

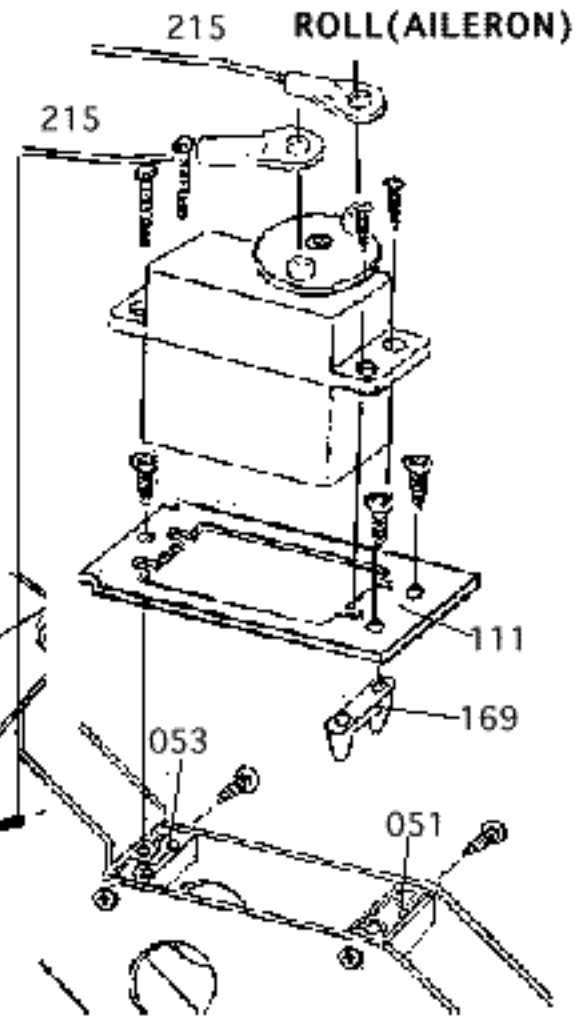
COLLECTIVE LINKAGE



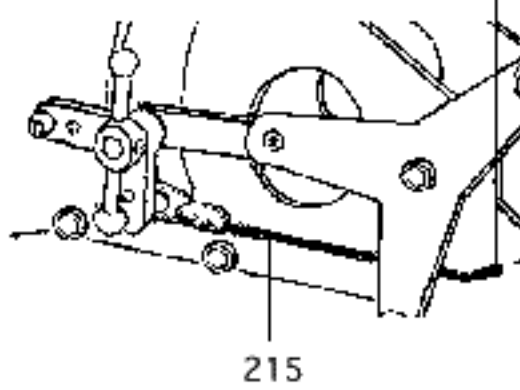
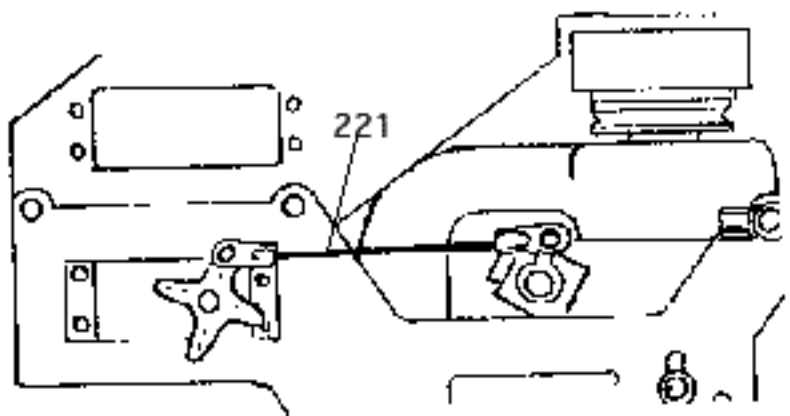
RUDDER LINKAGE

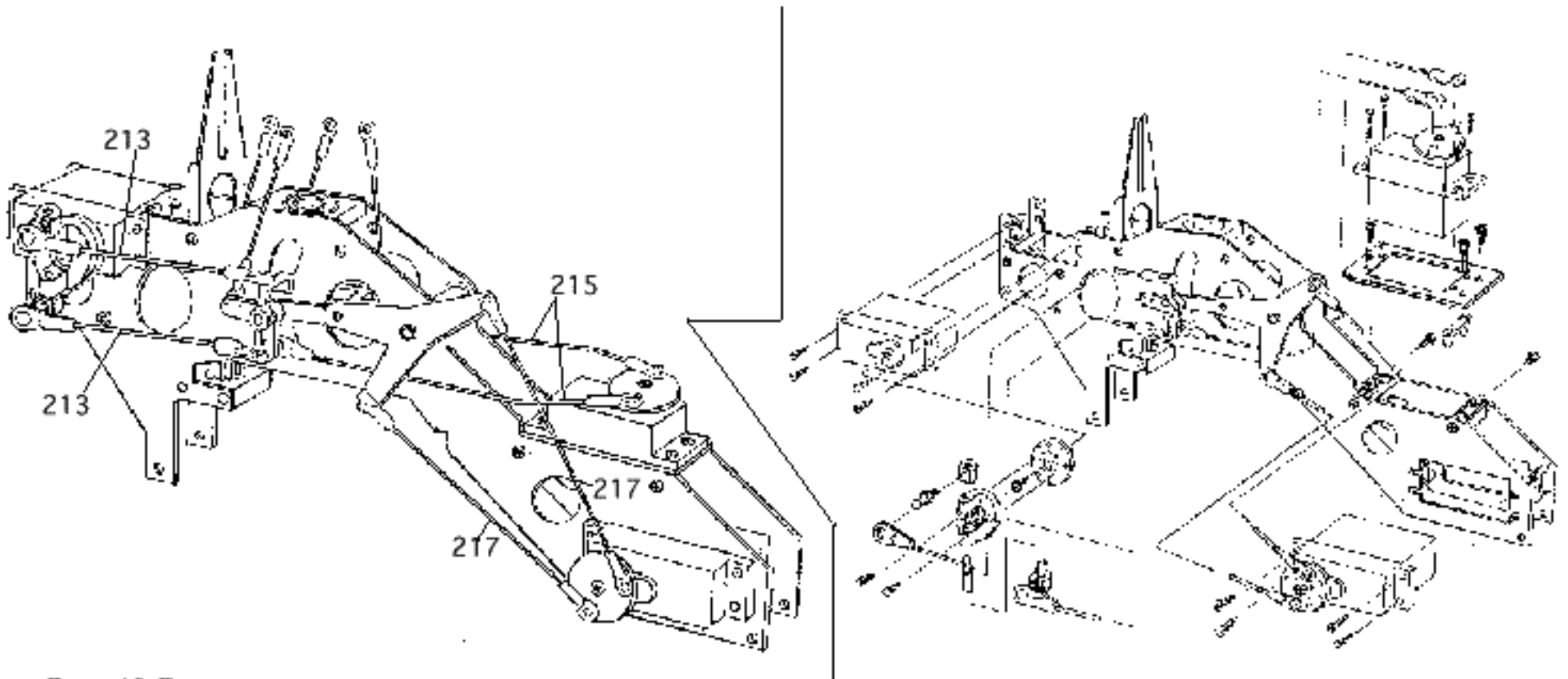


ROLL (AILERON)



