FALCON III

Instruction Manual

SPECIFICATIONS

* MAIN ROTOR DIAMETER	53 in.
* TAIL ROTOR DIAMETER	9.3 in.
* OVERALL LENGTH	47.5 in.
* HEIGHT	15.2 in.
* ENGINE	46 ~ 50
* BALL BEARINGS	29

Century Helicopter Products

Designed and Developed in USA

1st Edition April, 2000

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Introduction for the FALCON III helicopter kit

Congratulations on your purchase of Century Helicopter Product's 46 size RC helicopter model. The Falcon helicopter is the ideal aerobatic trainer for beginners new to the hobby through to intermediate pilots and aircraft modelers wanting to get involved in RC helicopters. This kit is best suited to a helicopter radio and engine and includes necessary hardware and instructions to assemble the kit. Be sure to check with us or your local dealer for compatible components.

Building on Success

The Falcon III features the proven control system from our previous Falcon and includes a new10mm main shaft and control system with 4mm flybar for the rigors of 3D and aerobatic flying. At 29 ball bearings a 10 oz fuel tank and full 600mm blades, the Falcon III is a strong contender for learning 3D. New thicker lower side frames and an improved cooling system ensure high performance and reliability yet benefits from the low part replacement costs of all our helicopter kits.

Warning

This radio controlled model is not a toy! It is a precision machine requiring proper assembly and setup to avoid accidents. It is the responsibility of the owner to operate this product in a safe manner as it can inflict serious injury otherwise. It is recommended that if you are doubt of your abilities, seek assistance from experienced radio control modelers and associations. As manufacturer, we assume no liability for the use of this product.

AMA Information

We recommend that all radio control helicopter and aircraft pilots join the Academy of Model Aeronautics to benefit from fellow modelers in helicopters divided by district across the USA. The AMA is a nonprofit organization that publishes a monthly magazine each month and offers a liability insurance policy in the event that your model damages property and/or causes bodily harm. All AMA chartered clubs require individuals to hold a current AMA licence prior to operation of any model at their club.
For further information contact:

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302 USA
(312) 287-1256

Pre Assembly Information

Upon opening the kit, all the major component parts are bagged and numbered for ease of assembly which correspond to the sections of the manual. Various assemblies have been pre-assembled only requiring the final assembly and installation onto the particular part, screws and nuts required for each step are packaged in the same bag as the parts. Be careful when opening each bag as not to lose any hardware. Care has been taken in filling and packing of each bag however mistakes do happen, if there is a parts shortage or missing hardware please contact us at:

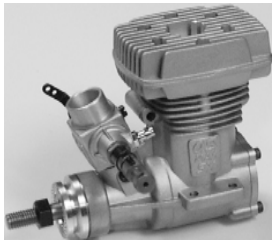
Century Helicopter Products
523 Sinclair Frontage Road
Milpitas, CA 95035
408.942.9525

Necessary Items "Not Included" in the kit.

6 Channel Helicopter Radio or Equivalent.

Dual Rate
Piezo Gyro CN2018

Glow Remote Adapter
CN2222



46-50 Helicopter Engine

Tuned Muffler 46 size
CN3033A

Necessary Tools for Assembly and Adjustments

Main Blade Pitch Gauge
w/PaddleGauge
CN2026

Needle Nose Plier
& Cutter Pliers

15% or 30%
Heli Fuel

12Volt Start Battery

Fuel
Line

12Volt
Starter

5.5mm,7mm, Phillips
Screw Driver

4 Way Wrench
#CN2031

Ball Link
Plier
CN2034

Metric
Ruler

Glow Starter w/Charger

Eletric Fuel
Pump or
Hand Pump

Whip Antenna

Hobby
Scissors

Glow Plug

Fuel Filter

Tie-Wraps

Locktite

Servo Tape

Allen Key Set CNBN10946

Hobby Knife

Lubrication CN2024T

Falcon 46 III Construction Manual

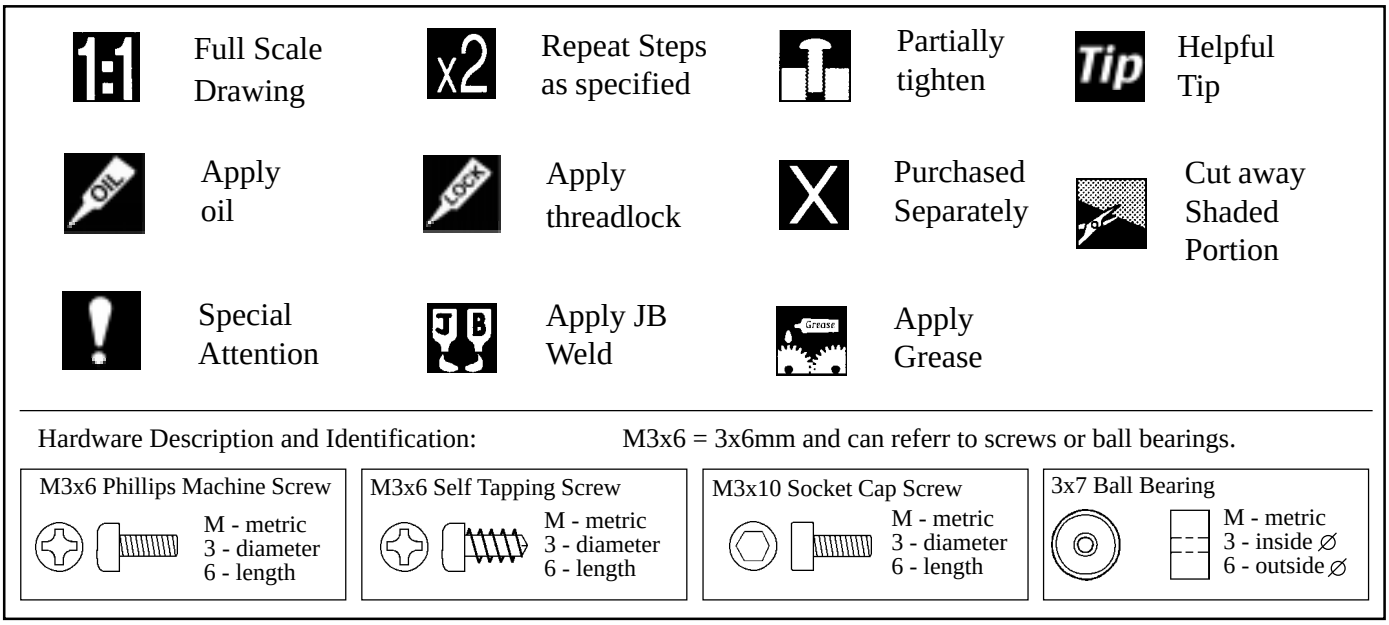
This manual has been written for the Falcon III helicopter, the main portion of the manual covers the full construction of the kit using a helicopter engine and radio. For those modelers with airplane equipment, 5 servos and "Y" harness can be used control throttle and collective together.

Every attempt has been made to ease the assembly of your kit, at each step where there are complex instructions there are detailed written instructions to walk you through the building process.

Remember to take a few minutes before each step to carefully examine each step to become familar with the parts and assembly before beginning that step.

Falcon III helicopter kit Complete Steps 1 through 45.

Symbols used to help assist you in building the kit:



Recommended Tools & Accessories

The tools and materials listed below are the minimum needed to build the helicopter:

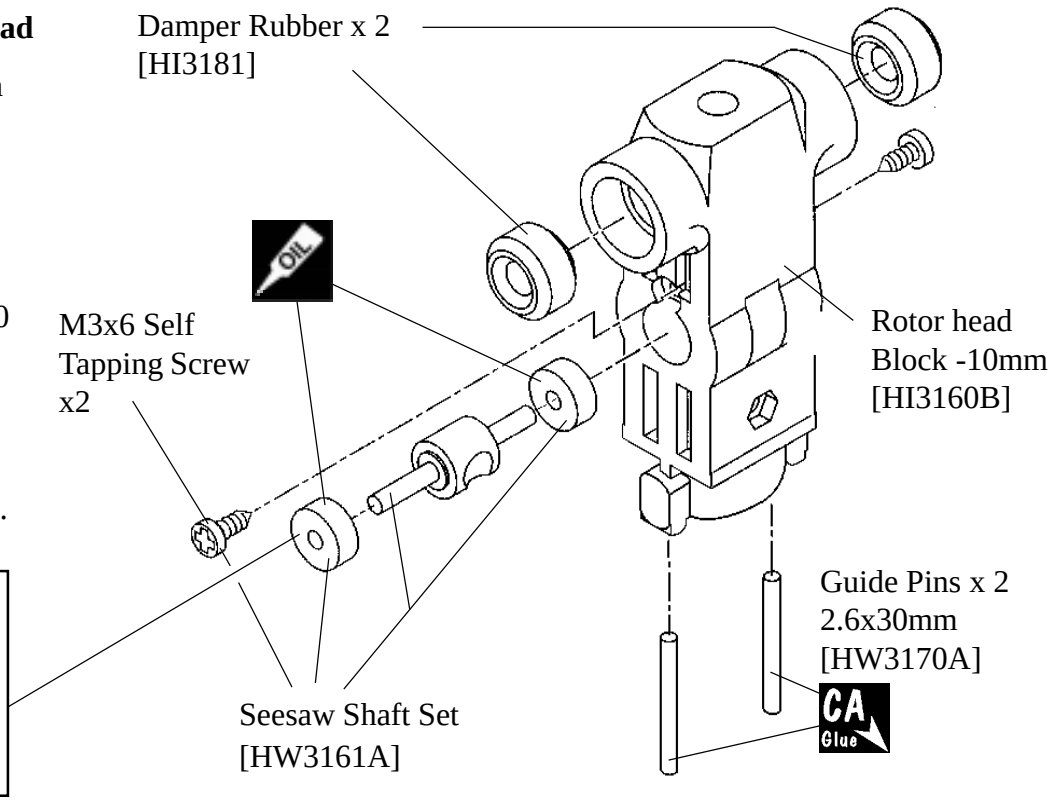
Screwdrivers - Slotted and Phillips head.
Long-Nosed Pliers.
Allen Wrenches - 1.5mm, 2.0mm, 2.5m.
(supplied in kit) + 3.0mm
Appropriate Socket Wrench
(glow plug wrench for engine shaft nut)
Scissors
Double Sided Foam Tape (1/16" - 3/32")
Foam Rubber (radio packing)
JB Weld
Locktite (thread lock liquid).
Hobby Grease (Super Lube)
Oil to lubricate sliding shafts.

In addition, the following will make assembly and setup easier, and prove useful later in your model toolbox:

Ball link Pliers.
Pitch Gauge.
Main Blade Balancer.
Hi-Point Balancer.
Flybar Lock.
5.0mm Open End Wrench.
5.5mm Open End Wrench.
7mm Open End Wrench.
Cir Clip Pliers.

STEP 1 Main Rotor Head

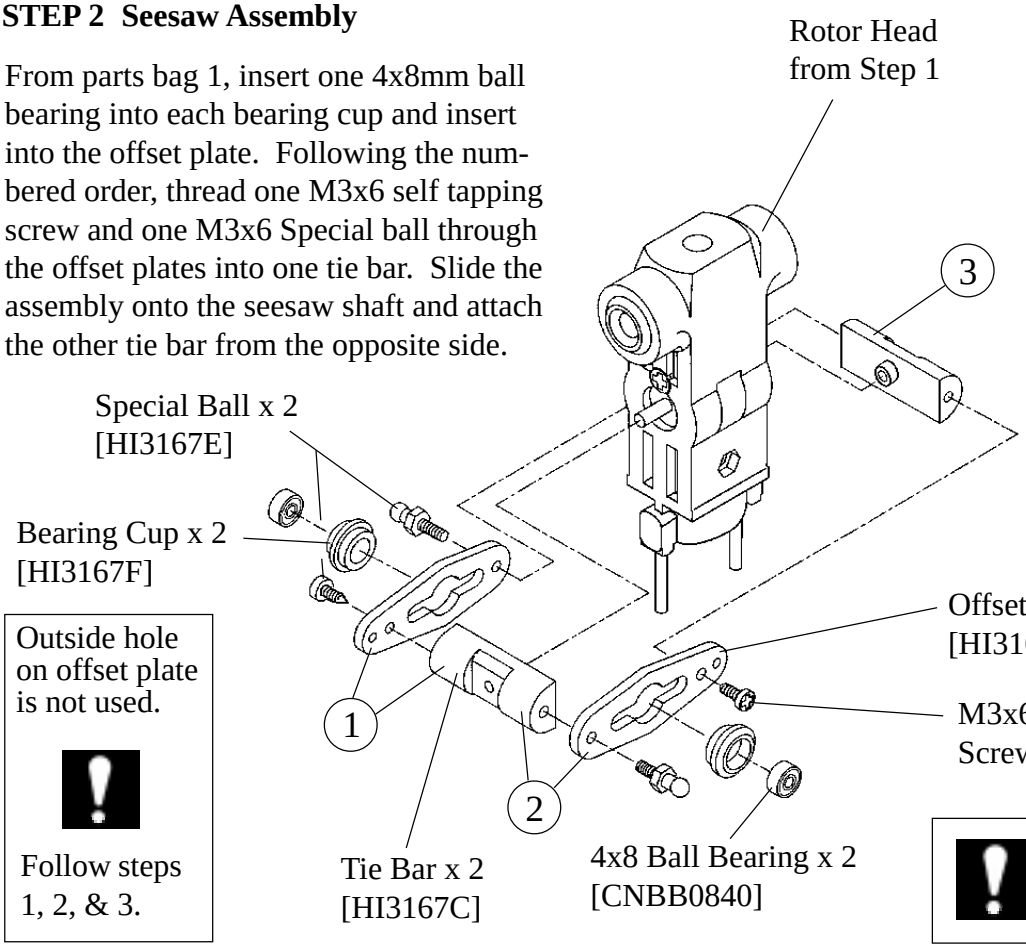
From parts bag 1, press in the Damper Rubbers and the Guide Pins into the Head Block. Apply one drop of medium CA glue after the pins are fully seated. Install one M3x10 oilite bearing onto each side of the seesaw shaft and insert into the Head Block. Fasten the two M3x6 self tapping screws.



Optional Seesaw Ball Bearings CNBB1030 x 2

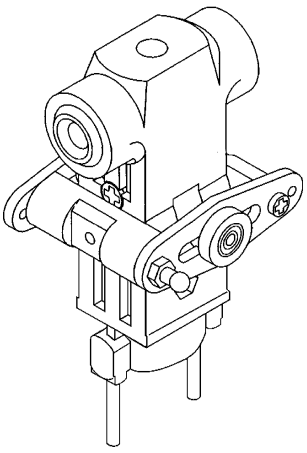
STEP 2 Seesaw Assembly

From parts bag 1, insert one 4x8mm ball bearing into each bearing cup and insert into the offset plate. Following the numbered order, thread one M3x6 self tapping screw and one M3x6 Special ball through the offset plates into one tie bar. Slide the assembly onto the seesaw shaft and attach the other tie bar from the opposite side.



Outside hole on offset plate is not used.

Follow steps 1, 2, & 3.

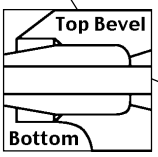


Completed rotor head.

Take notice of the location of the two steel balls on the offset plates.

STEP 3 Main Blade Grip Assembly

Note, the long ball is installed pointing away from the **top** of the blade grip.



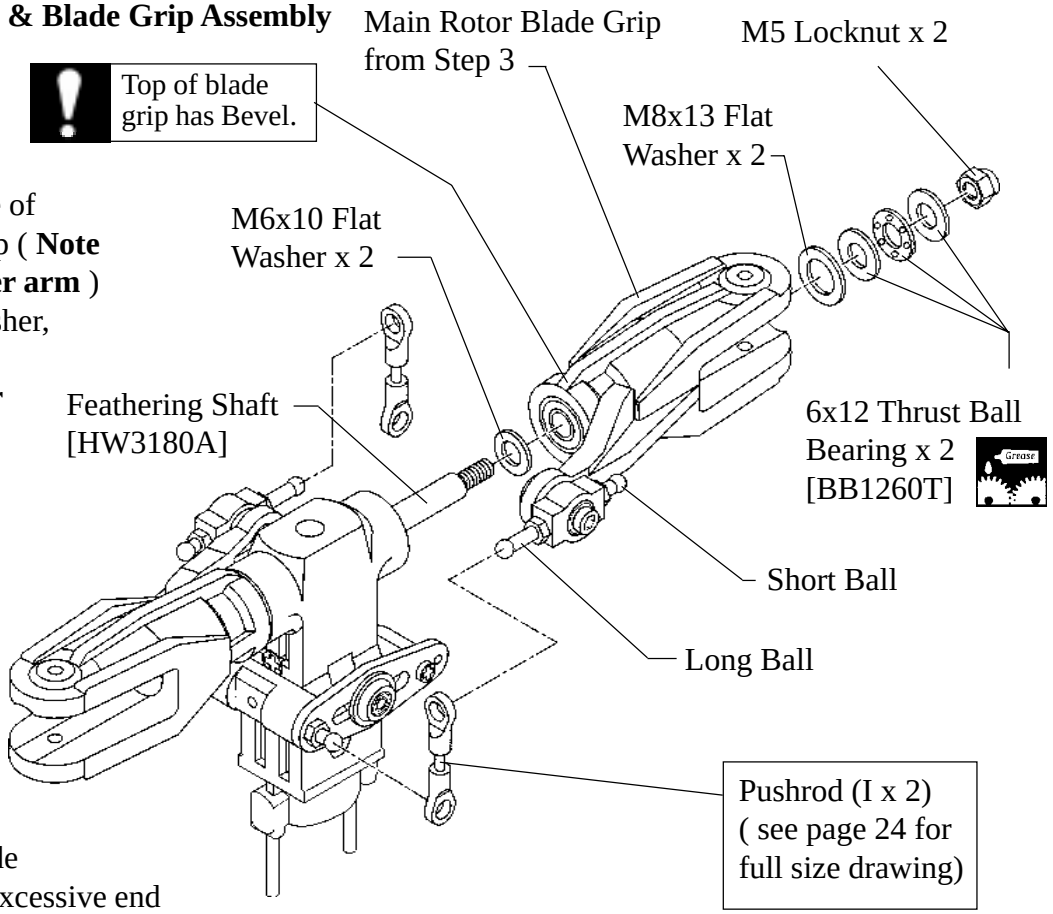
Side View

From parts bag 1, install one Long Ball and one Short Ball into the Bell Mixer, insert the slide tube into the bell mixer arm (**Note: the oilite bearings are pre-installed**) and secure onto the blade grip with one M3x16 Socket Cap screw and M3x7 Flat washer. Install two M6x13 Ball Bearings into both ends of the blade grip assembly. Complete the second blade grip in exactly the same way.

STEP 4 Feathering Spindle & Blade Grip Assembly

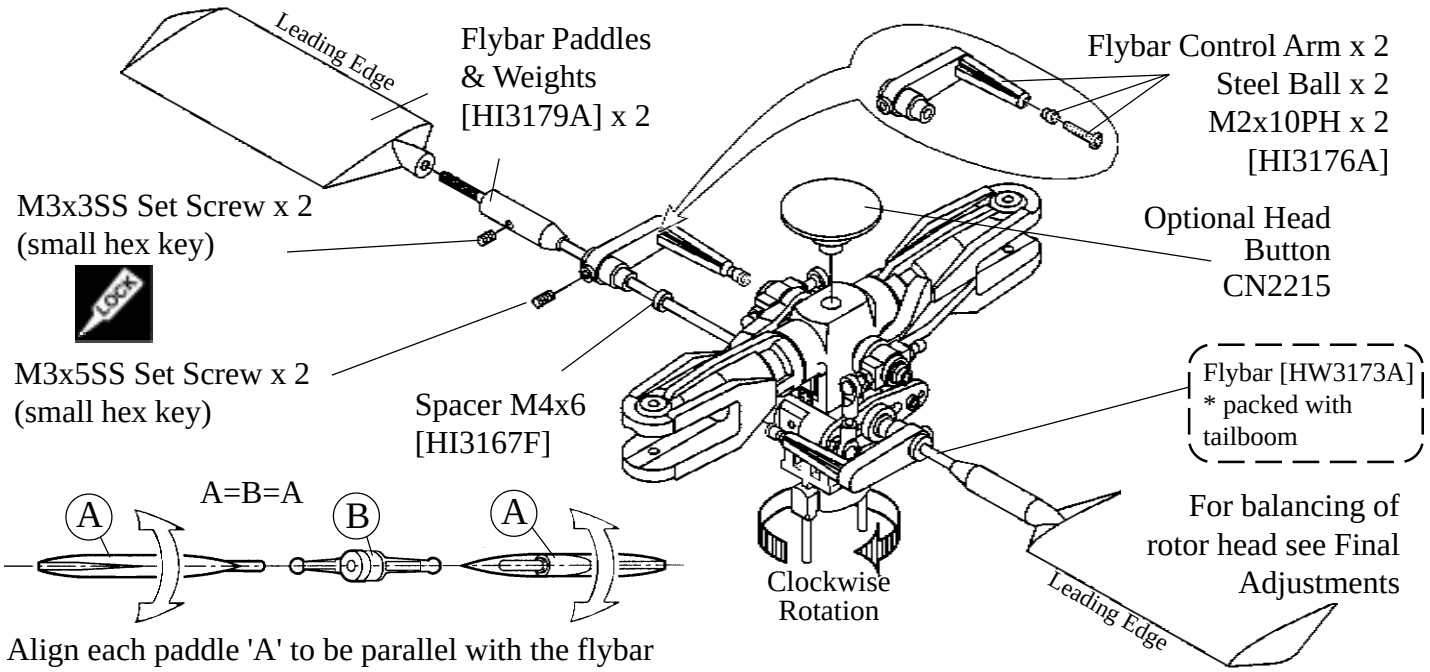
Top of blade grip has Bevel.