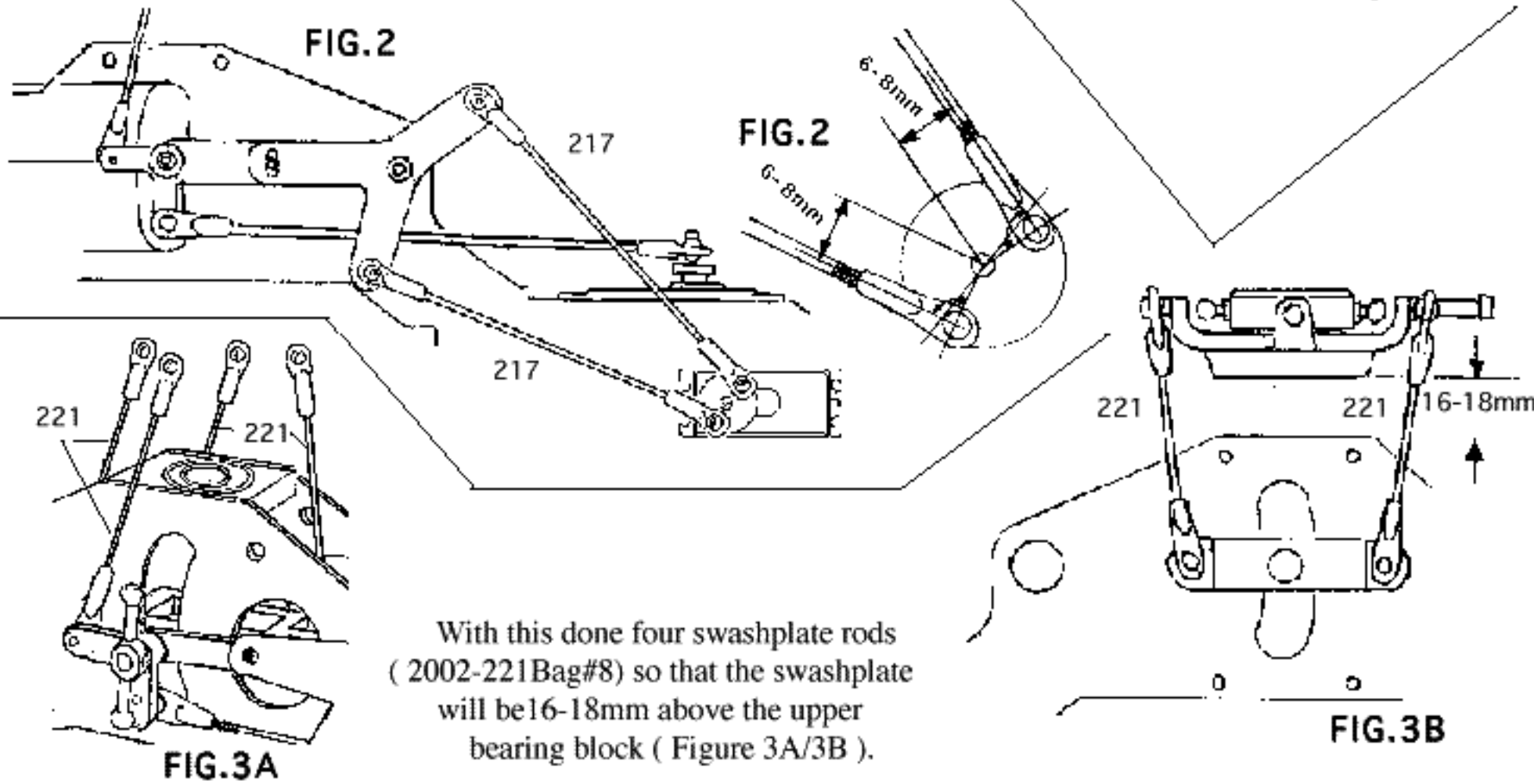
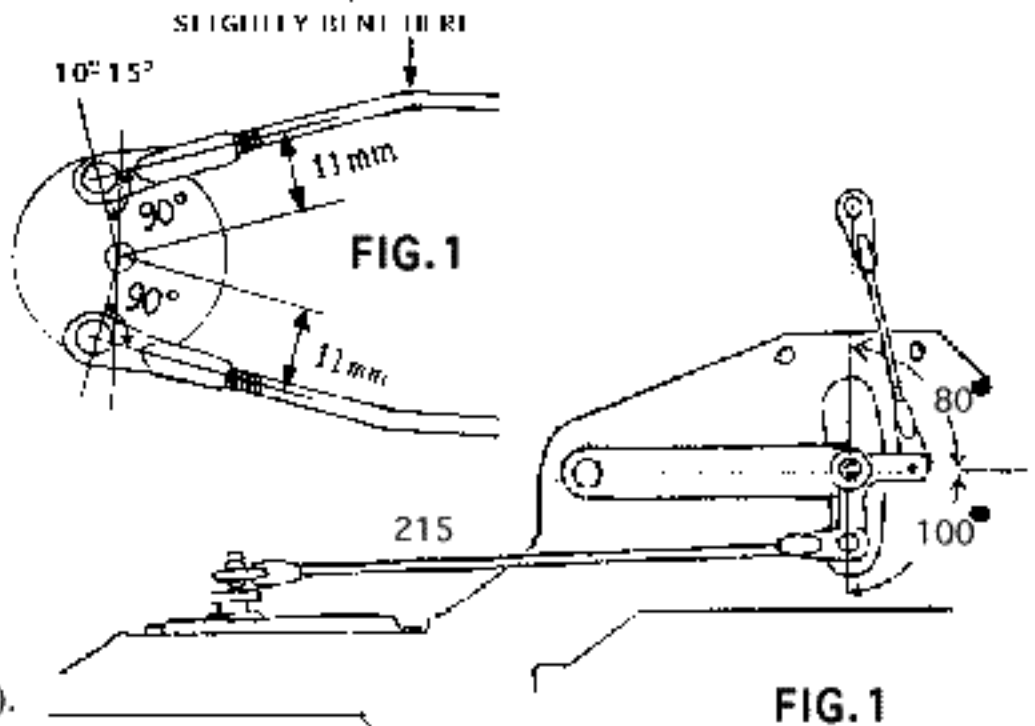
THROTTLE (ENGINE)





Step 19 Setup

All of the push rods now need to be fine adjusted to the proper length. First adjust the roll push rods (2002-215 Bag #8) so that the top edge of the bell cranks are 80 degrees with the roll servo in the neutral position(Figure1). Now adjust the collective rods (2002-217 Bag #8) so that the pitch arms are in the center of the slot within the main frame at collective half stick. When installing the control balls on the collective servo space the balls 6mm-8mm from the center of the servo wheel if using a standard radio. If using a computer radio space the balls 8mm from the center of the output wheel. This will insure that you don't have too much collective travel.(FIGURE 2).