From parts bag 1, insert the Feathering Shaft into the head block, slide one 6X10mm Washer on each side of the shaft. Install the blade grip (**Note the direction of the bell mixer arm**) followed by one 8x13mm Washer, one 6x12 Thrust Ball Bearing (**install the first steel washer (large inside diameter) followed by the ball race, remember to grease the ball race, followed by the second steelwasher (smaller inside diameter)** and one 5mm Locknut. Tighten the locknut, using the glow plug socket wrench on one nut while holding the other with pliers, tighten the nuts until both blade grips turn freely without any excessive end play. Assemble Pushrod I x 2,measuring 33mm end to end following the diagram on page 24, and connect the seesaw arm to the long ball on the bell mixer.



Step 5 Flybar and Paddle Assembly

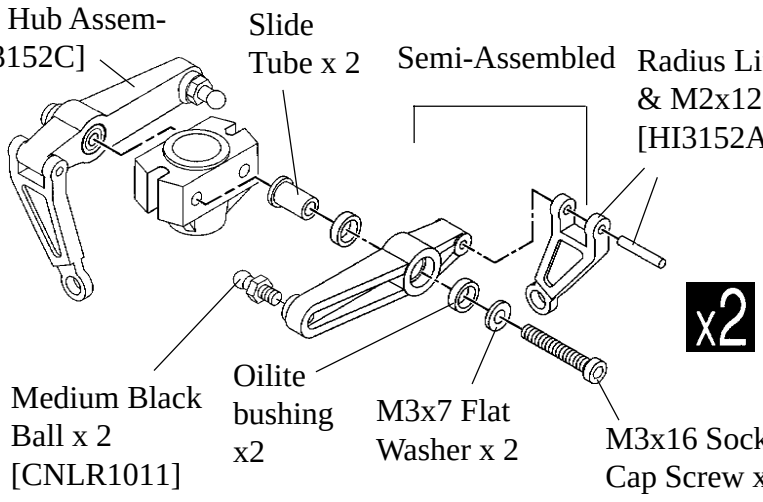
From parts bag 1, slide and center the Flybar through the seesaw arm assembly. Install one Steel ball onto each flybar control arm with one 2mm screw, the hole on the arm is slightly too small, open slightly before inserting the screw, slide the Spacer, Flybar Control Arm on the flybar. Loosely tighten the control arms. Using a ruler, check the distance between the end of the flybar and the control arm and adjust until the lengths are the same and there is no free play between the control arms and the rotor head. Remove one set screw at a time, apply threadlock and tighten in place. Slide the Flybar Weight (**Tip**: the flat end of the weight faces the paddle) and thread on the Flybar Paddle until all the threads are covered onto the flybar and align the paddles parallel. Again using the ruler, rotate one paddle or the other to get equal distances, remember leading edge of the paddles turn clockwise. Using two 3x3mm Set Screws secure the weights using threadlock.

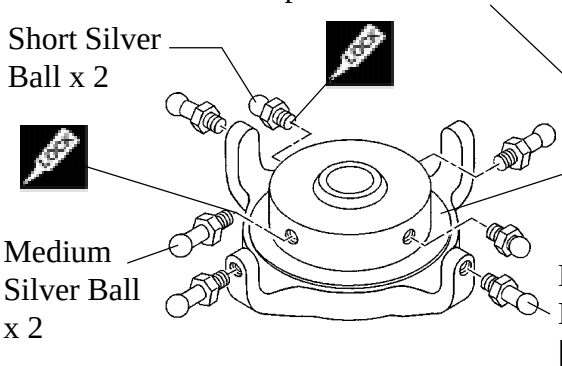


Align each paddle 'A' to be parallel with the flybar control arms 'B'. This is made very simple with the optional pitch and paddle gauge CN2026

Step 6 Washout & Swashplate

Attach two Short Balls to the Washout Mixing Arms (**Note, attach from the flat side of the arm**). Secure the semi-assembled mixing arms onto the Washout Hub using one slide tube inserted from the flat side and secured using one 3x16mm Socket Cap Screw and 3x7mm Flat Washer per arm (**note, use the left side hole on the hub**). Press the radius link on to the inner short balls on the Swashplate.

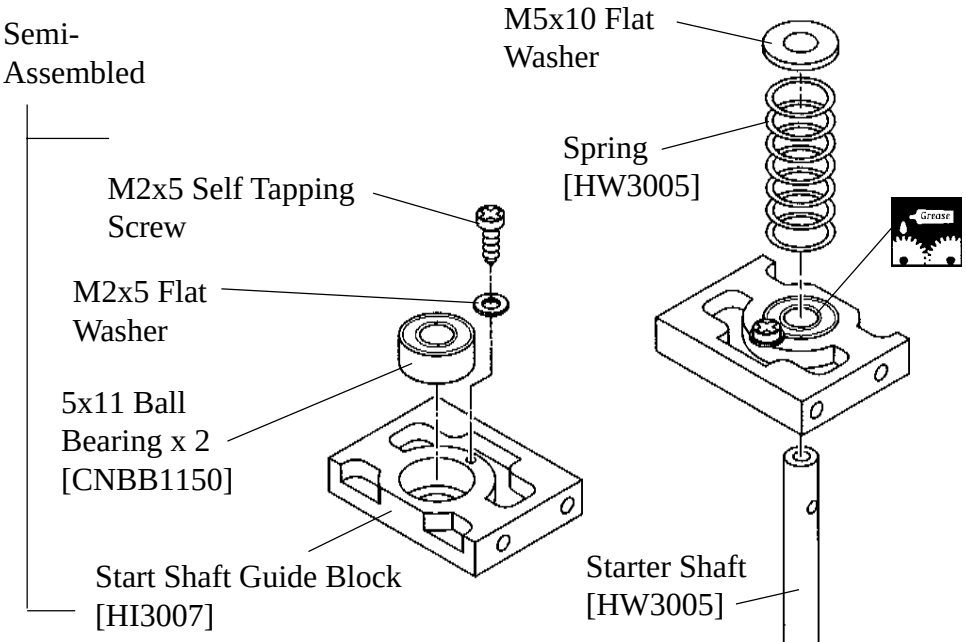




Starting with the inside race, apply threadlock and attach two short silver balls directly across from each other, similarly attach two medium silver balls to the remaining holes. Attach the three medium black balls to the outside race. The rear location is not used.

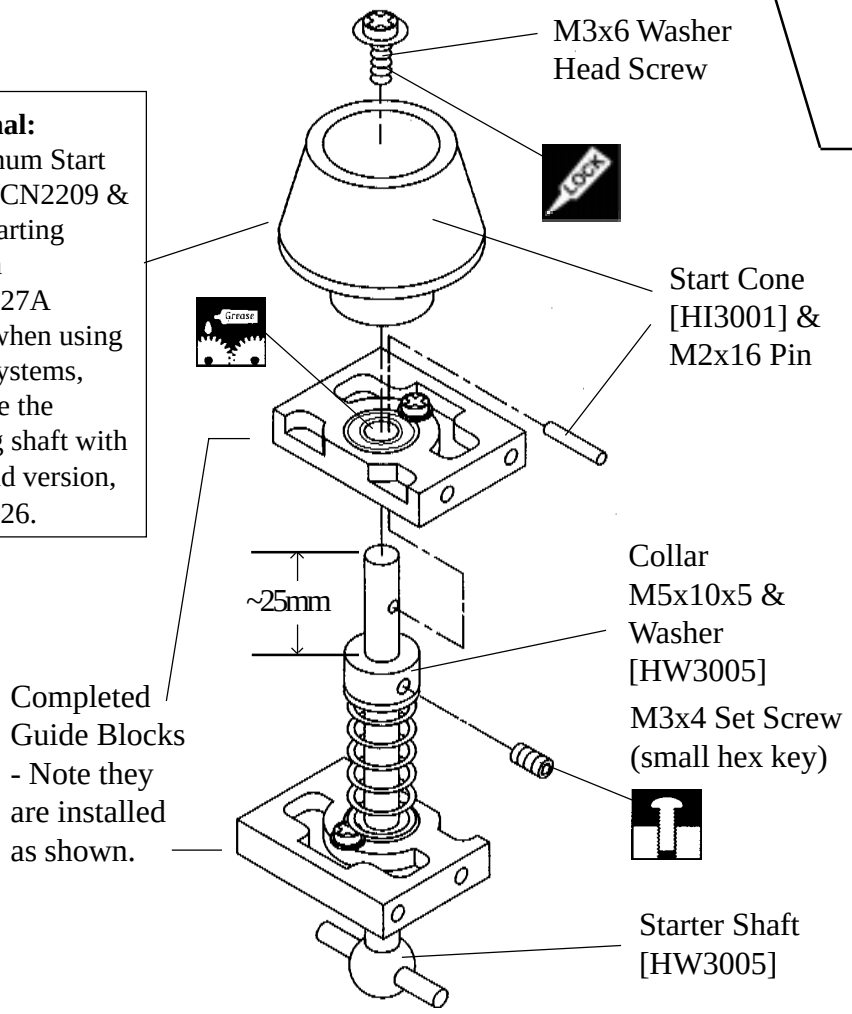
Step 7 Starting Shaft Bearing Blocks

From parts bag 2, the Start Shaft Guide Blocks are pre-assembled. Slide the Starter Shaft through one of the block assemblies with the M5x11 Ball Bearing facing up and slide the spring and 5mm Washer onto the shaft.



Step 8 Starting Shaft

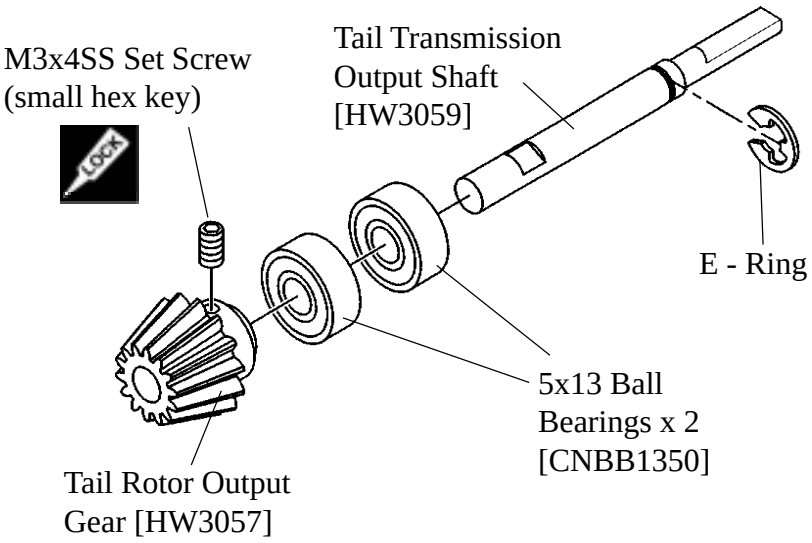
Optional:
Aluminum Start Cone #CN2209 & Hex Starting System #CN0427A
Note: when using these systems, upgrade the starting shaft with the solid version, #CN2226.



From parts in bag 2, slide the M5x10 Collar spaced approximately 25mm from the top of the start shaft and partially tighten with one M3x4 Set Screw. (After the engine assembly is installed the position on the start shaft will be adjusted to allow the starting shaft to disengage from the cooling fan.) Assemble the Starter Cone by installing the second Guide Block onto the start shaft, insert the pin through the hole in the top of the shaft and press the Start Cone over the pin, finally secure with one M3x6mm Washer Head Screw from inside the cone using threadlock. Apply some lubricant on the shaft after assembly to ensure smooth operation.

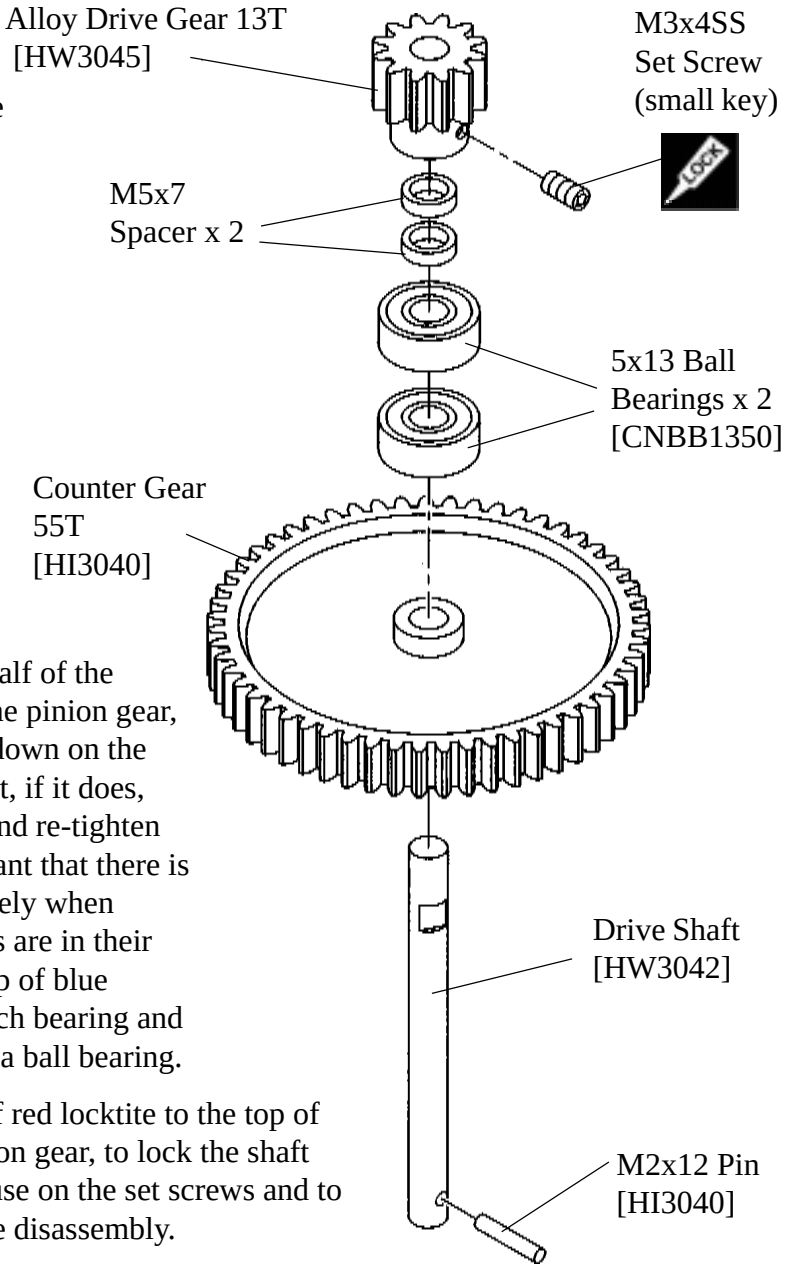
Step 9 Tail Drive Pinion Gear

From parts bag 2, assemble the Tail Transmission Output Gear. Install the E-Ring then slide two Ball Bearings onto the Tail Rotor Output Shaft. Insert one 3x4mm Set Screw using threadlock into the gear, note where the flat spot is on the shaft and slide the gear on and tighten the set screw (**Make sure the set screw is positioned over the flat spot**).



Step 10 Counter Gear Assembly

From parts bag 2, assemble the engine drive gear assembly, start by pressing the guide pin into the hole in the end of the Drive Shaft. Insert the shaft through the Counter Gear (**make sure the pin is fully seated in the recessed side of the gear**) then slide the two M5x13 Ball Bearings followed by two M5x7 spacers. Clean the top of the shaft and the set screw and apply a small amount of threadlock to lock the gear to the shaft. Insert one 3x4mm Set Screw into the Alloy Drive Gear, then slide the gear onto the shaft taking care to position the set screw over the flat spot on the shaft.

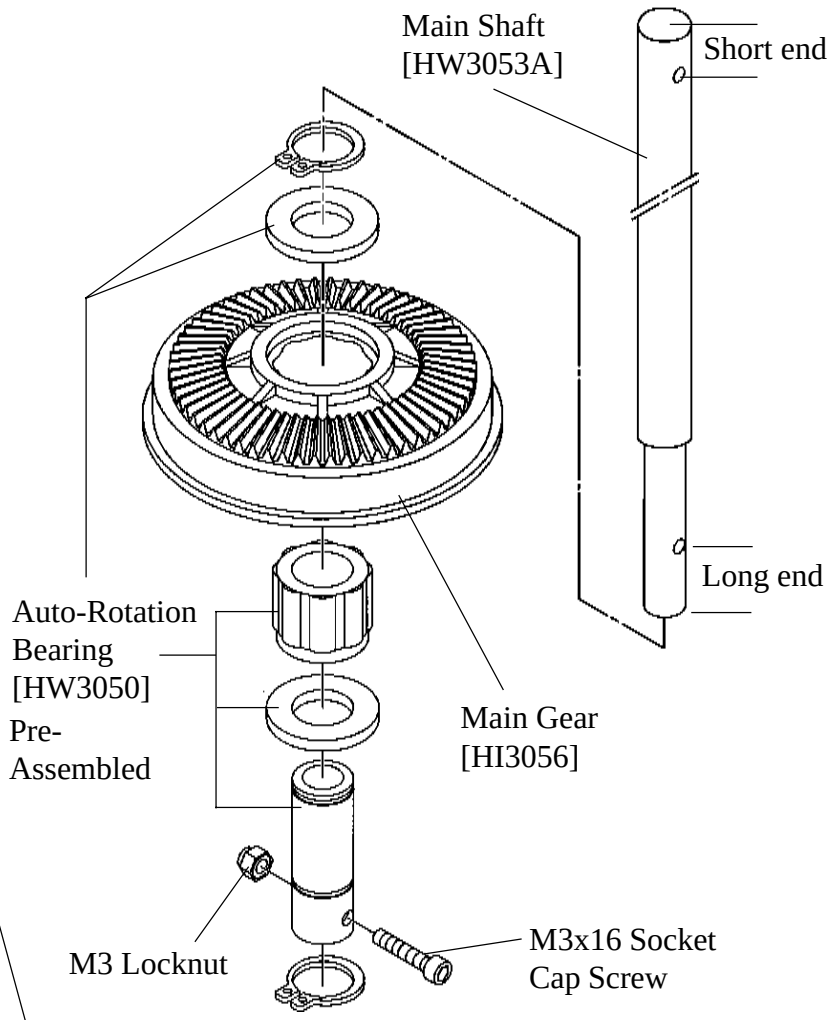


Tip Test fit the gear assembly into one half of the upper side frames. While holding the pinion gear, try to slide the counter gear up and down on the shaft. The gear should not slide up the shaft, if it does, readjust the top pinion to remove the slop and re-tighten the set screw using threadlock. It is important that there is no free play but the bearings are turning freely when assembled. Expert tip, once all components are in their final position, using a needle apply one drop of blue threadlock carefully at the joint between each bearing and the shaft. Warning threadlock will damage a ball bearing.

Tip Expert Tip: Apply a small amount of red locktite to the top of the start shaft and insert into the pinion gear, to lock the shaft to the pinion gear. Warning: do not use on the set screws and to remove the gear requires upper frame disassembly.