With this done four washplate rods (2002-221Bag#8) so that the washplate will be 16-18mm above the upper bearing block (Figure 3A/3B).

Adjust the pitch control rod (2002-221 & 2002-225) as needed to achieve 4-5 degrees pitch ! (Figure 4) you need slightly bend #2002-221 to clear mixing arm too. Now using the high and low pitch trimmers on your transmitter set the low pitch to -1 degree and the high to +8 degrees ! (see your radio instruction manual). Adjust the flybar control rods (2002-219 Bag #8) so that at half collective stick the washout control arms will be level (Figure 5).

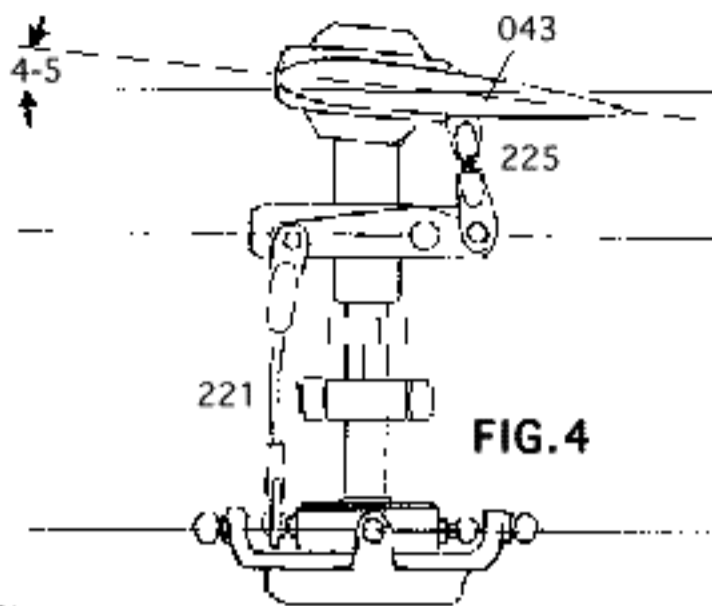


FIG. 4

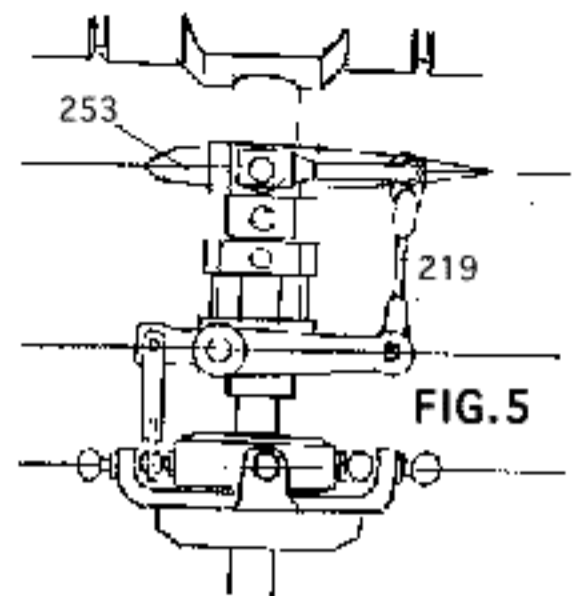


FIG. 5

Now lets move on to the throttle. Adjust the throttle rod (2002-221) and the servo arm so that at full low throttle and trim the carburetor will be completely closed, You can using throttle trim to set up idle speed. At half stick the carburetor should be open exactly 50% and at full stick the carburetor will be open to 100%. If you do not get to 100% open than your servo arm is too short and must be lengthened (Figure 6).

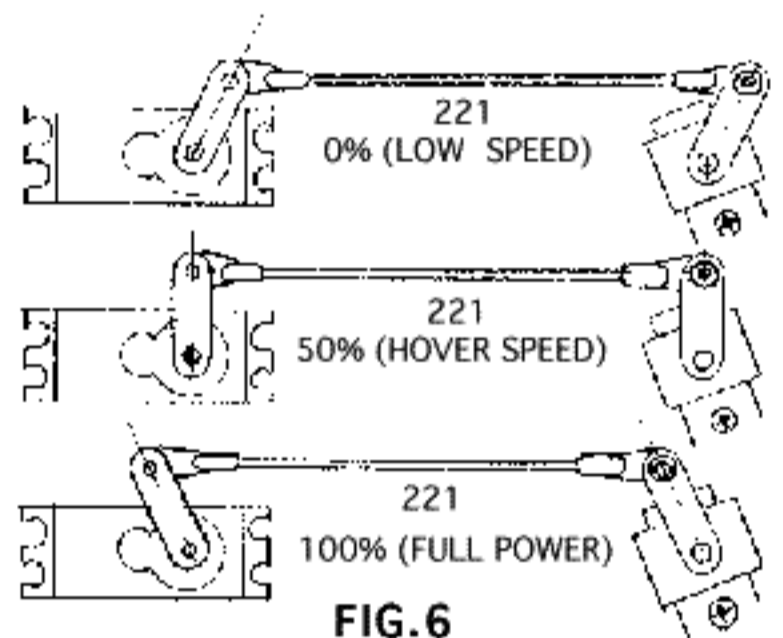


FIG. 6

Adjust the elevator lever so that it is 3 degrees forward with the swashplate level (Figure 7). The two elevator push rods (2002-213 Bag #8) must be the same length with the servo in the neutral position.

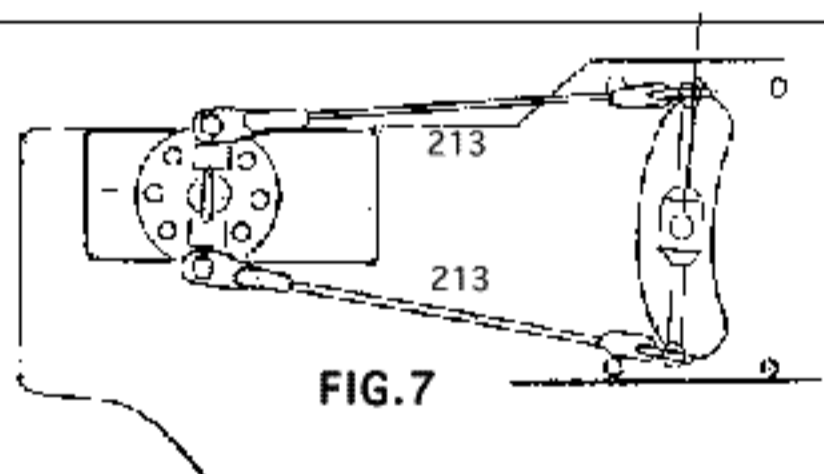


FIG. 7

The last item that needs to be adjusted is the rudder pushrod. With the servo output arm set at 90 degrees to the servo, adjust the pushrod so that the tail pitch lever is 90 degrees to the tail boom (Figure 8).