Step 11 Main Gear Assembly

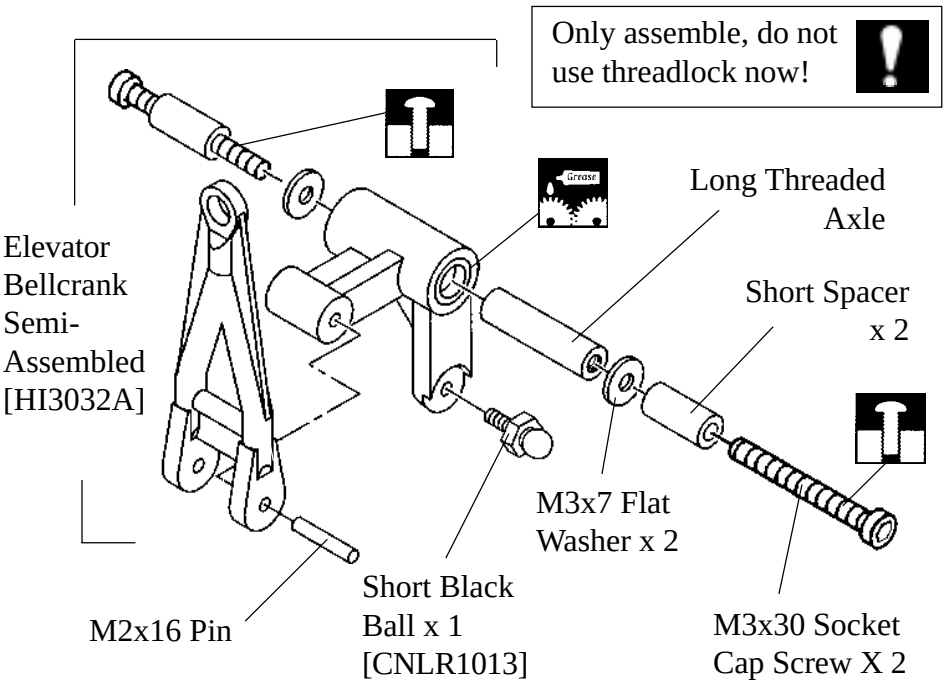
The Main Gear is pre-assembled with the Auto-Rotation Bearing installed. From parts bag 2, the Main Shaft has two holes one farther from one end of the shaft, this end is the bottom of the shaft. Insert the bottom end through the auto rotation gear assembly aligning the holes and secure the Main Shaft using one 3x16mm Socket Cap Screw and one 3mm Locknut.



Step 12 Elevator Assembly

From parts bag 2, apply a small amount of lubricant to the long threaded axle and slide through the elevator bellcrank (semi-assembled), be careful not to get grease on the threads. Slide one short spacer over one 3x30mm Socket Cap screw and one 3x7mm washer, attach to the threaded axle (**do not use threadlock here!**), repeat for other side. The 2x16mm pin is assembled, just insure the elevator radius link moves freely against the Bellcrank. Thread one short black ball (m2 thread) into the elevator arm.

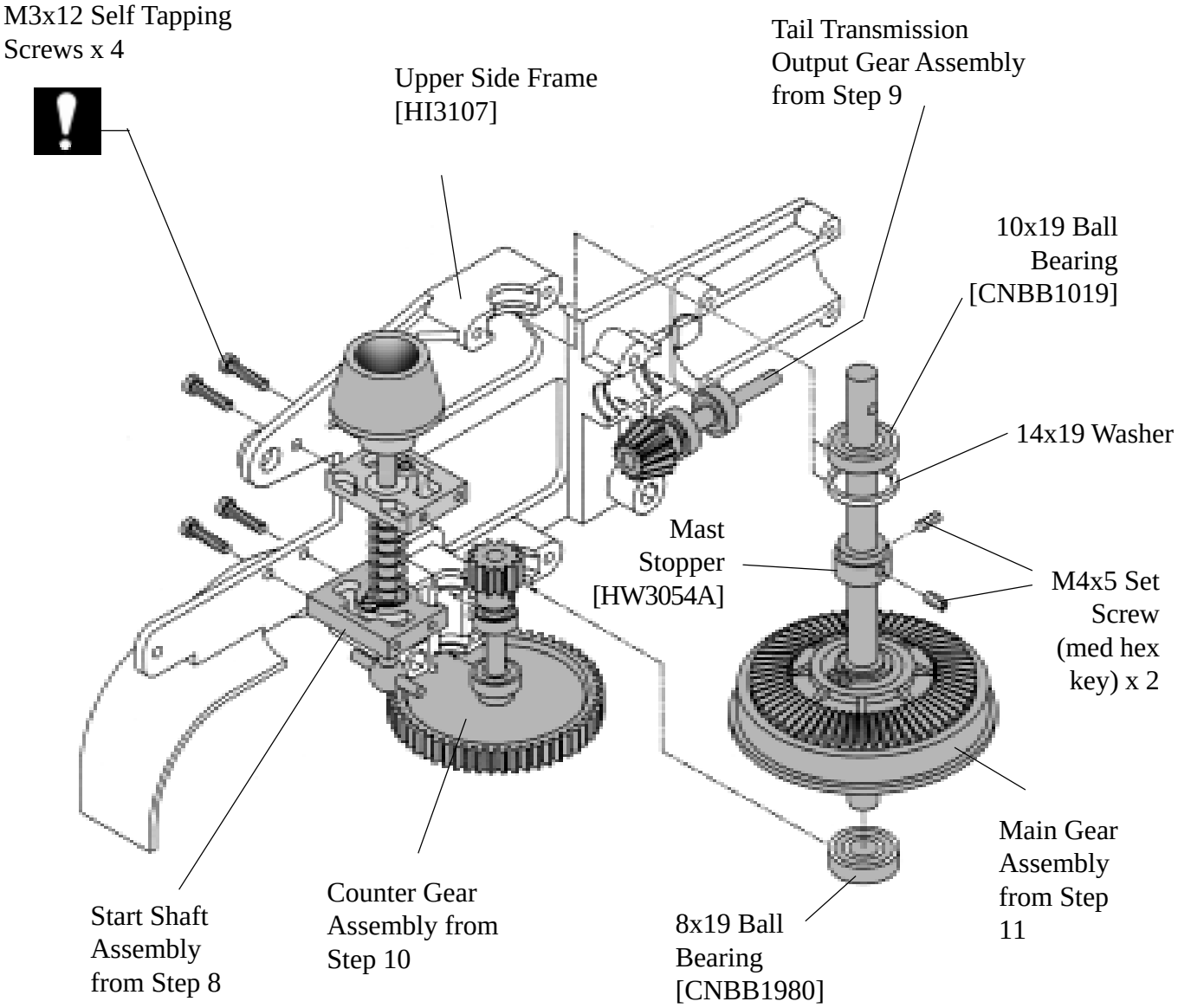
CNQSC04
Optional machined ballbearing elevator arm w/ adjustable ball link.



Step 13 Upper Side Frames

From parts bag 2, install two 4x5mm Set Screws on the Mast Stopper then slide the mast stopper on the main shaft, only assemble at this time. Slide one M8x19 Ball Bearing to the bottom of the main shaft and the M14x19 washer and M10x19 Ball Bearing from the top side.

Attach the starter shaft assembly with four 3x12mm Self Tapping Screws[1] (**observe the correct direction of the block assemblies**). Position the auto rotation gear assembly, the counter gear assembly and the tail transmission output shaft assembly at the locations on the diagram into the upper right side frame (**Make sure the bearings are fully seated in the recesses.**)

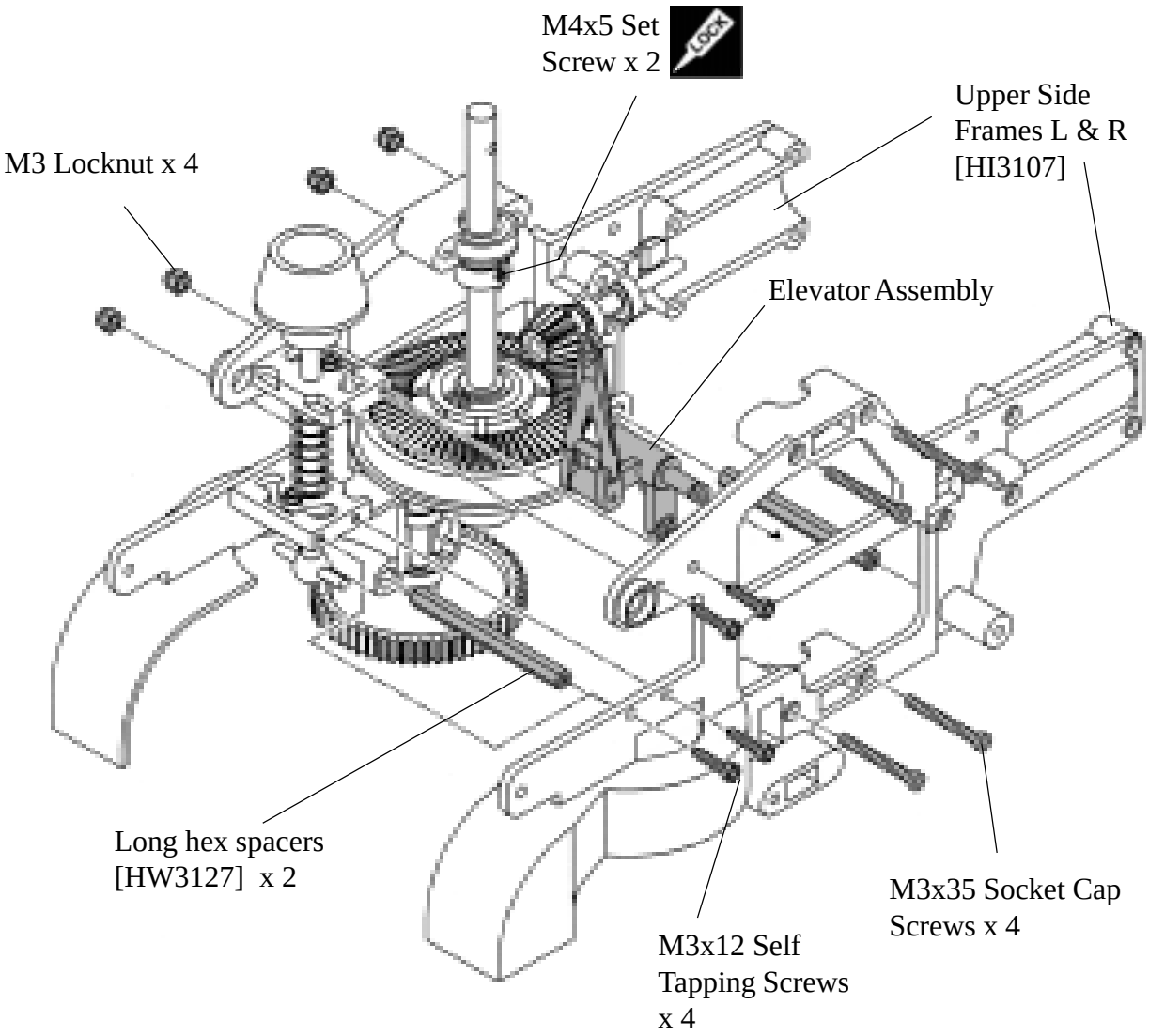


Note 1: Be careful when tightening the eight 3x12mm self tapping screws into the start shaft block assemblies as excessive force will strip out the plastic holes.

Step 14 Upper Frame Assembly

From parts bag 2, insert two long Hex Spacers at the specified locations in the diagram, note that the front hex spacer is installed into the forward-most hole. Install the upper left side frame, taking care that the bearings are aligned with the mating recesses and secure the frames with four 3x35mm Socket Cap Screws through the main shaft bearing block positions and four M3 locknuts. It is advised to position the elevator assembly between the side frames at this time to reduce the amount of disassembly later.

While pulling up on the main shaft (make sure the main gear rotates), push the mast stopper against the upper ball bearing, apply threadlock to the 4x5mm set screws and tighten in place. Attach the remaining four 3x12mm Self Tapping Screws to the starting shaft blocks.



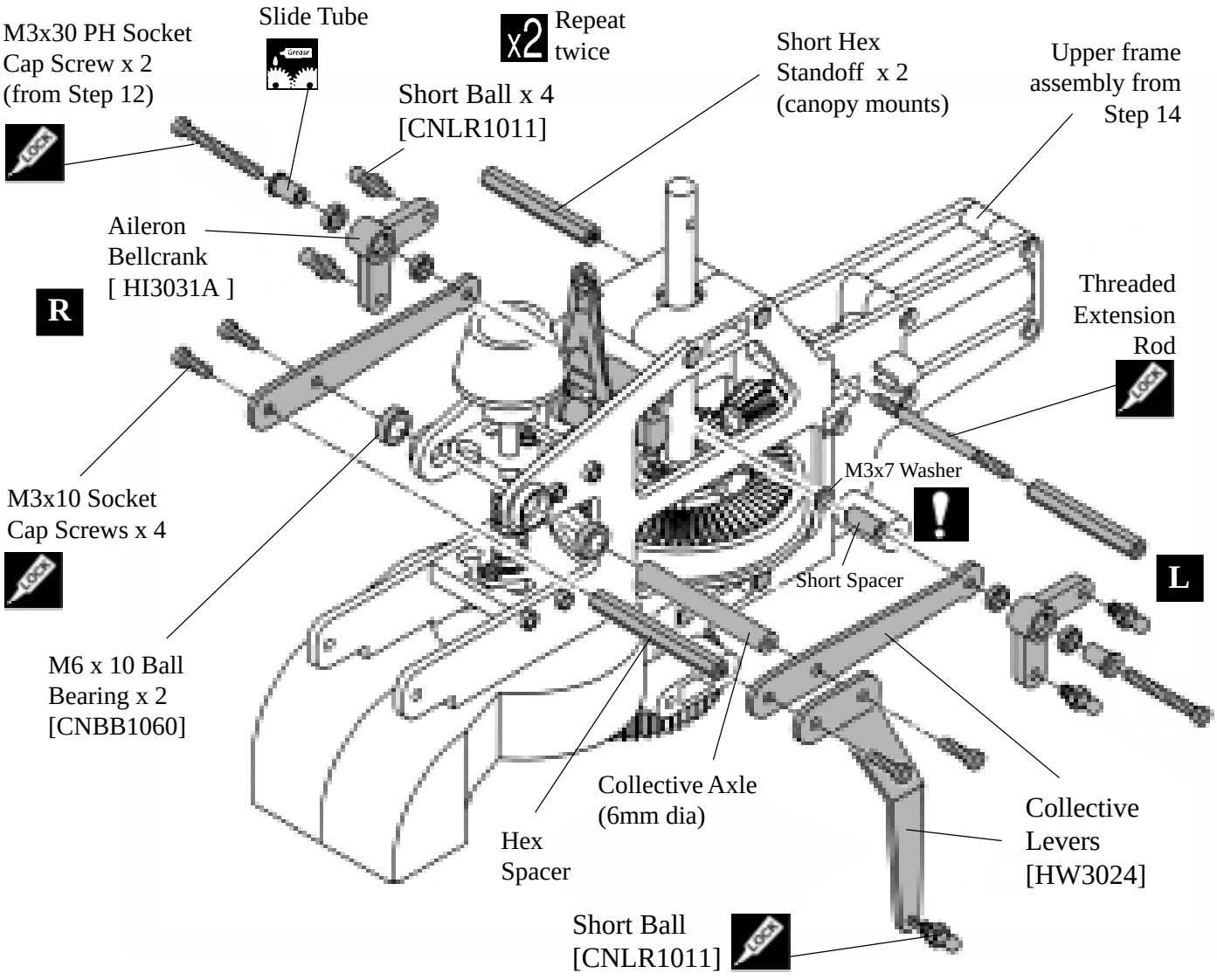
Note : The gear mesh between the main gear and the tail transmission output shaft should be a snug fit and will become smooth after a few flights, this is the normal wear in process.

Step 15 Collective and Aileron Levers

From parts bag 2, press in two M6x10 ball bearings into the front side frames for the collective axle. Attach the front Collective Arm Spacer (hex) and the Collective Axle (6mm dia) to the Right Collective arm (notice that the axle is attached at the middle hole) using two 3x10mm Socket Cap Screws using threadlock. Slide the assembly through the ball bearings in the upper frame sides from the right and attach the two Left Collective Arms with two 3x10mm Socket Cap Screws using threadlock (tighten the screws until the collective levers move freely with no side to side play.) Install one Short Ball on to the collective lever using threadlock.

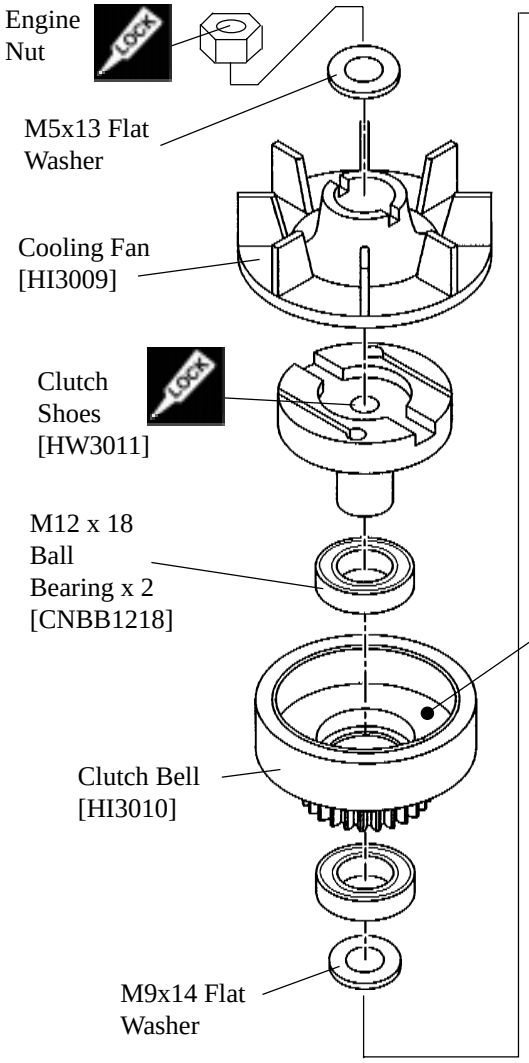
The left Aileron Bellcrank has two oilite bearings pre-installed into the bellcrank, insert two Short Balls (on the side with the "A") and insert the slide tube through the bellcrank using a small amount of lubricant (**the bellcrank is offset, make sure the slide tube is inserted from the offset side**). Starting on the left side, remove the 3x30mm Socket Cap Screw, short spacer and washer from the **elevator bellcrank** (previously assembled in Step 12), slide the left aileron assembly onto the screw and insert through the left collective lever. Apply threadlock to the end of the screw threads now and slide the short spacer and the 3mm washer before tightening into the elevator bellcrank axle. Repeat for the other side.

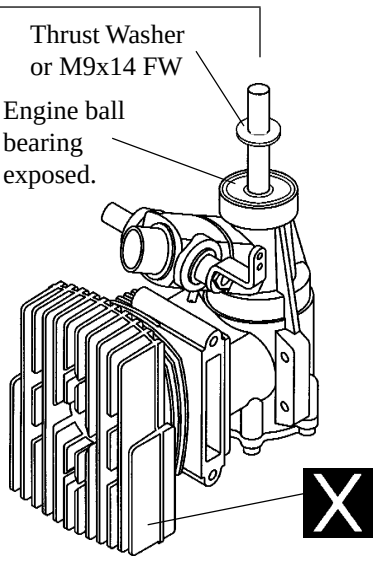
Slide one Threaded Extension Rod through the upper position of the tail output bearing recess and secure two Short Hex Standoffs (one per side) using threadlock (these are to attach the canopy).



Step 16 Clutch Fan & Engine Mounting

From parts bag 3. Remove all parts from the engine crankshaft until you can see the front ball bearing, install the 9x14mm Flat washer (or washer provided by engine manufacturer), insert the Ball Bearings into the clutch bell assembly and place on the crankshaft. Clean the threads on the crankshaft and on the clutch, carefully apply threadlock on the engine crankshaft threads nearest the bearing (be careful not to get threadlock into the ball bearings) and on the threads in the clutch. Thread the clutch until the crankshaft can be seen and insert the fan keying it to the clutch. Wrap a cloth over the fan (provides grip to the fan without breaking the fins) and tighten until the clutch stops, torque an additional 1/16 of a turn. Using a Piston Lock [CN2155 Optional Parts] makes this easier. Secure the fan by placing one 6.5x13mm Washer and apply a liberal amount of threadlock to secure the nut that came with the engine from the inside of the fan assembly. Again only torque the nut 1/16th more.



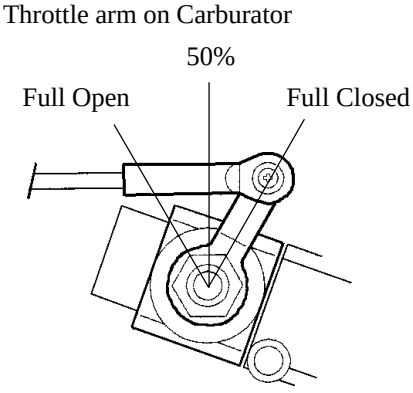


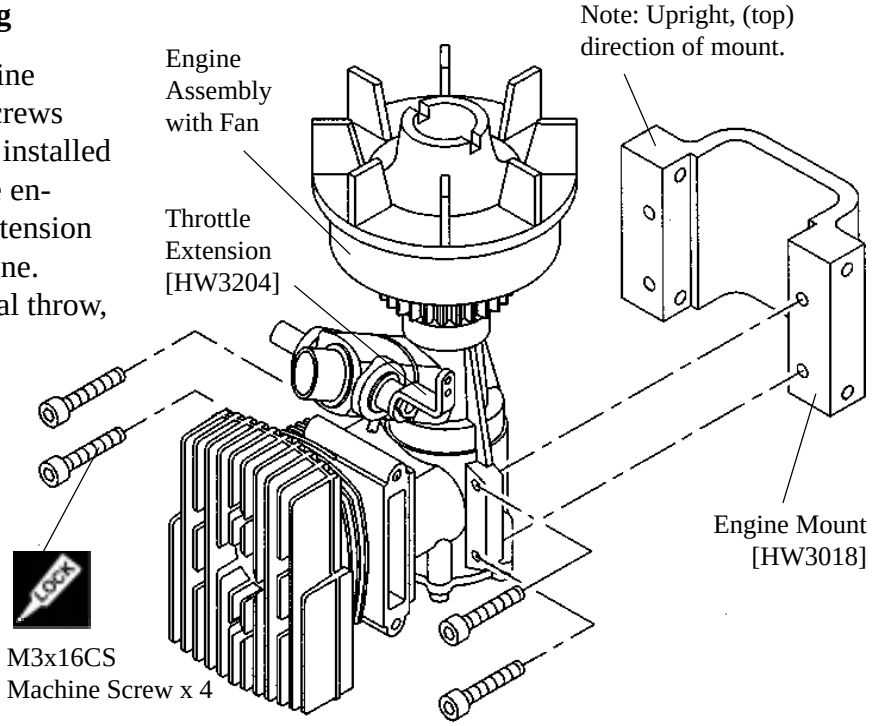
During final assembly wipe all traces of oil or grease from the inside surface of the clutch lining. Any grease here can cause a meltdown.

(Optional Parts)
CN2153 Throttle Extension for OS28-32FH,SX-H & 46FX-H

Step 17 Clutch Fan & Engine Mounting

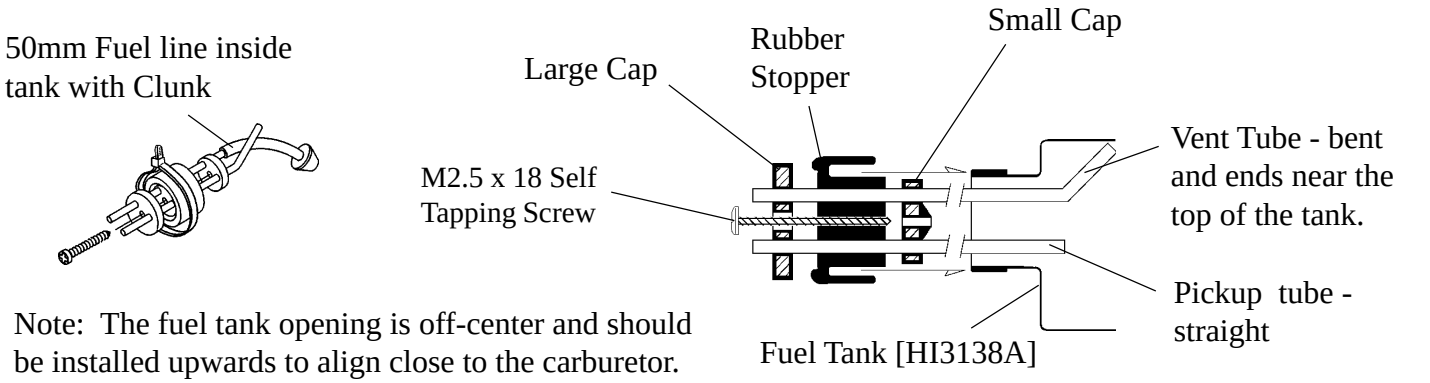
Secure the engine assembly on to the engine mount using four 3x16mm Socket Cap Screws using threadlock (make sure the mount is installed with the holes closest to the bottom of the engine). From bag 4, install the Throttle Extension by removing the arm supplied on the engine. The arm has to be repositioned to get equal throw, both open and closed from 50%.





Step 18 Fuel Tank Assembly

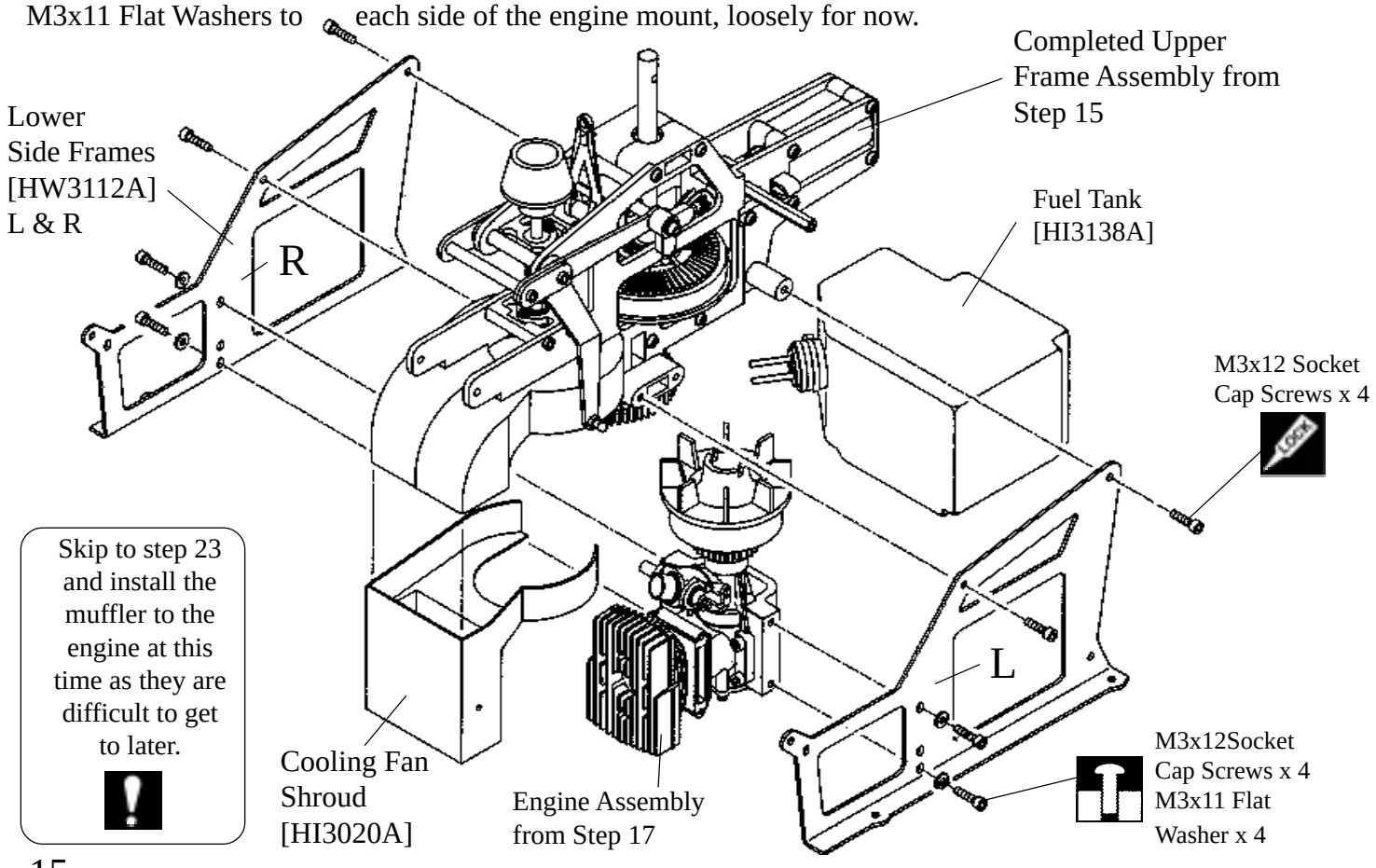
From parts bag 3, insert the two pieces of aluminum tubing through the large cap, rubber stopper and small cap, bend the long aluminum tube upwards (make sure the tube comes to the top of the fuel tank) and attach the short piece of fuel line and clunk to the short straight piece of tubing. Test fit the assembly into the Fuel Tank and make sure that the clunk reaches the end but moves freely and the vent tube is near the top of the tank but does not touch. Install the **included tie wrap** around the outside of the rubber cap. Finally tighten the long self tapping screw to seal the tank.



Note: The fuel tank opening is off-center and should be installed upwards to align close to the carburetor.

Step 19 Lower Frame Assembly

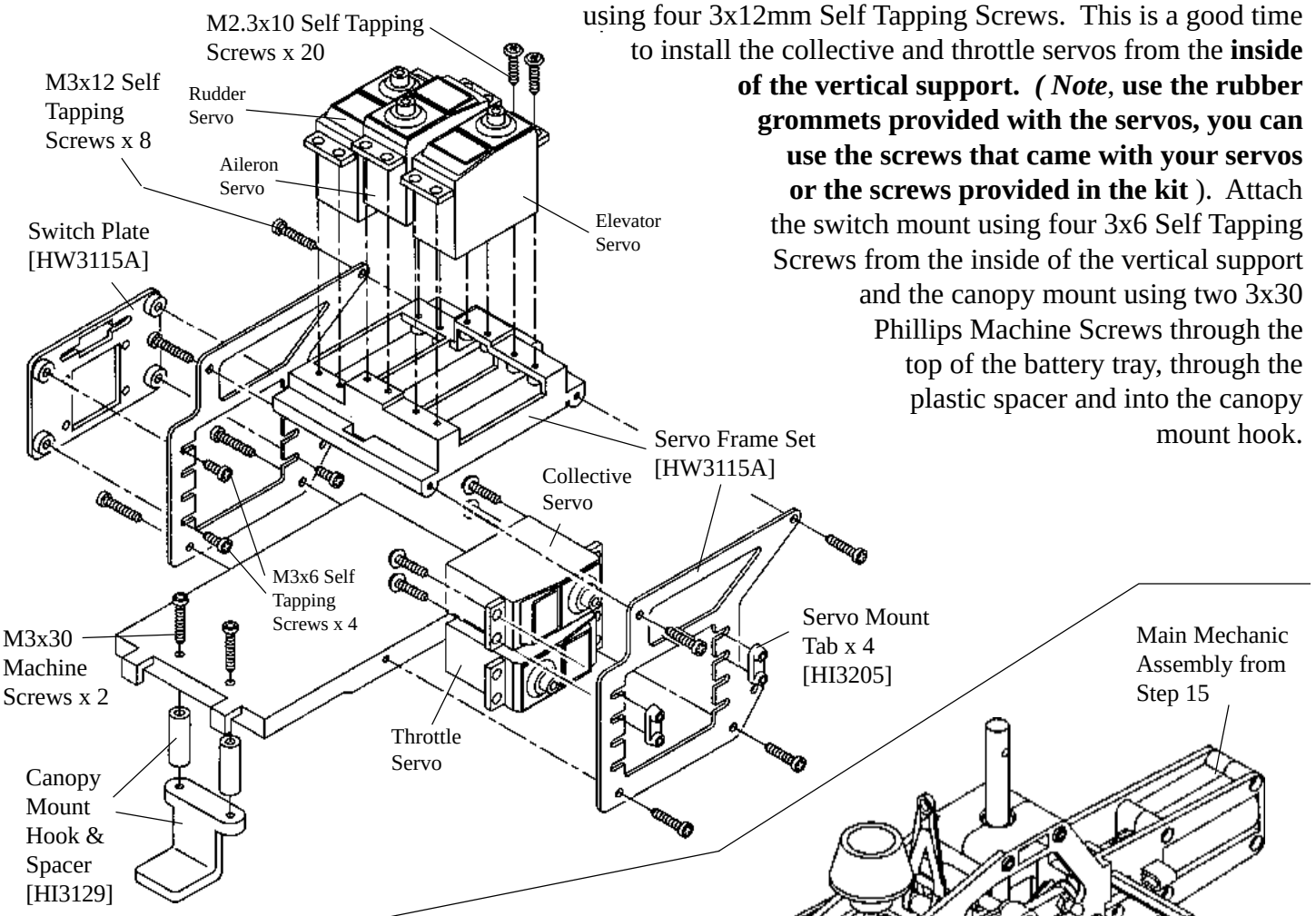
Attach the right lower frame(R) to the upper frame assembly with two 3x12mm Socket Cap Screws using threadlock. Slide the cooling Fan Shroud over the engine head and position the engine assembly into the upper frames while attaching the two M3x12 Socket Cap Screws through the R side frame (leave these loose for now). Skip to step 23 and **install the muffler at this time** as it is difficult later to get access to muffler screws. Slide the fuel tank assembly through the frame and attach the left lower side frame (L) to the upper side frames using two M3x16 Socket Cap Screws using threadlock. Attach two M3x12 Socket Cap Screws and two M3x11 Flat Washers to each side of the engine mount, loosely for now.

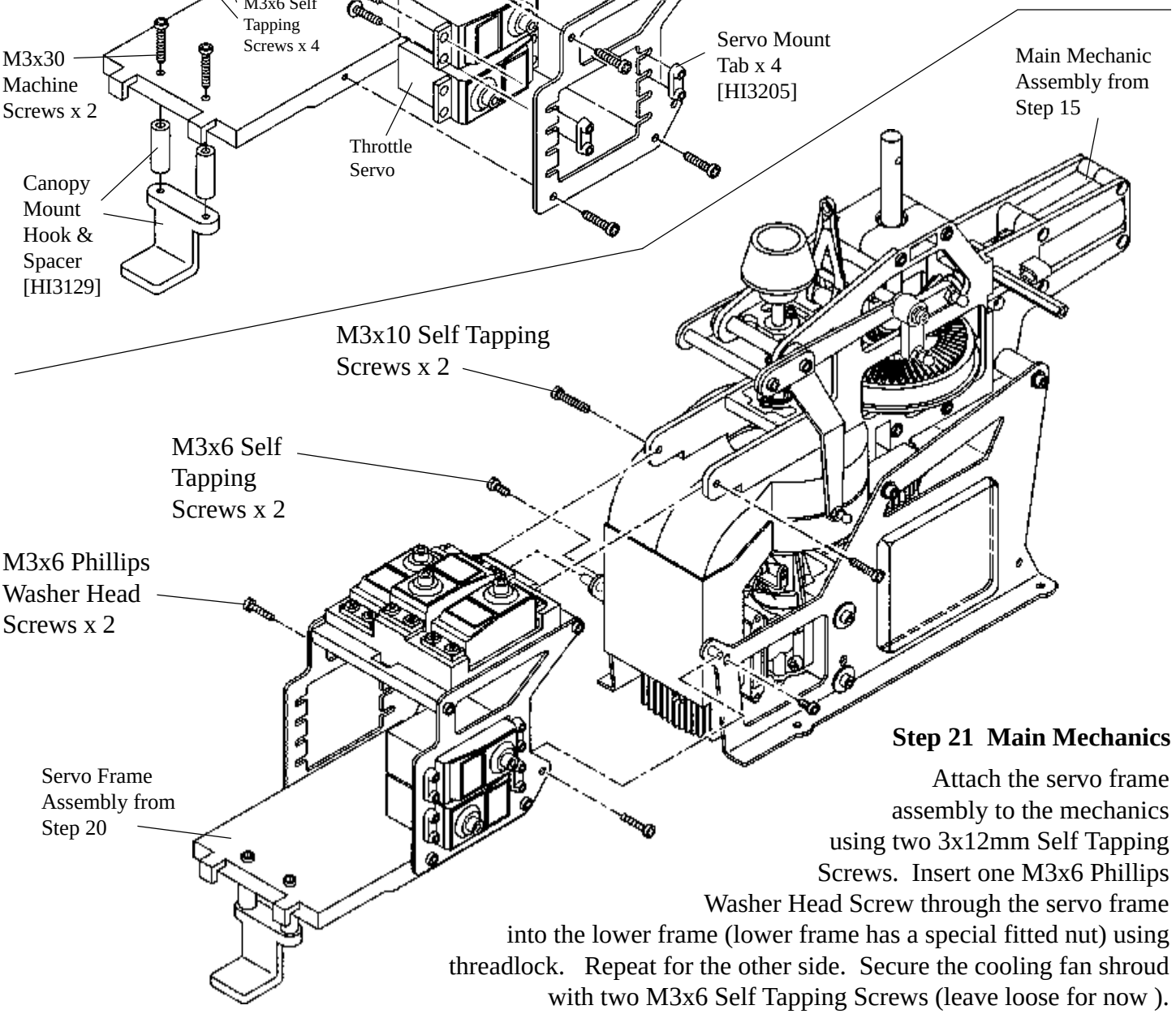


Skip to step 23 and install the muffler to the engine at this time as they are difficult to get to later.

Step 20 Servo Frame Assembly

From parts bag 5, assemble the servo tray using four 3x12mm Self Tapping Screws. This is a good time to install the collective and throttle servos from the **inside of the vertical support.** ***(Note*****, use the rubber grommets provided with the servos, you can use the screws that came with your servos or the screws provided in the kit**). Attach the switch mount using four 3x6 Self Tapping Screws from the inside of the vertical support and the canopy mount using two 3x30 Phillips Machine Screws through the top of the battery tray, through the plastic spacer and into the canopy mount hook.

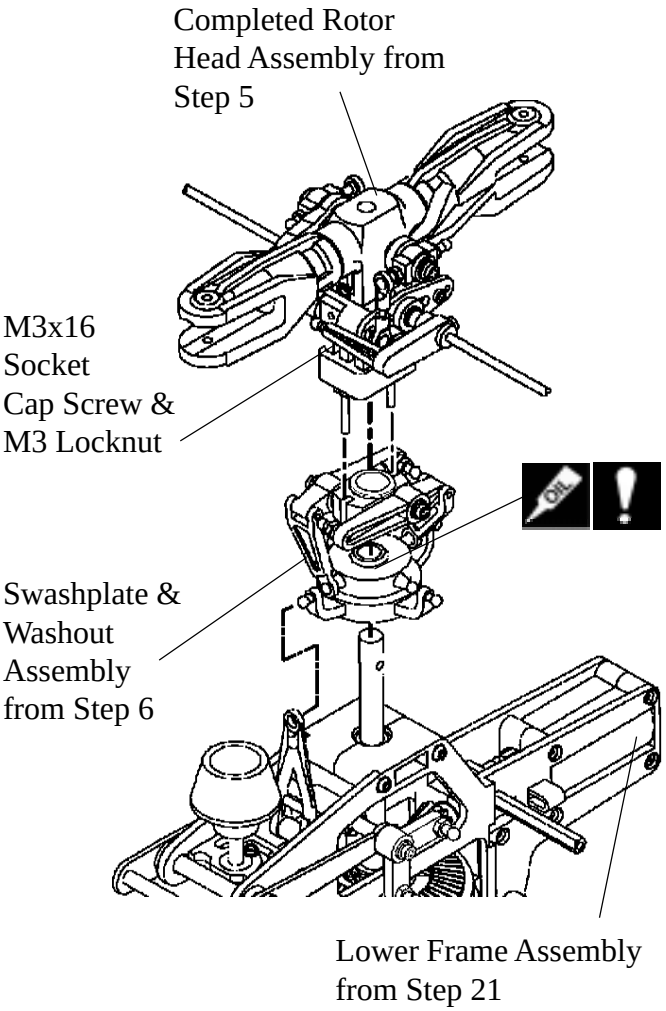




Step 21 Main Mechanics

Attach the servo frame assembly to the mechanics using two 3x12mm Self Tapping Screws. Insert one M3x6 Phillips Washer Head Screw through the servo frame into the lower frame (lower frame has a special fitted nut) using threadlock. Repeat for the other side. Secure the cooling fan shroud with two M3x6 Self Tapping Screws (leave loose for now).

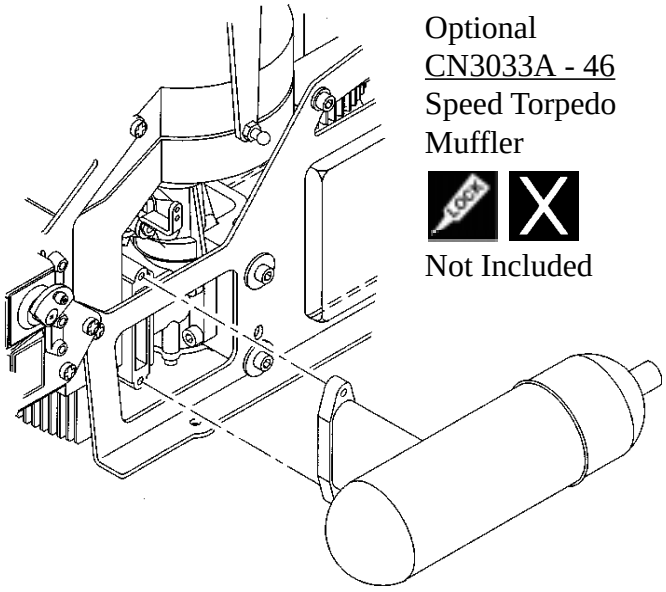
Step 22 Final Rotor Head Assembly



Slide the washout assembly from Step 6 onto the main shaft and snap the elevator lever arm onto the single front ball on the swashplate. Slide the completed rotor head assembly from Step 5 onto the shaft and align the hole in the head block with the hole in the top of the main shaft and insert one 3x16mm Socket Cap Screw and 3mm locknut (from Bag 2) to secure the two. **(Note: Make sure the pins in the rotor head block are aligned and inserted into the holes in the washout unit.)** Apply some oil sparingly to the washout hub assembly to insure they slide smoothly.