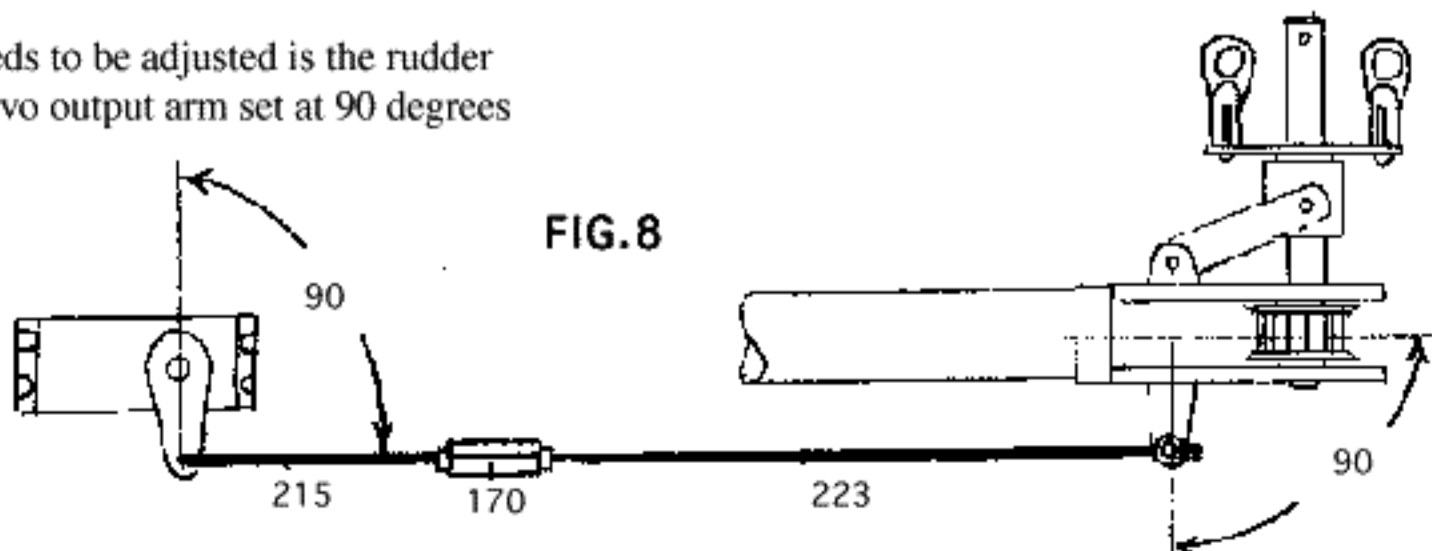


FIG. 8

Remember that this setting is at hover and must be fine tuned in conjunction with the revolution mixing on your transmitter. Set your control throws so that your swashplate tilts without any binding. Note that the swashplate must tilt to the left when left stick is applied and right when right is applied as well as forward and backward. Set the tail throw so you will get slightly more travel to the right than to the left. This will help to balance the tail control feel

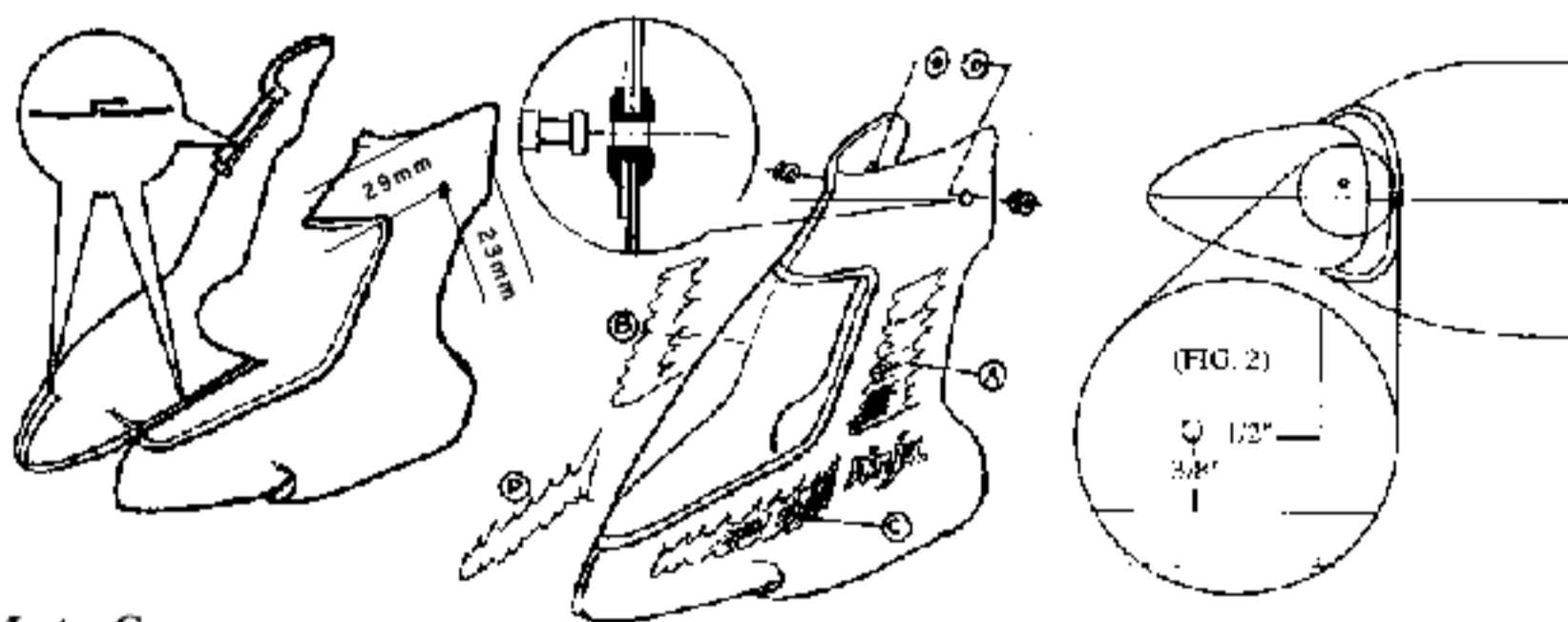
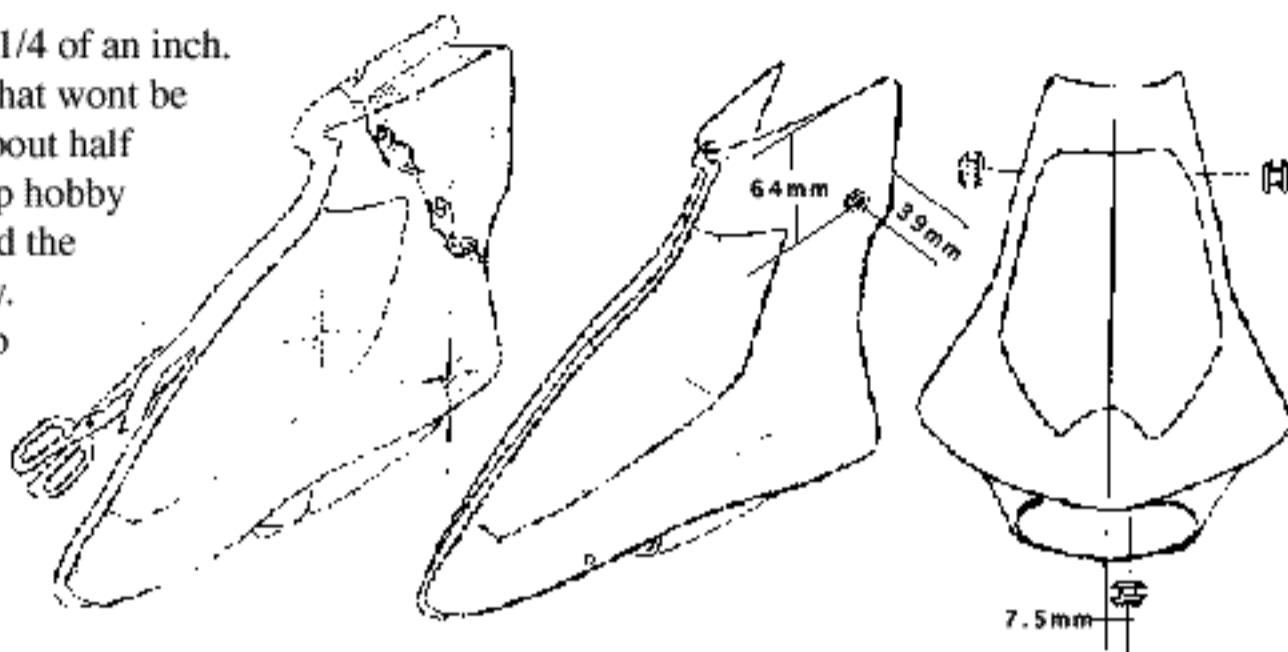
STEP 20 Canopy and Decal Ninja Pro canopy.