Following assembly, move the collective lever fore and aft to the endpoints. The swashplate and washout unit should be very smooth throughout the movement range. If not, inspect the fit of the washout guide to the pins in the rotor head, these pins can be bent slightly if binding. Also check the collective axle, the screws here may be too tight. Lastly the fit of the ball links sometimes can cause binding. These few points are the most common which will cause servo strain leading to premature wear and will appear as a jump in altitude when flying the helicopter.

Step 23 Attaching the Muffler

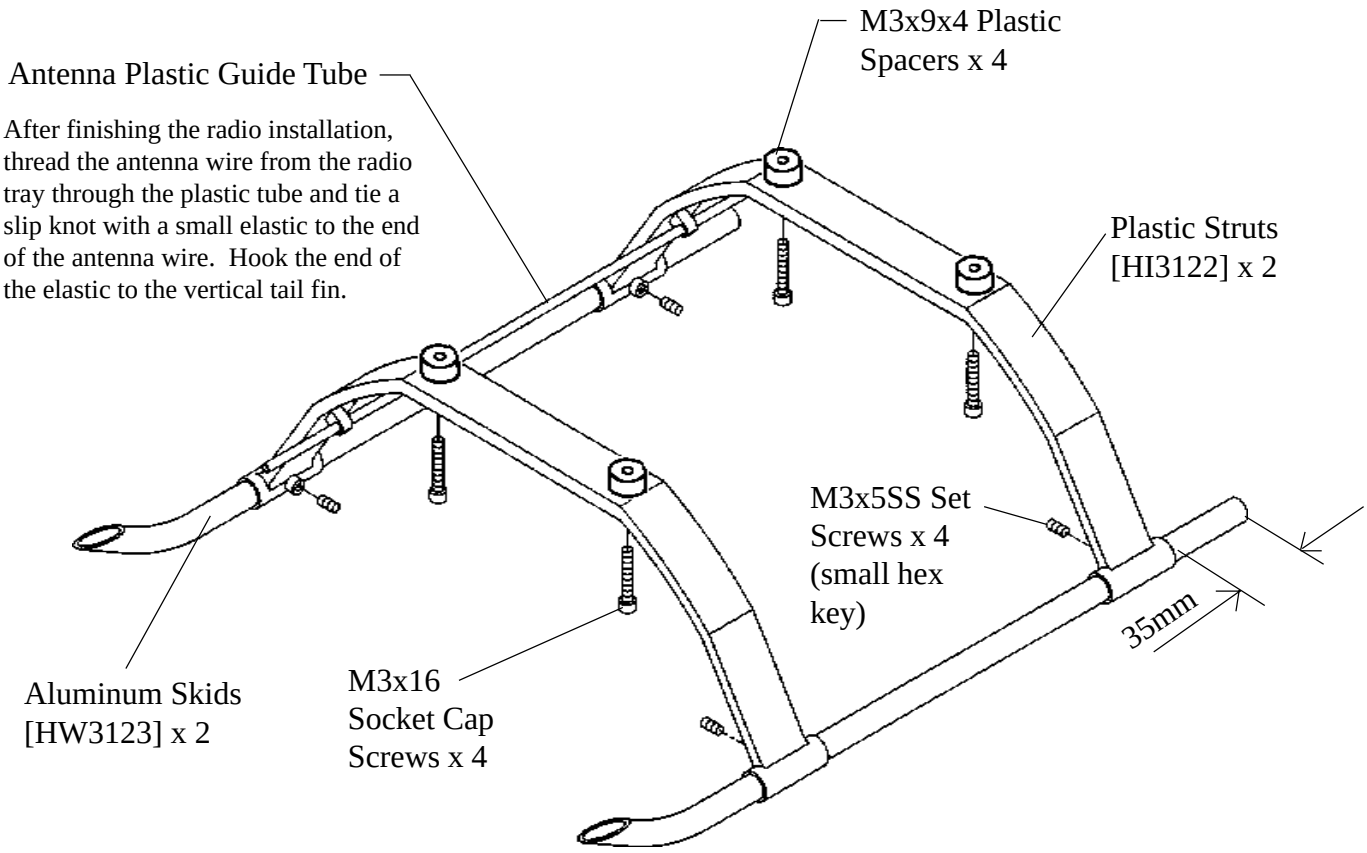


Attach the muffler to the engine with the screws provided with the muffler using threadlock. Attach the pressure tap to the top of the muffler and the M4x6 Phillips Machine screw to the bottom hole in the muffler, remember to use threadlock on these parts.

Tip For a good seal between the muffler and the exhaust port, use a gasket made from thin aluminum, brass or use high temperature RTV engine sealant found in an automotive supply store. To properly seal the fit, after running the engine for several minutes on the first run, shut down the engine and tighten the bolts again, with the hot engine you will gain 1/4 turn on the bolts which will seal the muffler in place.

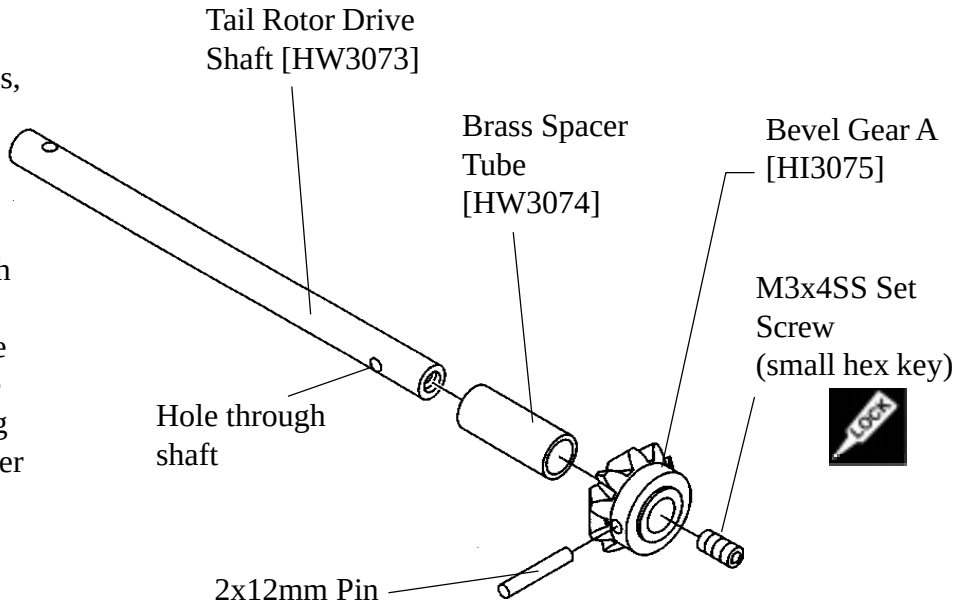
STEP 24 Landing Gear Assembly

From parts bag 6, assemble the landing gear by attaching the Aluminum Skids through the Struts, securing them with four 3x5mm Set Screws. Set the distance from the rear of the skid to the strut at 35mm. Attach the landing gear to the main mechanics using four 3x16mm Phillips Machine Screws and locknuts.



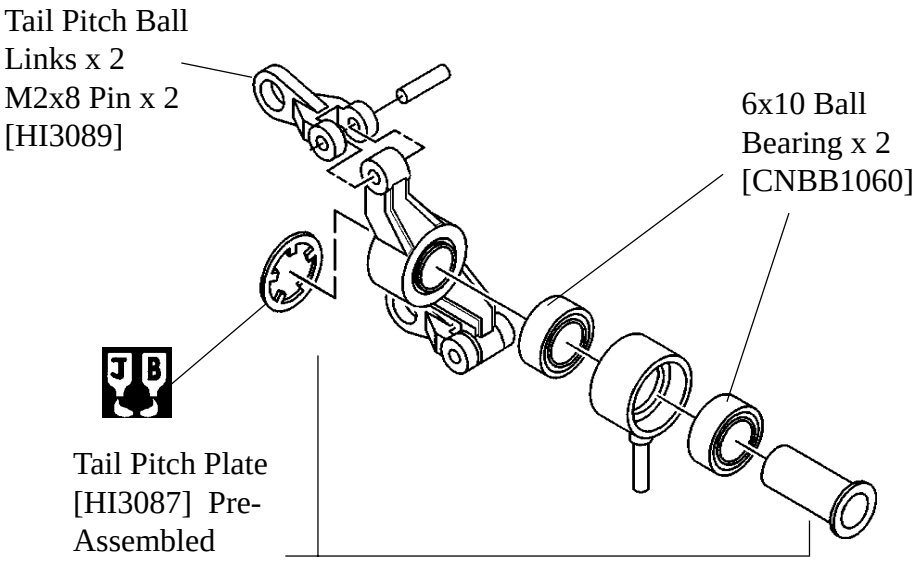
STEP 25 Tail Output Shaft Assembly

From parts bag 7, notice that the Tail Rotor Drive Shaft has 2 holes, one through the shaft and one drilled partially into the shaft. Slide the small Bevel Gear with the teeth facing the shaft from the end with the through hole and position the gear aligning the holes. Press the 2x12mm Pin through and secure with one 3x4mm Set Screw using threadlock. Slide the Brass Spacer Tube onto the shaft and position against the gear.



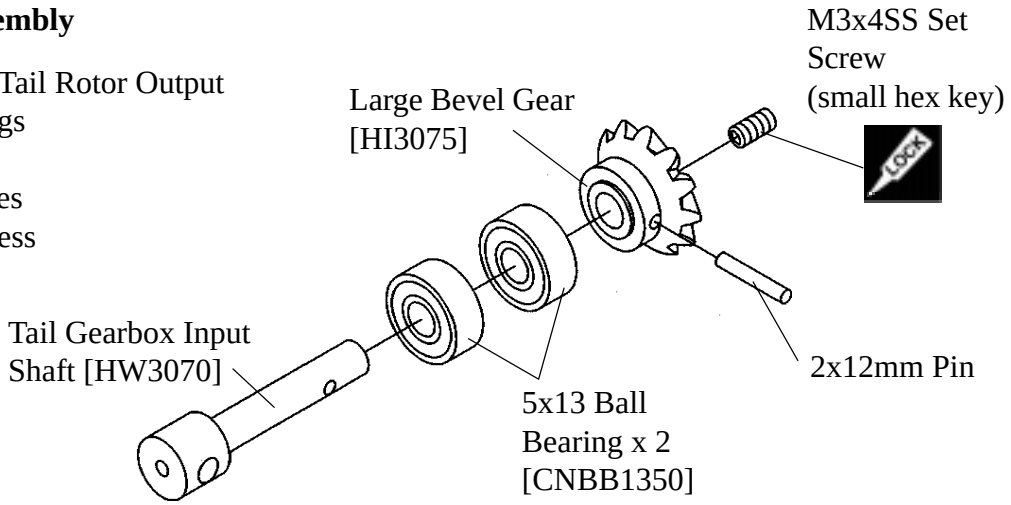
STEP 26 Tail Pitch Plate Assembly

From parts bag 7, the Tail Pitch Plate and Tail Pitch Ball Links are pre-assembled. (**Note: apply some JB weld to the outside of the lock ring to avoid the assembly loosening.**) Put this assembly aside for now.



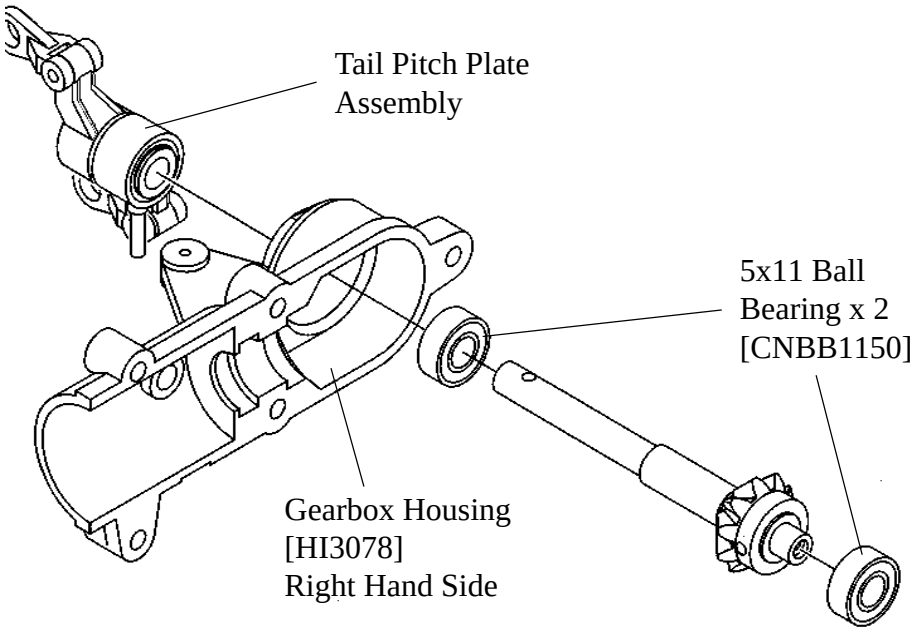
STEP 27 Tail Input Shaft Assembly

From parts bag 7, assemble the Tail Rotor Output Shaft by sliding two Ball Bearings on to the shaft followed by the large Bevel Gear. Align the holes on the gear with the shaft and press in one 2x12mm Pin and secure with one 3x4mm Set Screw using threadlock.



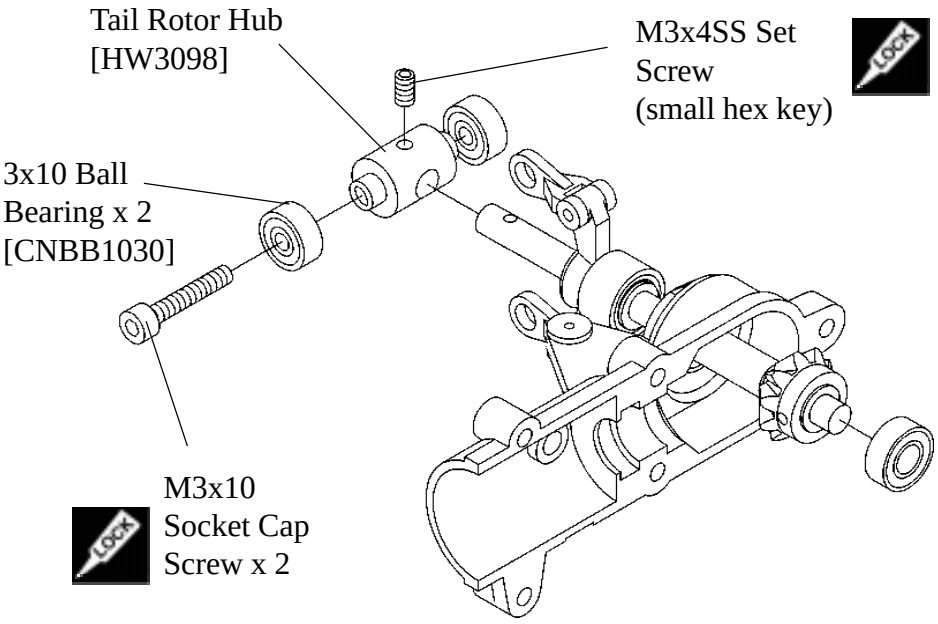
STEP 28 Tail Gearbox Assembly

Slide two Ball Bearings on each side of the Tail Rotor Drive Shaft assembly and insert through the right side of the Tail Rotor Gearbox Housing, make sure the bearing is fully seated into the recess. Slide the tail rotor pitch plate assembly on the shaft.



STEP 29 Tail Rotor Hub Assembly

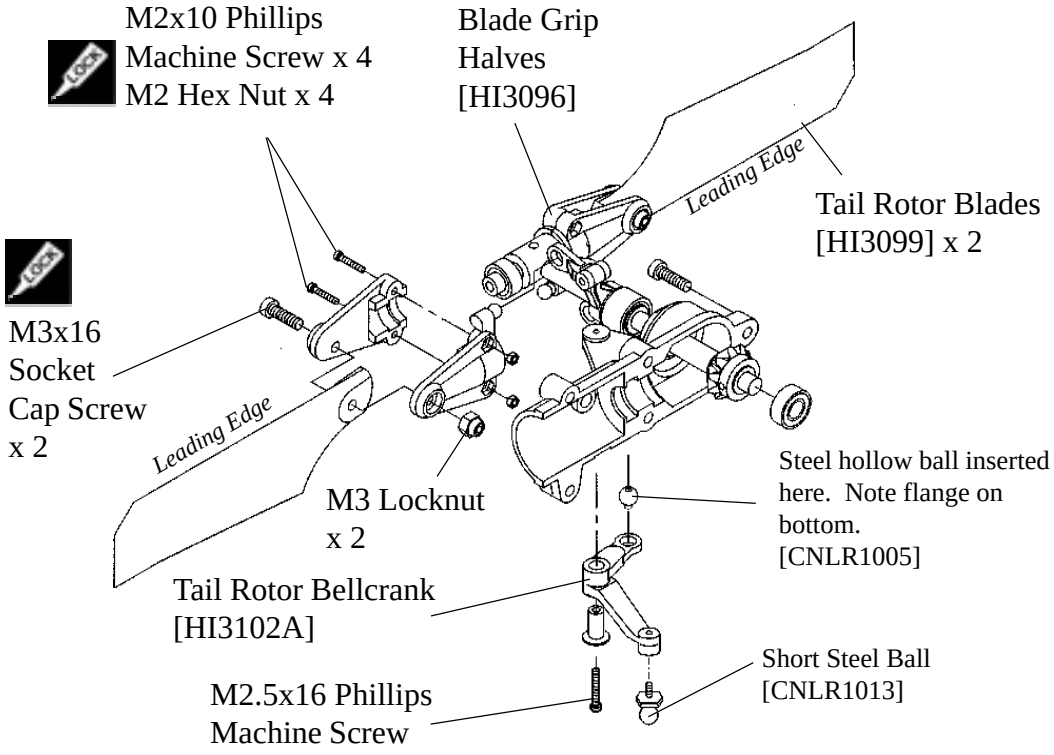
From parts bag 7, install the Tail Rotor Hub on to the tail rotor drive shaft, (**position the hub so the hole is aligned over the hole in the shaft**) and secure with one 3x4 mm Set Screw using threadlock. Using one 3x16mm Socket Cap Screw, attach one Ball Bearing on each side of the hub assembly using threadlock (**apply the threadlock to the threads in the hub to avoid getting threadlock into the bearings**).



STEP 30 Tail Rotor Blade Grip Assembly

From parts bag 7, assemble the Blade Grip Halves over the bearings with the nuts on the gearbox side using two 2x10mm Phillips Machine Screws and 2mm Nuts using threadlock. Snap the ball on the tail rotor grip into the adjoining pitch slider link on both sides.

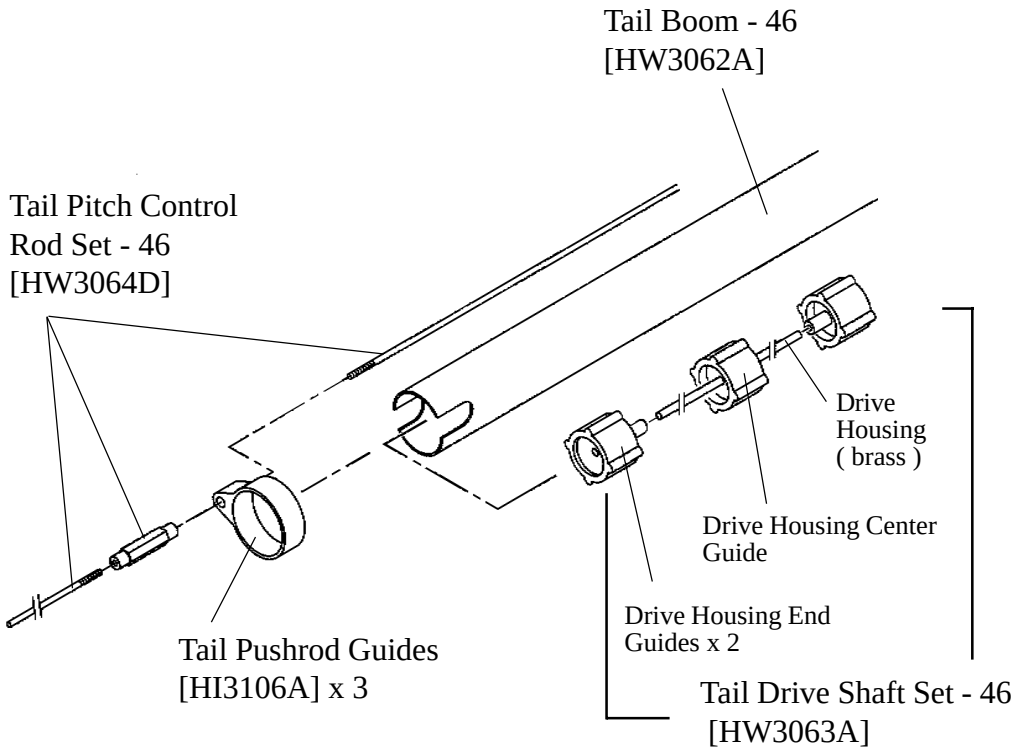
Install the Tail Rotor Blades using two 3x16mm Socket Cap Screws and M3 locknuts. Note the direction of the blades on the diagram, the leading straight edge of the blade should be on the same side as the ball on the blade grip. Press a steel hollow ball with the flange on the bottom into the Tail Rotor Bellcrank, install the Steel Ball, threaded from the bottom of the bellcrank and install the tail bellcrank arm on to the tail rotor gear box with one 2.5x16mm Phillips Machine Screw, inserted through the brass bushing with the washer side on the bottom (**make sure the steel ball is engaged on the pin of the tail rotor pitch slider assembly**).