Start it trimming the outside flange to 1/4 of an inch.

Then trim out the back of the canopy that wont be used. This is done by scribing a line about half the thickness of the plastic with a sharp hobby knife. After the plastic has been scribed the plastic can be pulled apart rather easily.

It is advisable to practice on some scap material from the back first. After trimming is done the canopy is painted on the inside. We have found the Pactra R/C paints to work best. The blue protective film should be left on the canopy to protect it from over spray during the painting.

After the paint is dry glue the two halves together with Zap a Dap a Goo. Use clothespins to hold the two halves together while the glue dries. After the glue dries remove the protective film and admire your canopy.

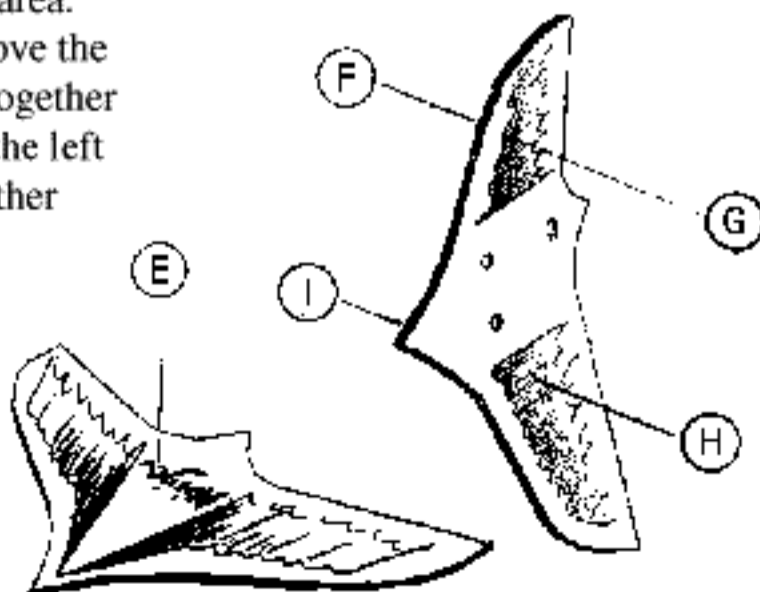


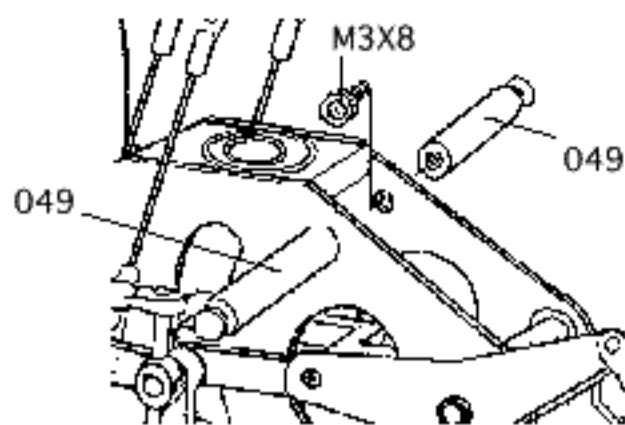
Pro Master Canopy.

The Pro master canopy is molded out of white styrene plastic. The right side of the canopy has a molded-in lip that will allow the canopy halves to overlap when finished. Trim this lip to 3/16 inch, remove the back and cockpit area.

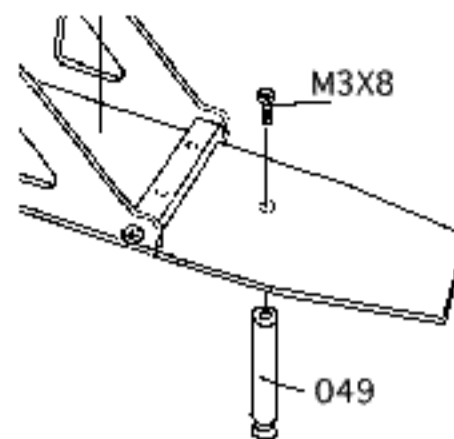
The left side of the canopy is simply trimmed to a straight line again remove the back and cockpit area. Trial fit the two halves together by taping them together from the inside. This will tell you if you need to do more trimming on the left side or not. When you are satisfied with the fit, tape the two halves together from the inside once again. Carefully wick some liquid plastic model cement into the joint between the two halves. When the glue has dried remove the tape from the inside. It is advisable to go over the inside of the seam with a bead of Zap a Dap a Goo. Next trim the windshield with a pair of curved scissors following the provided line.

Tape the windshield to the canopy and again carefully wick some liquid model cement into the seam. After this is dry apply the decals and you are finished.