Tip After flying the model, if a vibration is noticed on the vertical or horizontal fin, you can remove the complete tail rotor assembly with the hub and further balance it using a High Point balancer. Careful sanding of the rotor blades is all that is needed.

STEP 31 Tail Drive Housing & Pushrod Guides

From Bag 7, insert three tail drive shaft Guides on to the Brass Tail Drive Housing, found in the bottom of the box (**Note that one guide has a larger center hole than the others, slide this one to the center of the brass tube**), add the remaining two onto the ends. Glue the guides into position using Zap Ca on the brass tube. Insert the rod guide assembly into the tailboom from the end with the 2 holes and position the assembly centered in the tailboom (**gentle tapping with a wooden dowel will easy the insertion of the guides**). Slide the three tail pushrod guides onto the tailboom engaging tail pushrod. Thread the pushrod connector found in bag #4 onto the long pushrod, the short pushrod will be attached in Step 34.

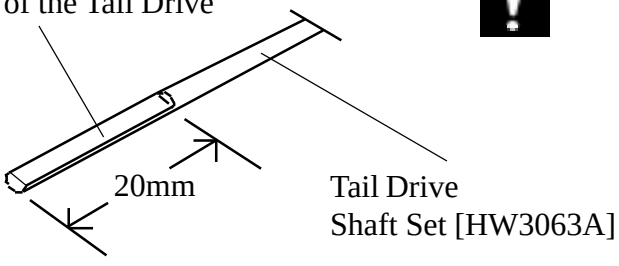


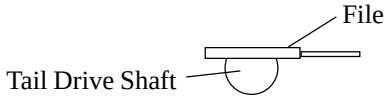
Make sure the brass tubing is glued to the internal guides for the tail boom. Also, after radio set up is complete glue the pushrod guides using a single drop of Zap Ca. One drop will stop the pushrod from binding and still be able to remove them later.

STEP 32 Tail Drive Shaft

The Tail Drive Shaft has one end flattened to engage into the main mechanics the other end needs to have a flat spot 20mm long filed on the round end of the shaft for the two 4x4mm Set Screws in the tail rotor input shaft. Thoroughly grease the tail drive shaft and insert the newly filed end into the tailboom end with the slots into the drive shaft housing assembly (**ensure the end with the new flat spot exits the tailboom end with the round holes**) and degrease both ends of the shaft.

Put a flat spot on the the round end of the Tail Drive Shaft.



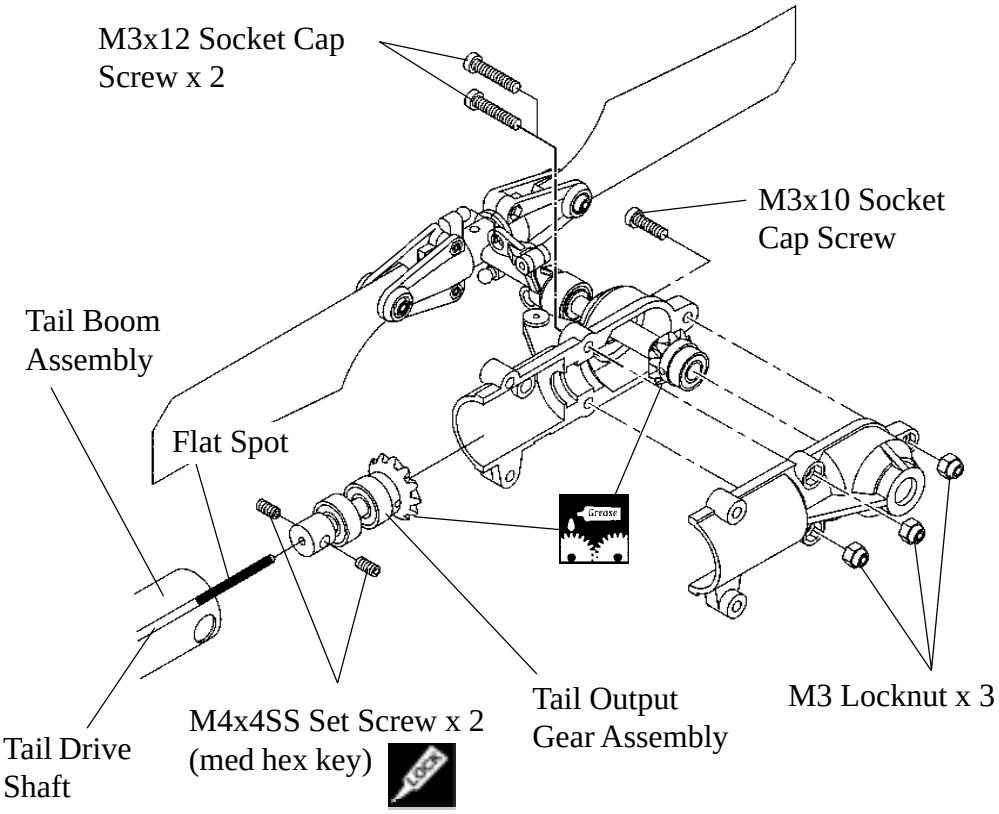


Tip

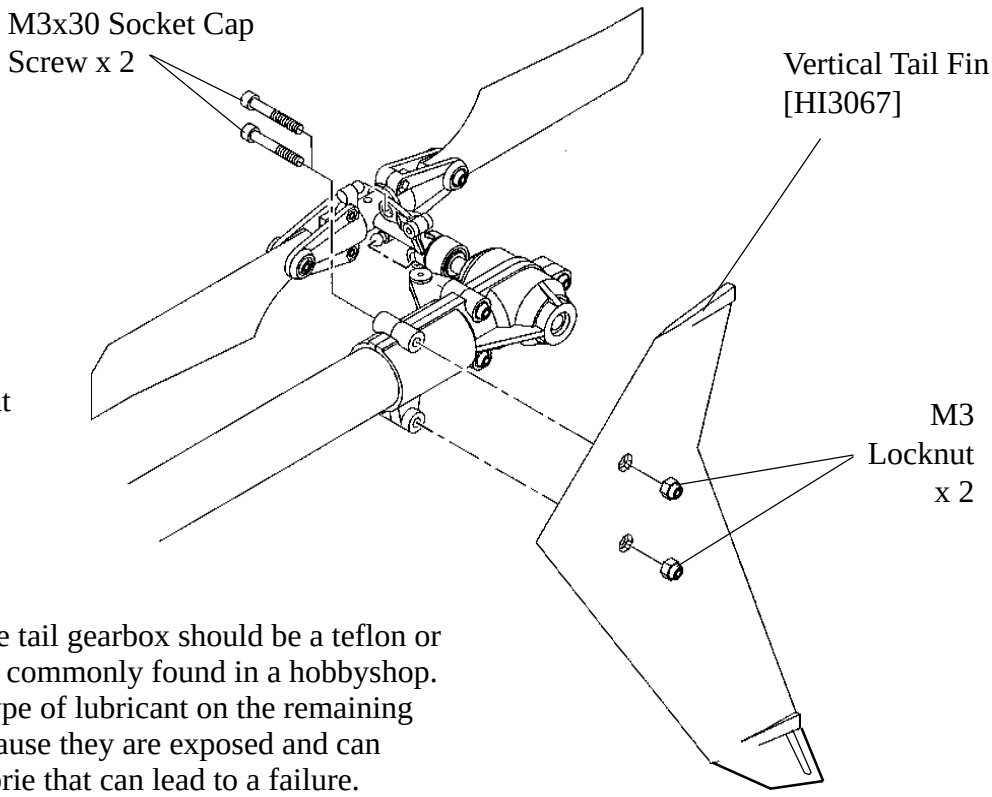
A flat file is the ideal tool for the job, alternately careful use of a Dremel Moto Tool will work. It is important that the flat be at least 1/4 of the diameter but no more than 1/3 to avoid weakening the material.

STEP 33 Tail Gearbox Assembly

Attach the tail output gear assembly on to the drive shaft with two 4x4mm Set Screws (**make sure the flat spot is aligned with one of the set screws**) using threadlock (see tip). Position the output gear assembly into the right gear box half (**insure the 2 bevel gears are meshed properly and the ball bearings are fully seated in their recesses**) and liberally grease the gears before closing the gearbox. Position the gear box halves over the holes in the end of the tail boom and secure with one 3x10mm Socket Cap Screw and M3 locknut at the end of the gearbox and two 3x12mm Socket Cap Screws with M3 locknuts at the center of the gearbox.



Tip Apply red locktite to the drive shaft end **only** and insert into the gearbox input shaft. Do not use on set screws, only bond the wire shaft to the input shaft. Tighten the set screws equally to make sure the wire and input shaft spin on the same center, especially when making field adjustments through the hole in the gearbox (any clicking from the tail box indicates this problem.)



Vertical Fin

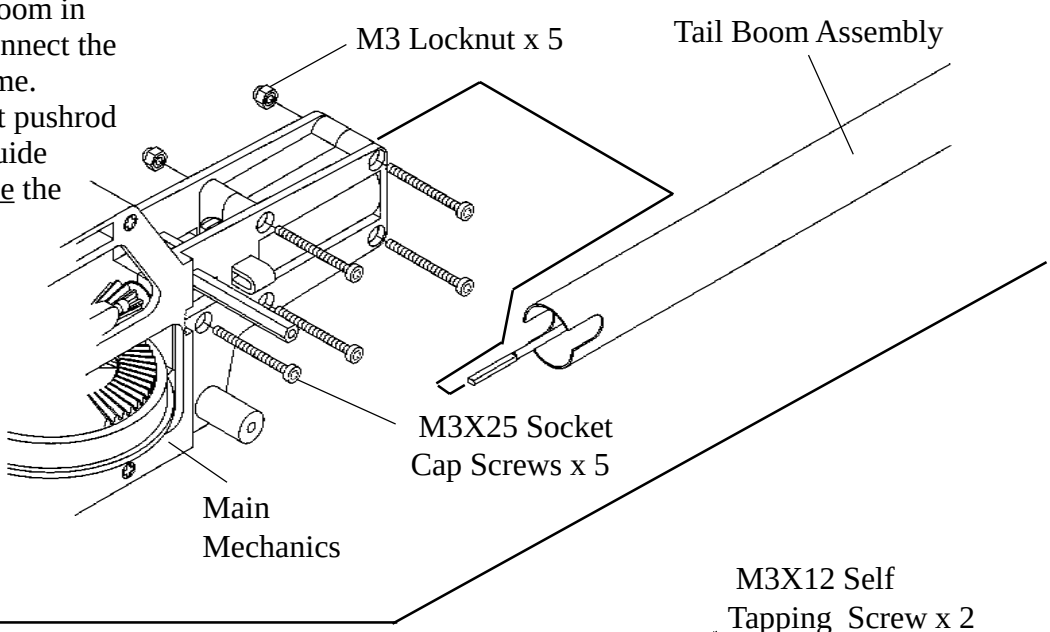
Install the Vertical Fin with two 3x30mm Socket Cap Screws and M3 locknuts through the mounts in the front end of the tail rotor gearbox.

Tip

Grease to be used inside the tail gearbox should be a teflon or light lithium type of grease commonly found in a hobbyshop. Do not use grease or any type of lubricant on the remaining gears on the helicopter because they are exposed and can actually attract dirt and debrie that can lead to a failure.

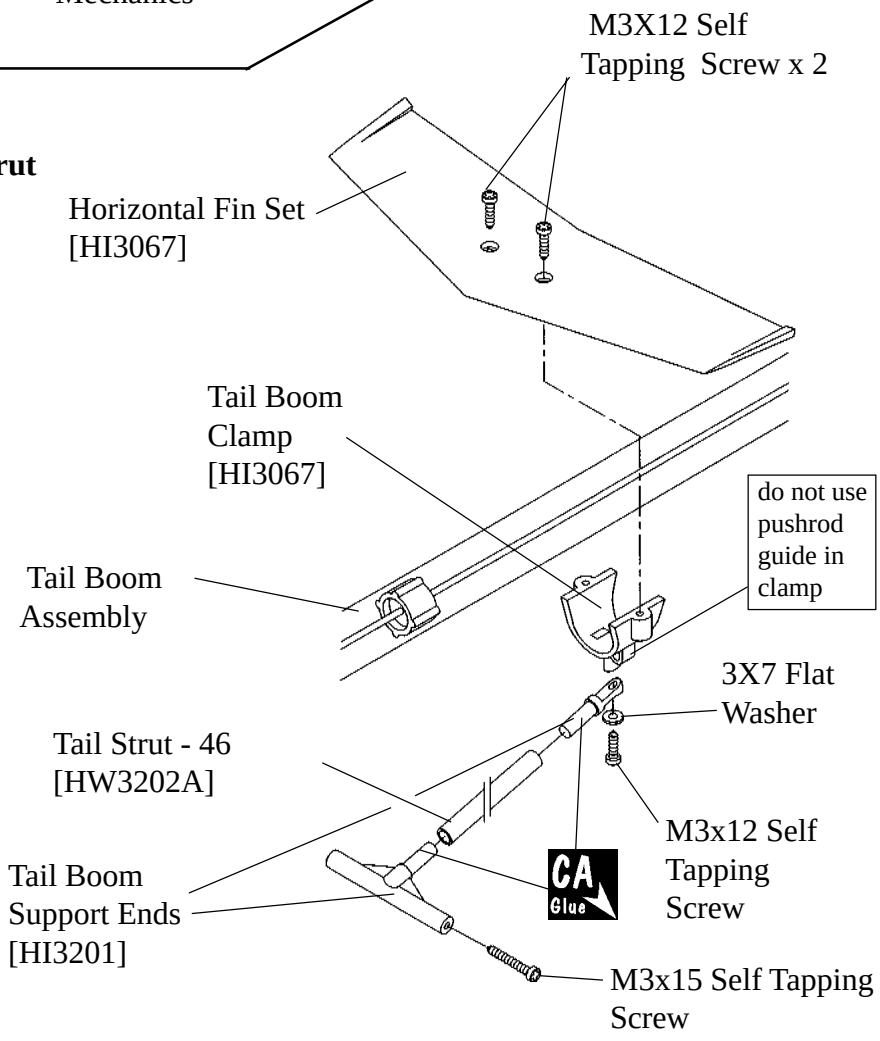
STEP 34 Tailboom Final Assembly

Attach the tail boom assembly to the main mechanics by sliding the tailboom tube into the hole in the rear of the upper frame using five 3x25mm Socket Cap Screws and M3 Locknuts, slowly press the tailboom in, being careful to engage the drive wire the flattened end into the tail rotor output gear shaft. The slots on the end of the tailboom will self align with molded pins inside the upper side frame.
As the upper frame is assembled at this point, just take your time and the wire will slide in.
Once engaged, press the tail boom in completely to fully seat it. Connect the short rudder pushrod at this time.
Note, when installing the short pushrod only insert through the rear guide on the upper frames, <u>do not use</u> the small guide near the front (used for earier versions).
Also, <u>do not insert</u> the long pushrod through the hole in the clamp on the horizontal fin, again (used for earlier versions). Following the pushrod setup, glue the pushrod guides in place on the tailboom.



STEP 35 Horizontal Fin & Support Strut

Insert the two tailboom Strut Fittings into the aluminum strut. Position two of the pushrod guides infront of the horizontal fin and one behind. Attach the Horizontal Fin on the tailboom using two 3x12mm Self Tapping Screws into the Tailboom Clamp and space the fin along the tailboom at the position where the Tail Boom support & Tail Strut is attached. **Note: the mount for the strut is angled, test fit the strut to position the clamp in the correct direction**) then secure the strut one 3x12mm Self Tapping Screw and one 3mm Washer. Attach the lower fitting to the lower frame assembly using two 3x15mm Self Tapping Screws. Finally apply some Zap Ca glue to the fittings onto the strut.

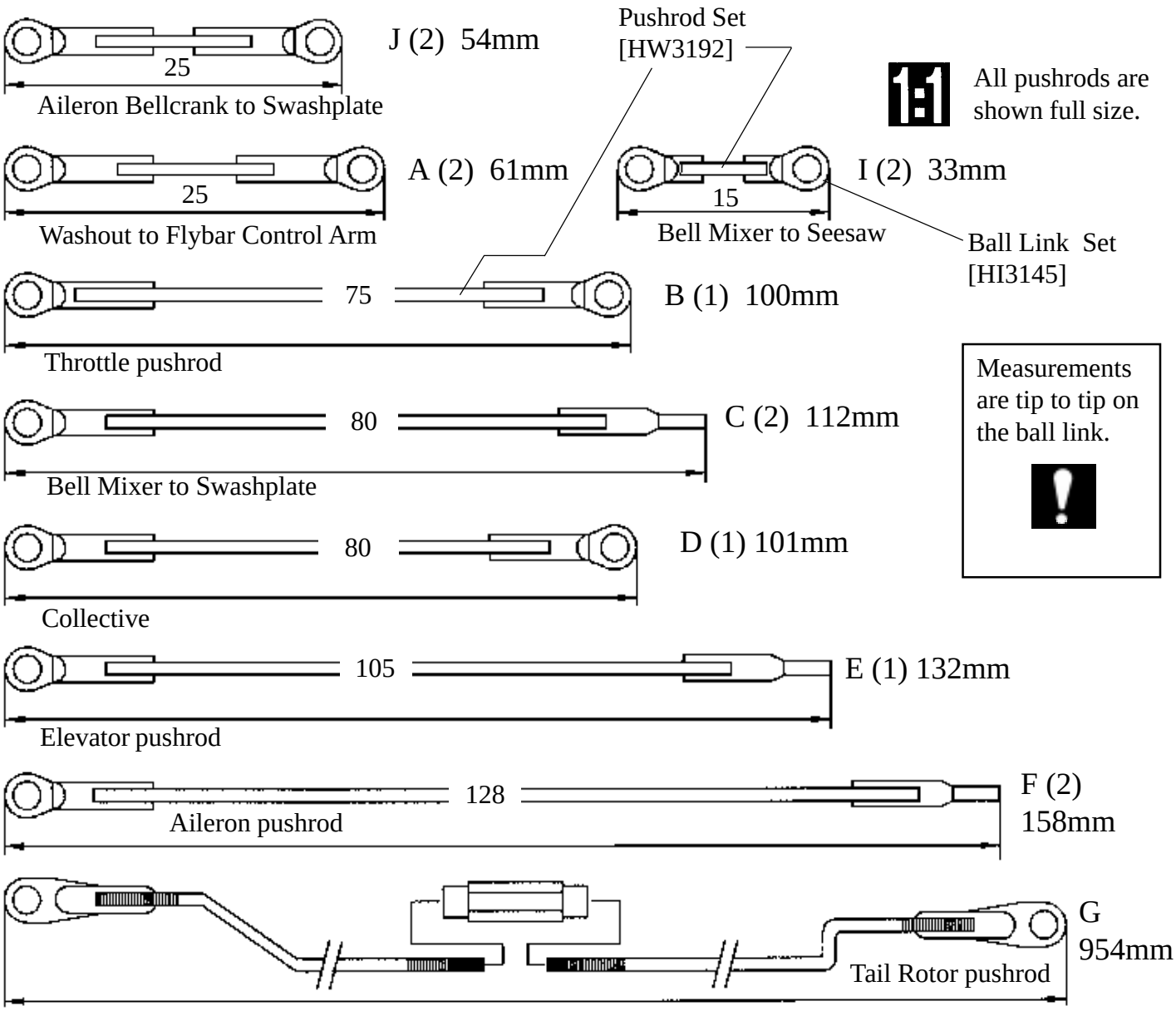


STEP 36 Pushrod Setup and Adjustments

Make up all the control pushrods according to the specified lengths shown in the drawing. These are full scale drawings so you can easily match each pushrod to the page. Please note that these dimensions listed from end to end of the plastic rod-ends are to be taken as correct. Fine tuning may be required as the picture size may change when printed. Also some servos offer different horn placements for fine tuning. The numbers in the center of the pushrod drawings are the actual length of the rods to help select the correct pushrod for each control surface.