INSTALL CANOPY MOUNT



STARTING ENGINE

1. First step turn on the radio receiver and gyro after confirming that every servo controlled by the correct movements.
- 2 Make a range test according to the description of the manual of your radio.
3. Remove the fuel tube and fill up the fuel tank.
4. Close engine main needle valve, than open it by 1 1/4 to 1 1/2 turns if you use OS 32 or ENYA 35. All final adjustment depends on your engine, fuel, & glow plug etc.
5. Place throttle stick at minimum position and trim at high or clear.
6. Connect glow plug to 1.5v battery for plug heat.
7. Connect the starter to 12v starter battery and check the rotation, the engine rotates counter clockwise when look from the above.
8. Holding the rotor head, rotate the starter with starting belt when the engine starts. Removed the starter and fix the belt between main frame and retaining clips (2002-057 Bag #8). if you have Pro Master use starter extension (2002-305 Bag #4M) into shaft adapter (2002-304 Bag #4M)

TEST FLYING

The first step to test flying is to run in the engine. Start the engine according to the engine manufacturers instructions. If you have a Ninja Pro Master use care not to apply any side-load on the starter while starting. This side load may bend the start shaft. Cycle the throttle from idle to operating speed and back to idle with approx. 1 minute at each setting.

Do this for two tanks of fuel. Now that the engine is run in double check for any loose nuts or bolts and re tighten them. Start the engine again and slowly bring the engine up to hover speed and look at the blade tips. If you see two separate rotor disks than you will need to do a blade tracking adjustment (Figure 9).

Make an adjustment on the pitch rod on the low blade to increase its pitch. Do this as necessary to get only one rotor disk. Now, slowly bring the throttle up until the helicopter barley lifts off. Take note where the throttle stick was at lift off. If it was less than half stick you have too much pitch, if it was more than half stick than you have too little pitch (figure 10). Lift off should happen at half stick. Lift off once more and took note if the nose of the helicopter wants to rotate one way or another. If the helicopter wants to rotate clockwise you have too much tail compensation, if the helicopter rotates counter clockwise, you have too little tail compensation. Most modern radios have an UP and a DOWN side to the revolution mixing. A good starting point is 25% on the down side and 20% on the up side. Remember that after adjusting the revolution mixing it may be necessary to re-adjust the rudder pushrod to get the proper center point again. After all the proper adjustments have been made your Ninja Pro should be ready to fly.

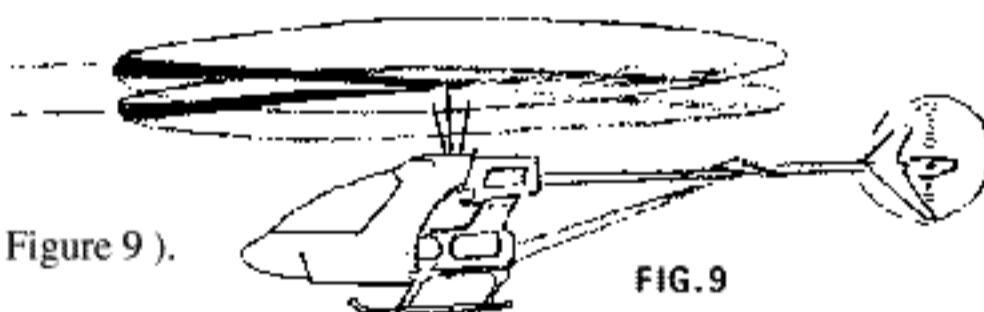


FIG.9

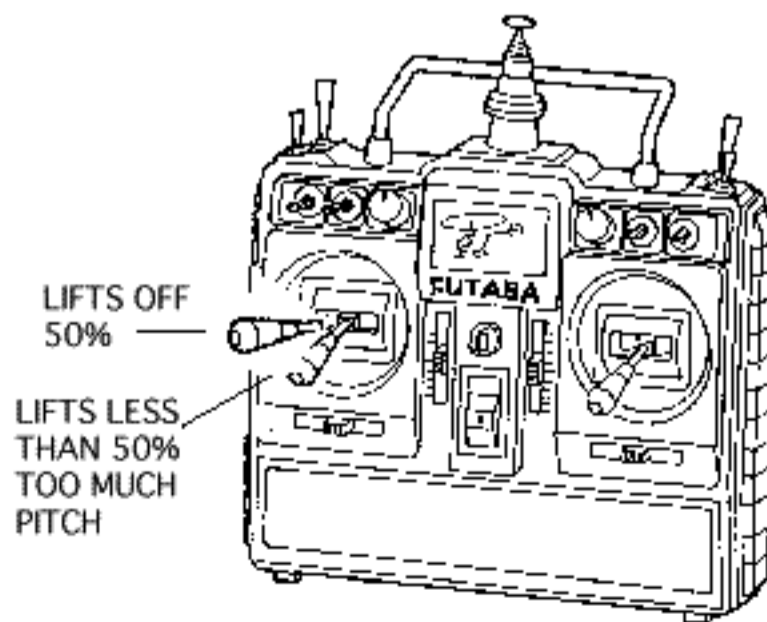
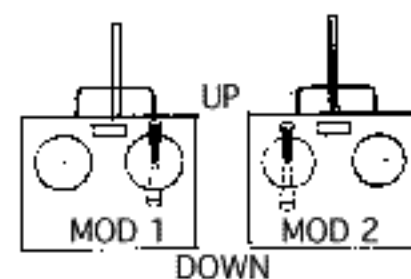
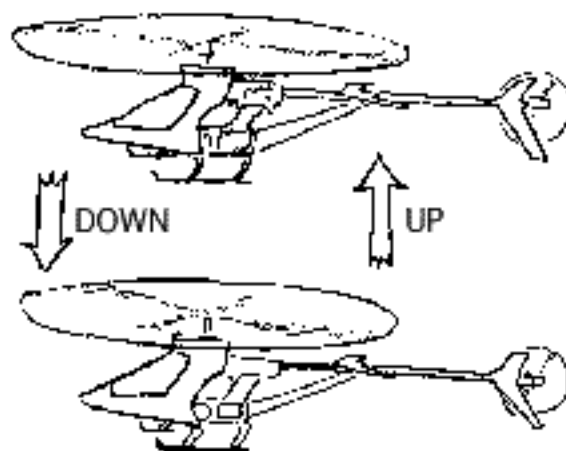


FIG.10

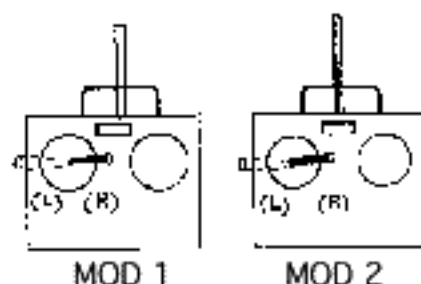
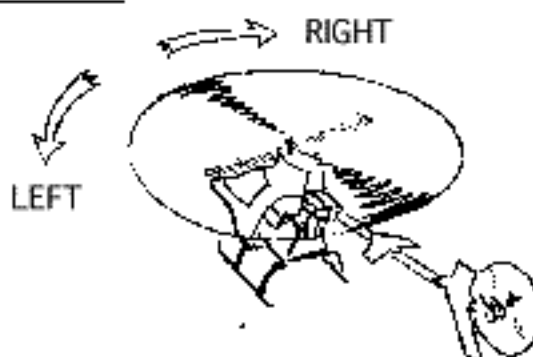
Collective and Throttle:

Slowly raise the throttle stick to HIGH, Helicopter should be lifts off at haft stick open, When helicopter is just about to take off, it inclines to some directions. Correct the inclination by using your radio trim.



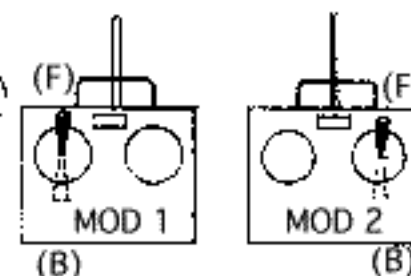
Rudder:

When the helicopter is just about to take off, make a correction trim first then use rudder stick to control Left & Right, Note! Now is good time to give your gyro a final adjustment. (see your GYRO manual.)



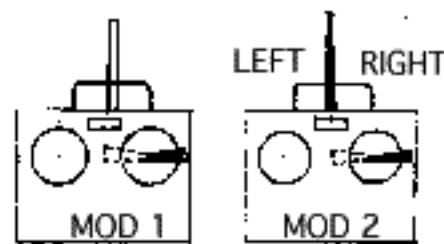
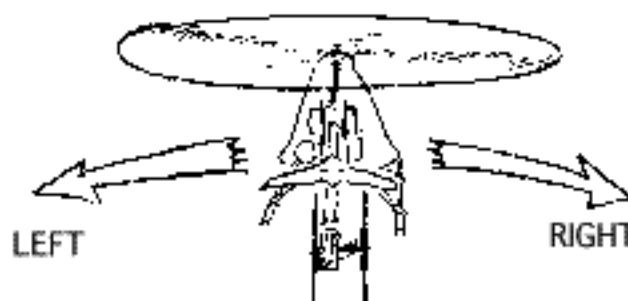
Elevator:

When the helicopter is just about to take off, make a correction trim first then use elevator stick to control Forward & Backward.



Roll(Aileron):

When the helicopter is just about to take off, make a correction trim first then use Aileron stick to control slide to Left or slide to the Right..



Ninja Pro & Pro Master Parts List

Ninja Pro 30-46 Helicopter Kit Replacement Parts List

2002-000	Ninja Metric Hardware Pack	1	19.95	D
2002-007	Main Blade Grip	1	28.95	D
2002-007A	Spacer	2	3.00	D
2002-008	Blade Grip Bearing 5x13x4	2	11.95	D
2002-009	Pitch Arm	2	14.95	D
2002-010	Main Blade Grip Assembly	1	88.95	D
2002-011	Damper Rubber	4	5.95	D
2002-013	Flybar Control Arm	1	8.95	D
2002-015	Spring Steel Flybar	1	4.95	D
2002-017	Seesaw	1	16.50	D
2002-019	Seesaw Arm	2	16.50	D
2002-020	Seesaw Ball Bearing 3x7x3F (OP)	1	14.50	D
2002-021	Washout Base Unit.....	1	26.50	D
2002-022	Ball Bearing 3x6x2.5F (OP).....	4	29.95	D
2002-022A	Ball Bearing 3x6x2.5 (Master)	4	17.95	D
2002-023	Washout Arm	2	18.50	D
2002-024	Washout Assembly (W/PI Bearing)	1	49.95	D
2002-025	Radius Link.....	2	4.95	D
2002-027	Linkage Set W/Ball End(1)	1	16.50	D
2002-026	Washout & Mixing Arm B.B.	4	17.95	D
	-3x6x2.5 (Master)			

2002-029	Flybar Paddle	2	14.95	D
2002-031	Swashplate assembly	1	64.95	D
2002-032	Swashplate Antirotation-Screw	1	3.95	D
2002-039	Mixing Arm B.B. Pack 3x6x2.5F(OP)	14	79.95	D
2002-043	Main Rotor Blade (prebuilt)	2	42.95	D
2002-049	Canopy Mount (A & B).....	3	7.95	D
2002-051	Servo Adapter Rear (A & B)	2	4.95	D
2002-055	Rx & Gyro Tray Mount	4	6.50	D
2002-057	Starter Belt Retaining Clip.....	2	2.50	D
2002-059	Collective Plastic Busing	2	1.50	D
2002-061	Collective B.B. 6x10x3F (OP)	2	12.95	D
2002-063	Fuel Tank- 10 OZ.....	1	4.50	D
2002-065	Canopy (Without Mount).....	1	22.95	D
2002-066	Landing Skid Only	2	15.95	D
2002-067	Tuf Landing Gear Set	1	29.95	D
2002-068	Landing Strut Only	2	15.95	D
2002-069	Elevator Lever	1	19.50	D
2002-070	Elevator B.B. 4x8x3F (OP)	2	12.95	D
2002-071	Collective Pitch Lever Set	1	12.95	D
2002-072	Elevator Plastic Bushing	2	1.50	D
2002-073	Rudder Mount Plate	1	12.95	D
2002-075	Push Pull Collective "Y" Lever	1	5.50	D