Note: It is very important that before you install the pushrod linkages that you first charge your radio then remove all the servo horns from the servos and center all the mechanical or electronic trims on the radio.

Due to printing, the overall lengths of the pushrods on the right are to be taken as correct. Pushrod G is not given a total length now.



Initial Radio Setup

There are various different radios on the market, each having it's own special setup requirements, we have picked the top three brands to give you the basic setup parameters for the computer class radios. Not all features are available on all radios, use values for functions that do apply. For those that are using either the airplane version or an analog radio some of the following information will still apply.

JR

		THR	AILE	ELEV	RUDD	GEAR	PITCH	AUX2	AUX3
Channel #		1	2	3	4	5	6	7	8
Servo Reverse		R	N	N	N	N	N	N	N
Travel (ATV)	H	95%	95%	115%	100%	100%	100%		
	L	95%	95%	115%	100%	100%	100%		

Subtrim (after test flying, adjust the individual pushrods to bring the mechanical trims back to center)

D/R & Exp	Pos 0	90%	90%
		20%	20%
	Pos 1	100%	100%
		0%	0%

Trim Offset (store trim positions after test flying)

Throttle Curve	L	2	H
Pos N	0%	50%	100%
Pos S[2]	40%	50%	100%

Throttle Hold (set 5% above idle position)

Revo Mix[1] Up 30% Down 20%

Pitch Curve	L	2	H
Pos N	-2˚	5.5˚	10˚
Pos S	-5˚	5.5˚	10˚
Pos H	-5˚	5.5˚	12˚

PG-01T Piezo Gyro
Direction R
Gain 50%

General
The parameters here are based on JR servos and to be used as a guide in programming your JR radio.

Note 1, revolution mixing values based on PG-01T gyro, actual values may varies depending on gyro used.

Note 2, Throttle position "S" is for stunt setup & 3D flying only. Strongly not recommended for beginners.

Futaba

		THR	AILE	ELEV	RUDD	GEAR	PITCH	SPARE	SPARE
Channel #		3	1	2	4	5	6	7	8
Servo Reverse		R	N	N	N	N	N	N	N
Travel (ATV)	H	100%	95%	95%	100%	100%	90%		
	L	85%	95%	95%	100%	100%	90%		

STRIM (after test flying, adjust the individual pushrods to bring the mechanical trims back to center)

D/R & Exp	Pos 0	90%	90%
		-20%	-20%
	IDLE-UP	100%	100%
		0%	0%

Trim Offset (store trim positions after test flying)

HV-T~TH-CRV (Throttle Curve)	1	3	5
Pos N	0%	50%	100%
IDLE-UP[2]	40%	50%	100%

TH-HLD (set 5% above idle position)

REVO[1] Up 30% Down 20%

TH-CUT (Throttle Cut) -20%

P-AT~PI-CRV (Pitch Curve)	1	3	5
Pos N	-2˚	5.5˚	10˚
Pos S	-5˚	5.5˚	10˚
Pos H	-5˚	5.5˚	12˚

PG-01T Piezo Gyro
Direction N
Gain 50%

General
The parameters here are based on Futaba servos and to be used as a guide in programming your Futaba radio.

Note 1, revolution mixing values based on PG-01T gyro, actual values may varies depending on gyro used.

Note 2, Throttle position "IDLE- UP" is for stunt setup & 3D flying only. Strongly not recommended for beginners.

Airtronics

		THR	AILE	ELEV	RUDD	GEAR	PITCH	7/B
Channel #		3	2	1	4	5	6	7
Reverse (SW-R)		R	N	N	N	N	N	N
Travel (EPA)	H	95%	95%	100%	100%	100%	95%	
	L	95%	95%	100%	100%	100%	95%	

TRIM (Sub Trim) (after test flying, adjust the individual pushrods to bring the mechanical trims back to center)

D/R & Exp	Pos 0	90%	90%
		20%	20%
	Pos 1	100%	100%
		0%	0%

Trim Offset (store trim positions after test flying)

TH~CU-PL,2,PH (Throttle Curve)	PL	P2	PH
Pos N	0%	50%	100%
Pos 1[2]	40%	50%	100%

Throttle HOLD (set 5% above idle position)

RVH[1] (Revo Mixing) Up 30% Down 20%

T-CUT (Throttle Cut) -20%

P-F~CU-PL,2,PH (Pitch Curve)	PL	P2	PH
Pos N	-2˚	5.5˚	10˚
Pos 1	-5˚	5.5˚	10˚
Pos 2	-5˚	5.5˚	12˚

PG-01T Piezo Gyro
Direction R
Gain 50%

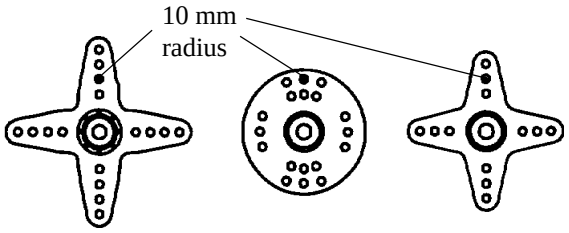
General
The parameters here are based on Airtronics servos and to be used as a guide in programming your Airtronics radio.

Note 1, revolution mixing values based on PG-01T gyro, actual values may varies depending on gyro used.

Note 2, Throttle position "1" is for stunt setup & 3D flyingonly. Strongly not recommended for beginners.

Servo Setup & Adjustments

In the next few pages the pushrod hardware will be mounted to the servos horns and ultimately the push-rods themselves. Each step is well described but lets take a few moments to cover a few basic points on setting up individual servos. By this time the radio will have been charged overnight. Recheck that all the servo trims are centered. Each radio manufacturer makes servo horns in different shapes: round, in a cross and sometimes a star, each giving a selection of hole patterns to choose from.

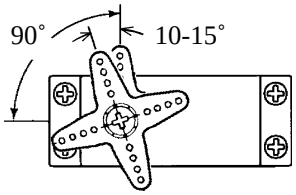


Futaba cross horn | JR round horn | Airtronics cross horn

Choosing the correct servo horn only involves whether the particular arm or wheel has the correct hole at the recommended distance measured from servo center to hole center, off by 1/2mm is ok. When using cross horns, many times the remaining arms need to be trimmed off to avoid binding on another servo like throttle and collective. When two pushrods need to be on the same horn but each at an angle, the round wheels are best suited. For wheels that are not predrilled for offsets, measure and drill your own holes. Remember to originally set the wheels or arms centered on the servo.

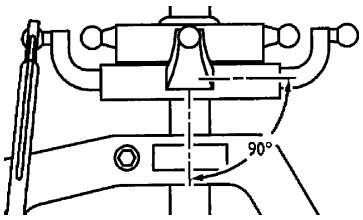
What we are looking for is equal travel both in the left and right rotation of the servo, this becomes complicated by pushrods attaching to the servo at an angle. To correct this we recommend an angle for the hole location. For elevator and collective, we suggest 10-15 degrees to allow for this "linear" geometry to be set up. A range is given to make it easier for you to just choose an available angle, if this is not possible, simply lift the servo horn off the servo and press into place one "notch" back (counter-clockwise).

We strive to have all the control surfaces setup linearly, this means that as the control stick is moved an equal distance from center that the servo will move a corresponding equal amount of travel. Although this is not clear now, this will become very clear when adjusting the throttle and collective servos movements, commonly called the throttle and pitch curves. At this time it is worth mentioning the danger of the ATV function, Adjustable Travel Volume has solved many setup problems while at the same time has created new ones. Most commonly used for throttle to easily keep the servo from binding, the thing to remember is to keep the upper and lower values should have the same. If the final values are different by more that 10 points then a mistake was made in setting the mechanical limits. Time to go back and recheck.



Servo horn shown offset one notch back on the output shaft.

The goal in the end after all the servos are mounted is to have the swashplate sit level or at 90 degrees to the main shaft and have the swashplate move equally fore, aft and side to side. The swashplate will also travel up and down as the collective servo is moved, it is important that in the upper position the washout hub does not contact the rotor head block while at the same time the swashplate remains above the top of the frames to avoid cyclic interferrence.



After installing the aileron and elevator pushrods, the swashplate should sit level.

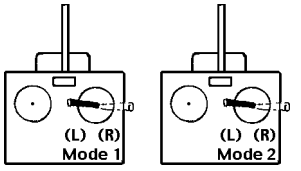
Don't use the pitch gauge until you have installed all the servo horns and pushrods. Pitch settings usually are the last step in completing the basic setup for the helicopter just prior to making the first test flights.

STEP 37 Aileron & Collective Linkage

The Aileron linkage controls the side to side tilt of the swashplate which in turn causes the helicopter to pitch to the left or right (hence roll cyclic pitch).

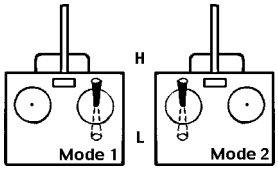
Attach two steel balls with two 2mm nuts at a distance of 10-11mm from the center of the servo (this range may vary depending on your particular radio) and 5-10 degrees ahead of the center of the servo using threadlock. The angle offset will eliminate any stress (wear) on the servo. With the radio turned on and the trim centered, attach the servo horn and Aileron Bellcrank Pushrods (**F**), some slight adjustment maybe necessary to have the swashplate sit level or 90 degrees to the main shaft when viewed from front or back. Move the Aileron stick completely in both directions to insure that there is no binding in the linkages.

For the Collective Servo, attach one steel ball with one 2mm nut to the servo horn at a distance of 10-12mm from the center of the servo using threadlock. With the Collective/Throttle stick on the radio in the center press the servo horn onto the collective servo so the ball is at 75-80 degrees to the servo as shown. Attach the Collective Arm Pushrod (**D**) and move the Collective stick completely in both directions to insure that there is no binding in the linkages.

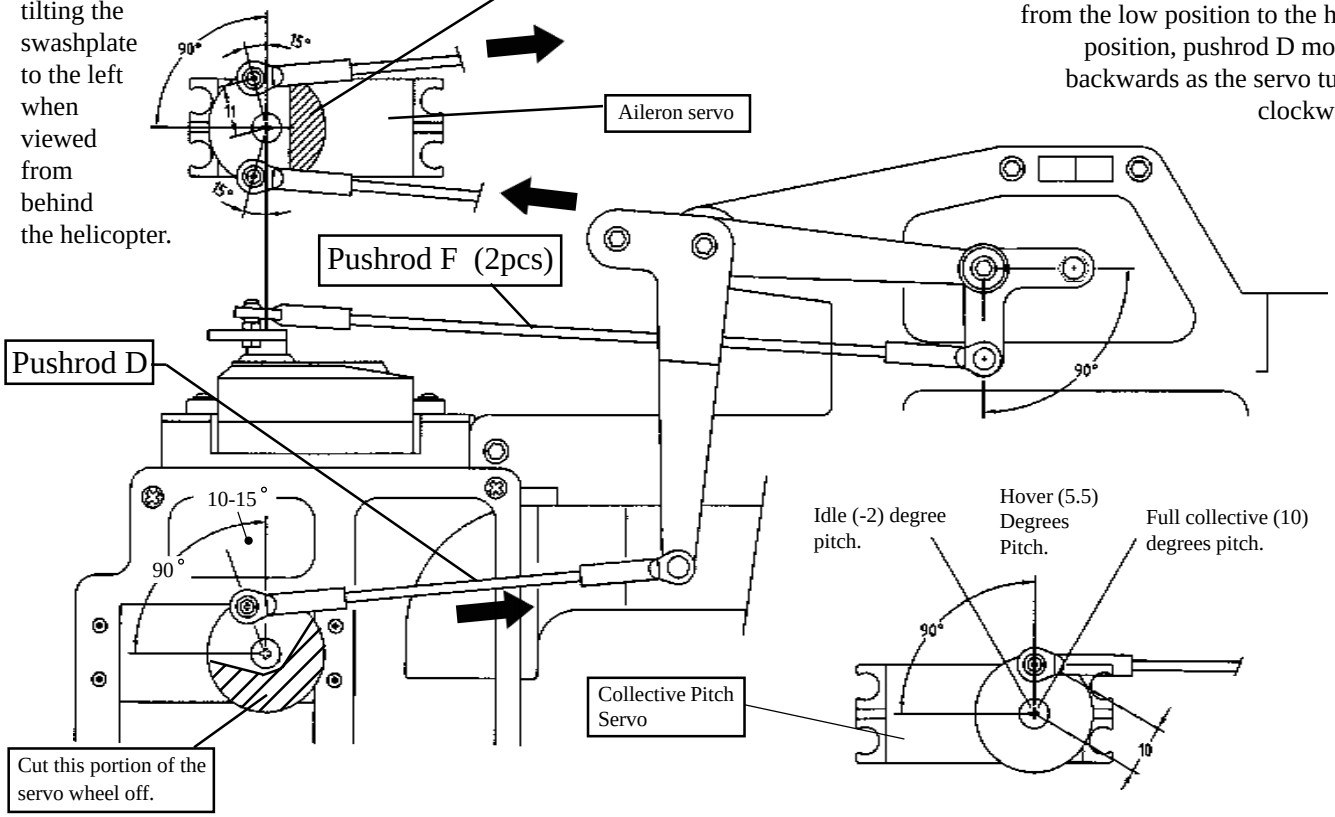


At the aileron stick is moved to the left the servo turns clockwise tilting the swashplate to the left when viewed from behind the helicopter.

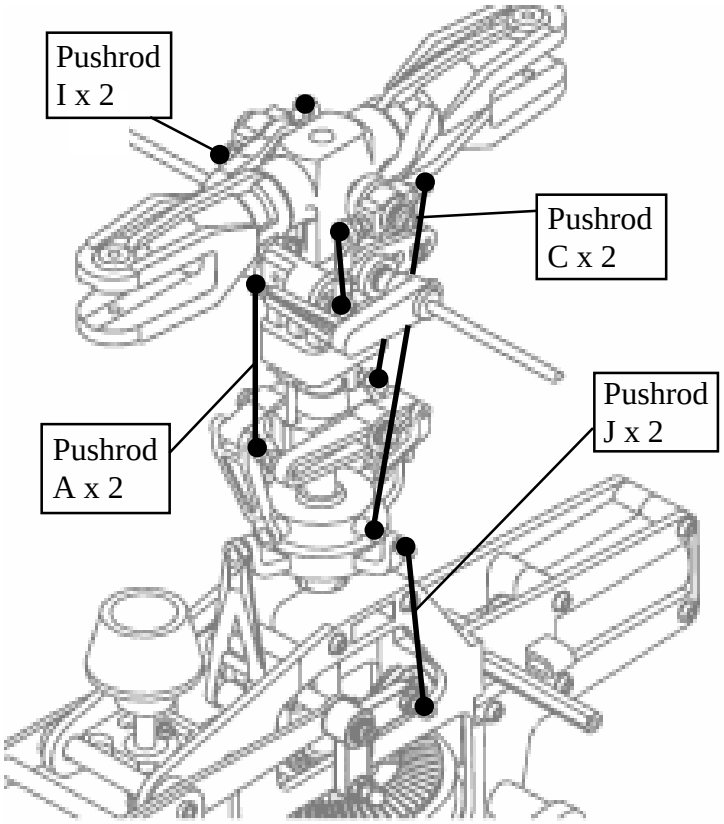
1. Remove this section of the servo wheel to avoid the rod end binding against the servo wheel.
2. Optionally, the straight arm can be used however this tends to bind, for free movement use first method .



As the collective stick is moved from the low position to the high position, pushrod D moves backwards as the servo turns clockwise.



These pitch settings will be made later with a pitch gauge.



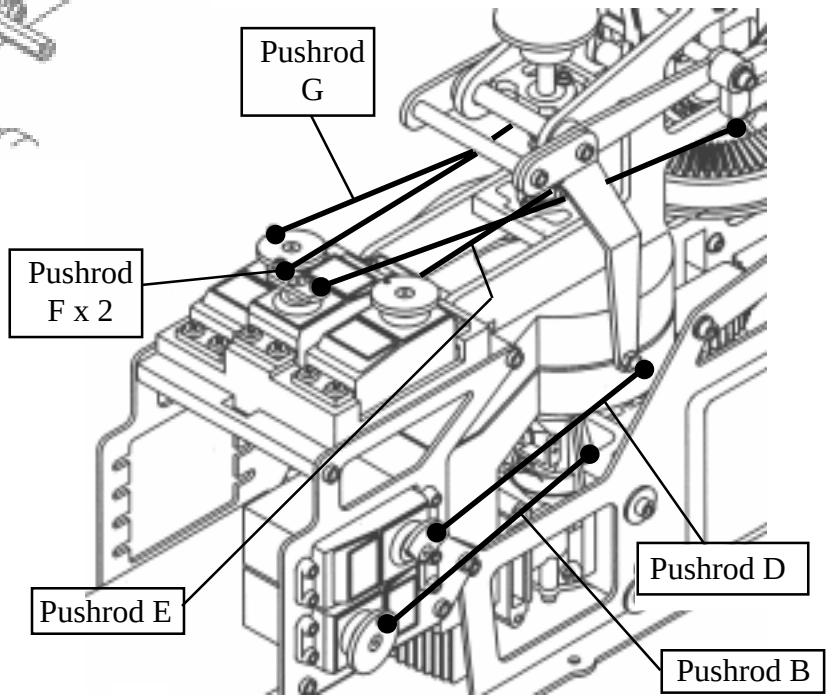
STEP 38 Rotor Head Linkages

When attaching all pushrods, make sure same length pushrods are actually the same length from the beginning otherwise it will be difficult later to figure out where the linkage problems are coming from. The entire rotor head is set up the same way for both types of radios. Attach the following:

2 Flybar to Washout pushrods (**A**)
2 Bell Mixer to Seesaw pushrods (**I**)
2 Bell Mixer to Inner Swashplate pushrods (**C**)
2 Aileron Bellcrank to Outer Swashplate (**J**)

STEP 39 Servo Pushrod Overview

The lower linkages are shown here to illustrate the general setup and layout of the servo linkages to the respective control surfaces.



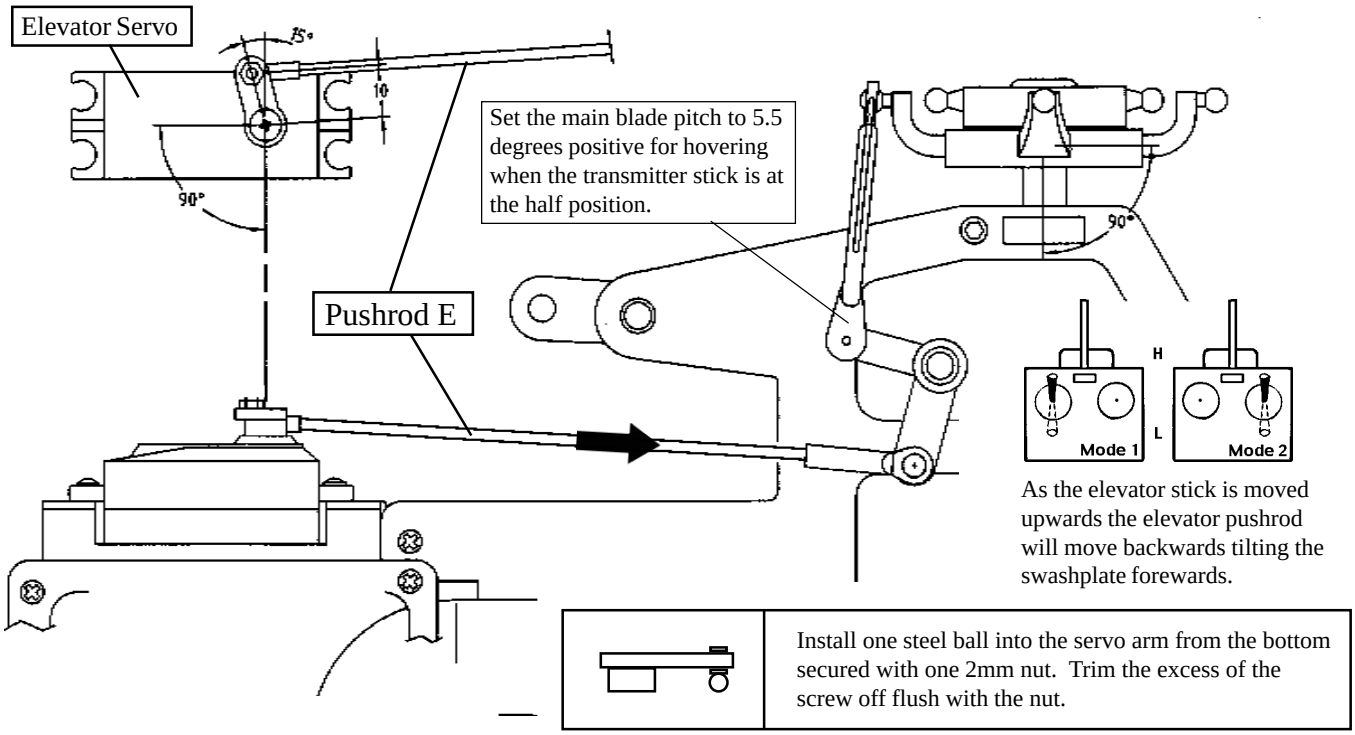
STEP 40 Elevator Linkage

The Elevator linkage controls the tilt of the swashplate forward and backward which causes the helicopter to pitch forward or backward (hence fore-aft cyclic pitch).