2002-077	Swashplate Antirotation Bracket	1	12.95	D	2002-191	Tail Pitch Lever W/B.B.	1	15.95	D
2002-079	Landing Gear Support	2	11.50	D	2002-193	Tail Output Shaft With Pulley	1	12.95	D
2002-081	Pinion Bearing Block	3	7.50	D	2002-197	Tail Output Shaft Ball Bearing	2	12.50	D
2002-083	Main Shaft Block	2	5.25	D	2002-199	Tail Shaft Hub	1	11.95	D
2002-085	Tail Boom Support Holder	6	7.50	D	2002-200	Tail Pitch Assembly	1	39.95	D
2002-087	Tail Drive Pinion Gear	1	9.95	D	2002-201	Tail Pitch Control Plate	1	6.50	D
2002-089	Side Frame Spacer 14mm	8	11.95	D	2002-202	Tail Pitch Plate Special Screw	1	4.95	D
2002-091	Threaded Spacer 14mm	2	5.00	D	2002-203	Tail Pitch Inner Sleeve W/Washer	1	5.50	D
2002-093	Threaded Spacer 26mm	4	9.25	D	2002-204	Tail Pitch Plate Ball Bearing	2	10.75	D
2002-094	Threaded Stub	2	4.25	D	2002-205	Tail Pitch Housing	1	10.75	D
2002-095	Threaded Spacer 57mm	2	6.50	D	2002-206	Tail Blade Grip Assembly	1	15.75	D
2002-096	Colling Fan Spacer (.46)	1	2.95	D	2002-207	Tail Blade Gripe	4	4.25	D
2002-096A	Cooling Fan W/Pully	1	22.50	D	2002-209	Tail Blade Grip B.B.	2	11.50	D
2002-097	Cooling Fan (.46)	1	9.95	D	2002-211	Tail Blade Grip Spacer	2	0.95	D
2002-097A	Cooling Fan Pully (.46)	1	12.50	D	2002-212	Push Rod Complete Set	1	11.50	D
2002-098	Fan Cover Bracket (.46)	1	4.50	D	2002-213	Push Rod-Elevator 68mm	2	2.00	D
2002-099	Engine Mount (.30-.36)	1	14.50	D	2002-215	Push Rod-Aileron 100mm	3	3.00	D
2002-101	Engine Mount (.40-.46)	1	18.50	D	2002-217	Push Rod-Collective 80mm	2	2.00	D
2002-103	Clutch Ball Bearing 4x9x4	1	8.95	D	2002-219	Push Rod-Pitch Arm 25mm	2	2.00	D
2002-105	Cooling Fan Cover (.30)	1	8.95	D	2002-221	Push Rod-Swashplate Control, Throttle, Hiller Control 40mm	7	4.50	D
2002-107	Cooling Fan Cover (.46)	1	18.95	D	2002-223	Push Rod-Rudder Control 476mm	1	2.50	D
2002-109	Starter Belt 500mm	1	6.95	D	2002-225	Push Rod-Pitch 12mm	1	2.00	D
2002-111	Servo Tray	1	6.95	D	2002-226	Steel Ball End Swashplate Inner 3x7 2	1	4.50	D
2002-113	Battery Tray	1	5.95	D	2002-227	Fiberglass Tail Rotor Blade (OP)	2	14.95	D
2002-115	Lower Side Frame	2	29.95	D	2002-228	Fiberfilled Tail Rotor Blade	2	6.95	D
2002-117	Upper Side Frame	2	29.95	D	2002-229	Steel Ball End-Elevator 3x4.5	2	4.50	D
2002-119	Gyro Plate	1	4.95	D	2002-230	Micro Washer 3x4.5x0.5t	10	2.75	D
2002-120	Servo, Battery & Gyro Tray	3	14.95	D	2002-231	Steel Ball End-Pitch 3x14	2	4.75	D
2002-121	Main Shaft	2	12.50	D	2002-232	3mm Lock Nuts	10	3.95	D
2002-123	Main Shaft Stopper	1	3.95	D	2002-233	Ball Link-Long	10	5.95	D
2002-125	Main Shaft Ball Bearing 8x19x6	2	12.95	D	2002-234	Cooling Cover Extension-.30 (OP)	1	7.95	D
2002-127	Clutch Bell W/Gear & Lining	1	39.95	D	2002-235	Ball Link-Short W/Special Tail Link	6	4.50	D
2002-129	Clutch Lining	2	2.95	D	2002-237	Clip & Screw-Seesaw	4	4.95	D
2002-131	Clutch & Pinion B. B. 6x17x6	3	18.95	D	2002-238	Complete Plastic Bearing Set	1	5.95	D
2002-133	Timing Pully	1	2.95	D	2002-239	Steel Ball-5mm	10	5.95	D
2002-135	Main Gear	1	22.95	D	2002-240	Epoxy Fiberglass Canopy (OP)	1	64.95	D
2002-136	Autorotation Set	1	44.95	D	2002-241	First Aid Spare Parts Kit (OP) Main Shaft, Main Blade, Tail Boom, Tail Blade, Flybar	5	85.95	D
2002-147	Clutch Shoes	1	22.95	D	2002-242	Ninja Pro Canopy Decal	1	10.95	D
2002-149	Starter Pulley	1	19.95	D	2002-243	Ball Bearing Upgrade Kit-20 Pcs (OP)	1	109.95	D
2002-151	Cooling Fan (.30)	1	19.95	D	2002-244	Instruction Manual	1	10.95	D
2002-153	Elevator Lever Axle (Long)	2	6.95	D	2002-245	Assembly & Adjustment Video Tape	1	24.95	D
2002-155	Elevator Lever Axle (Short)	5	6.95	D	2002-248	.30 Engine Conversion Kit (OP)	1	143.95	D
2002-157	Collective Pitch Lever Axle	1	9.50	D	2002-249	.46 Engine Conversion Kit (OP)	1	51.90	D
2002-159	Aileron Bell Crank Lever Set	2	4.95	D	2002-250	Ninja Pro Master Canopy Set (OP)	1	28.95	D
2002-160	3x6x2.5 Plastic Bushings	4	1.50	D	2002-251	Pro Master White Coated Epoxy Fiberglass Canopy Set (OP)	1	64.95	D
2002-161	Elevator Ball Crank Lever	1	9.95	D	2002-252	Kevlar Timing Belt (OP)	1	22.95	D
2002-163	Elevator Servo Rocker Pin	1	0.95	D	2002-253	Pro Master Flybar Paddle (OP)1	2	14.95	D
2002-165	Elevator Servo Rocker Coupler	2	8.95	D	2002-254	Gold Side Frame Spacer Set (OP)	1	29.95	D
2002-166	Elevator Servo Rocker Mount	1	0.95	D	2002-255	Pro Master Ball Bearing Kit (OP)	1	54.95	D
2002-167	Servo Wire Lock	2	0.95	D	2002-300	Shaft Start Assembly (Hex system)1	1	96.95	D
2002-169	Servo Mounting End	10	4.50	D	2002-300	Shaft Start Assembly (One way system) ..	1	96.95	D
2002-170	Rudder Control Rod Connector	1	0.95	D	2002-301	Shaft Start Bearing Block	1	15.95	D
2002-171	Tail Push Rod Guide	3	5.95	D	2002-302	Shaft Start Clutch	1	22.95	D
2002-173	Tail Boom	1	12.95	D	2002-303	Shaft Start Clutch Bell	1	39.95	D
2002-175	Horizontal & Vertical Fin	2	22.95	D	2002-304	Shaft Start (One Way) Adapter	1	18.95	D
2002-179	Tail Boom Support Rod	2	9.95	D	2002-305	Shaft Start Extension (One Way)	1	12.95	D
2002-183	Timing Belt	1	22.95	D	2002-306	Shaft W/Uniball	1	15.95	D
2002-184	Metal Tail Gear Box Assembly	1	89.95	D	2002-307	Shaft Start Bearing Block W/B.B.	1	28.95	D
2002-185	Tail Gear Box Sideplate W/B.B.	2	48.95	D	2002-308	Shaft Start (Hex) Adapter	1	14.95	D
2002-186	Tail Gear Box Housing Only	1	12.95	D	2002-309	Shaft Start Extension (Hex)	1	18.95	D
2002-187	Tail Gear Box Housing	1	14.50	D					
2002-188	Tail Gear Box Spacer Pack	1	6.50	D					
2002-189	Tail Guide Pulley W/B.B.	1	12.50	D					