Use a servo horn in the shape of a cross and trim the 3 of the 4 arms off. Install one steel ball and one 2mm nut at a distance of 10mm from the center of the servo (**mount the ball directly against the bottom of the servo arm and tighten the nut on top, trim off the screw level with the nut to avoid hitting the Aileron pushrods**), remember to use threadlock. With the radio on and the elevator trim set at the center, attach the elevator pushrod (**E**) to the elevator bellcrank, then attach the servo horn at an angle of 10-15 degrees behind center of the servo (the offset enables an equal throw of the swashplate). **It is important that the swashplate sit at 90 degrees to the main shaft.**

Note, for Airtronics servos, the ball needs to be installed on the top of the servo horn requiring the aileron servo to be moved up. This can simply be done with 1/4" thick (6mm) spacer make from wood or plastic with the appropriate holes drilled.

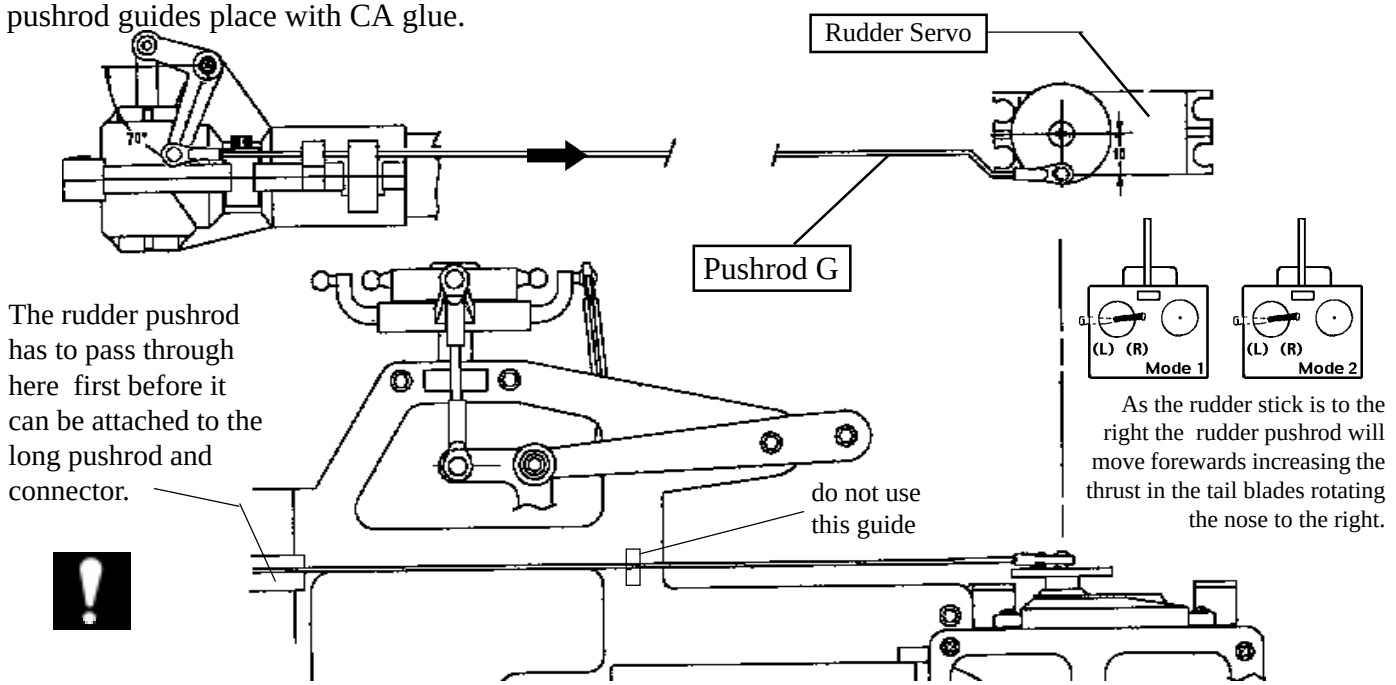
Elevator Linkage Diagram



STEP 41 Rudder Linkage

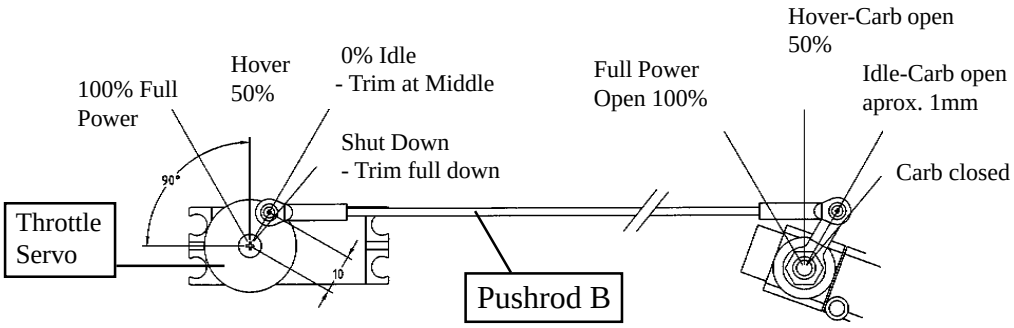
The Rudder linkage for the tail rotor is set up the same for both Helicopter and Airplane radios, the pushrod changes the pitch of the tail rotor blades to increase or decrease the torque compensation to rotate the nose of the helicopter about the main shaft.

Use a servo horn in the shape of a cross and trim the 3 of the 4 arms off. Install one steel ball and one 2mm nut at a distance of 10mm from the center of the servo remember to use threadlock. The Rudder Pushrod (**G**) will at this point be installed up to the upper frames, holding the pushrod hex connector thread the short rudder pushrod and attach the ball link to the servo end. Having the radio on and the rudder trim centered press on the servo horn onto the servo set at 90 degrees to the servo and align the rudder bellcrank to 70 degrees as shown in the diagram. Prior to connecting the rudder ball link, move the pushrod back and forth and move the pushrod guides until the pushrod moves the smoothest. Glue the pushrod guides place with CA glue.



STEP 42 Throttle Linkage

From Bag 4, attach one steel ball one 2mm nut, to both the Throttle servo horn and the Throttle Extension using threadlock. Position the ball at 10mm from the center of the servo and in the outermost hole on the metal throttle arm. With the radio on, and the throttle stick centered and the trim in the center, press the servo horn onto the servo so the ball is at 90 degrees to the servo (the hovering position). Move the throttle stick to the low/idle position and press the Throttle Pushrod (**B**) onto the steel balls. Check that in the low position the carburetor has about a 1mm wide opening for idling and finally as the trim is moved fully down the carburetor closes completely to shut the engine off. Also check that in the high position the carburetor is fully open. The throttle extension nut may have to be loosened and the lever repositioned to operate as recommended.

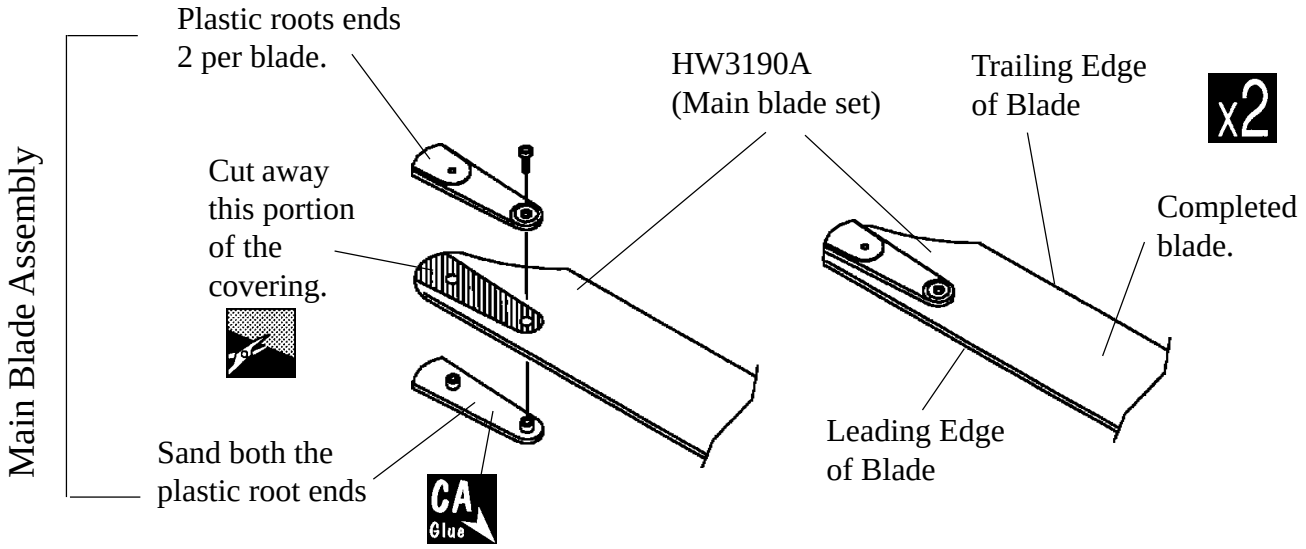


Tip

Pushrod B will vary in length slightly as the position of the carburetor is different for each engine manufacturer. Following the above instructions will allow you to get the carburetor setup correctly.

STEP 43 Main Blade Preparation & Installation

The Main Rotor Blades in the kit are pre-built and balanced, the only work required is to glue the blade grip root ends to the blades (**Please note that this step is to avoid the blades separating from the helicopter during flight!!**). Temporarily install the root ends (see note) onto the blades by cutting the covering over the holes and mark with a pencil, the outline of the plastic parts on the covering, remove the root ends and mark a second line about 3mm inside the first and trim away this internal portion of the covering with a knife. Using some sandpaper roughen the plastic root ends and glue them in place with Slo CA glue. Install the blades onto the rotor head to dry to make sure the thickness is perfect when finished.

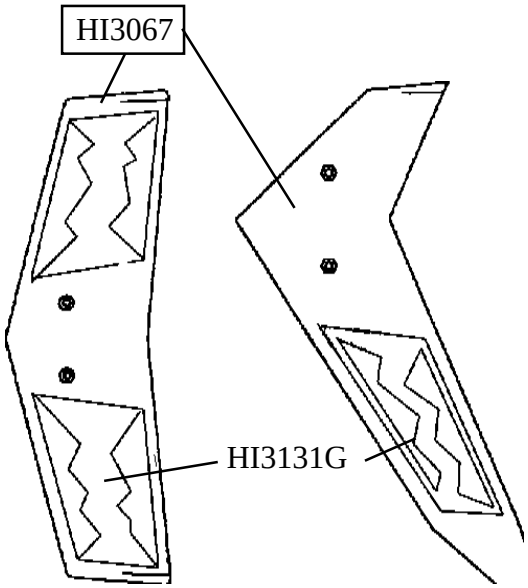


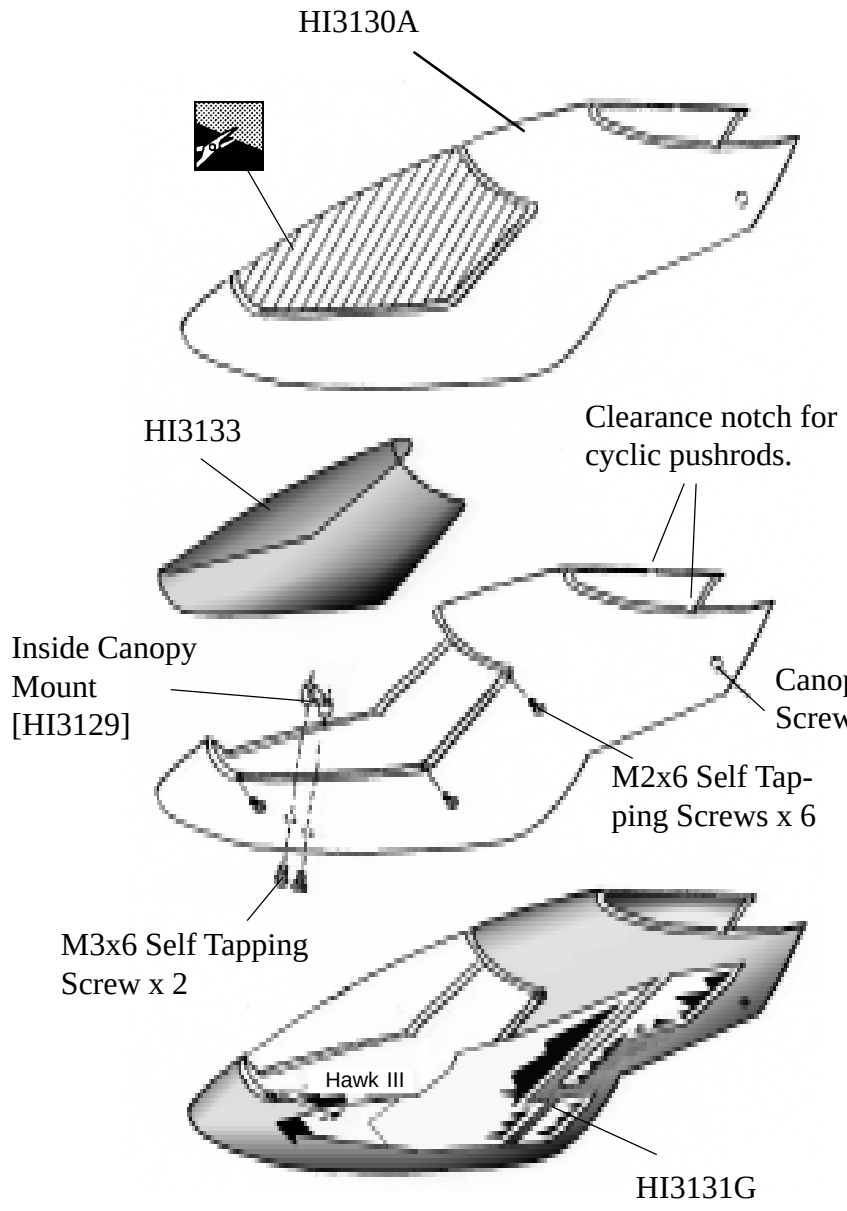
Note: The plastic blade grips have a top and a bottom which are different when viewed from the large end. Test fit the parts to be sure that the total thickness of the blades are 12mm.

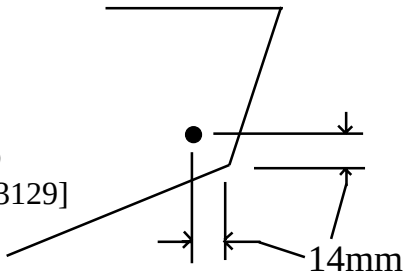
STEP 44 Canopy & Decals

The Canopy has a line molded into the plastic to follow when trimming the windshield part out, be careful, trim the innermost line leaving the 6mm band for attaching the windshield. Using a sharp hobby knife carefully scribe a line several times into the plastic until you cut through the material. Similarly trim the clear windshield along the provided line, to make it easier to see the line, use a non-permanent marker and trace the line, any extra ink can be removed with rubbing alcohol. Test fit the canopy together by taping it to the canopy, some additional trimming maybe necessary to get a good fit. From Bag 5, the inside canopy mount can be installed (**note the direction of the mount**) with two 3x6mm Self Tapping Screws,(**note: the location for the mount has to be moved 8mm forward of the marked location on the bottom of the canopy**). The clear windshield can be attached using six 2x6mm Self Tapping Screws in Bag 4, drill six 1mm holes at the locations shown.

To improve the adhesion of the decals to the body, peal the decal off the backing and apply one coat of spray adhesive (spray glue) to the sticky side, commonly found in your hobbyshop. For those who would prefer to paint the canopy, automotive flexible bonding clear must be used to prime the canopy first.







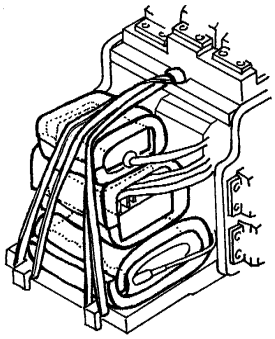
STEP 45 Canopy Mounts

The two holes for the rear canopy mount have to be moved to 14mm from the rear and bottom edge as shown. Attach the canopy using two Canopy Retaining Screws. Two notches have to be made in the canopy to clear the cyclic pushrods.

Radio Components & Balancing

Gyro Having completed all the assembly for the helicopter, all that remains is mounting the radio receiver, receiver battery and the gyro. For piezo gyros: mount inside the canopy.
Mount the gyro on the radio tray, some rearrangement from the picture is required to mount everything. If using the PG2000, the gyro can be mounted between the collective & throttle servos and the right servo frame side. It is extremely important that the gyro is attached using only the supplied two sided tape on to a clean surface (wipe with rubbing alcohol only). Keep all wires and components away from the gyro housing. Do not use straps or elastics or velcro to secure the gyro. Install the gyro using double sided foam tape (supplied with gyro) put a full strip along the bottom of the unit and press onto the surface.

Note: the gyro tray in the behind the engine is for mounting the mechanical style gyro, not for the piezo type.

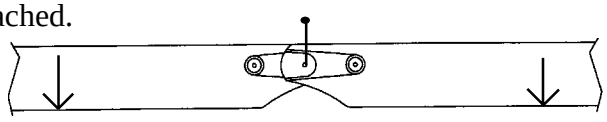


Receiver, Battery Pack and Gyro Controller

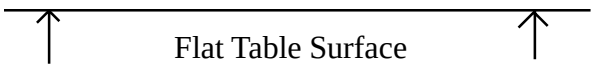
Using the foam rubber, wrap the battery pack, receiver and gyro controller(mechanical type) separately, allowing wires to be collected and tied together. Using two elastics looped through the front of the top servo tray, secure the components to the two hooks on the lower servo tray. Depending on your equipment, the gyro controller and switch can be mounted on the provided bracket.

Balancing the Rotor Head & Attaching Main Blades

Balance is the most important part in maintaining a safe and reliable helicopter. First check the blades for balance, this can be done on a balancer but can be done directly on the helicopter by tipping the helicopter on its side at the edge of a table and attaching the blades with two 4x30mm Socket Head Cap Screws and 4mm locknuts. Temporarily remove the bolt to secure the autorotation bearing so the head spins free (remember to replace this bolt!!). If one blade stops at the same spot add some tape to the lighter blade to balance the rotorhead. The same procedure can be used to balance the flybar without the main blades attached.

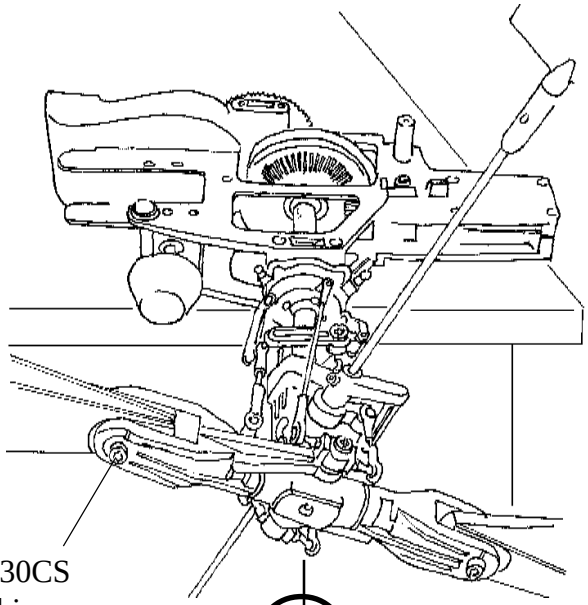


Distance A Distance B



Flat Table Surface

Bolt the blades together and support by the ends of the bolt off a flat surface. If one blade tips to one side add small pieces of tracking tape until both blades hang an equal distance from the table (Distance A = B). Attach the Main Blades to the helicopter using two 4x30mm Socket Head Cap Screws and M4 Locknuts.



M4x30CS Machine Screws x 2
M4 Locknuts x 2

When attaching the main blades, the direction of rotation is clockwise, when looking on top of the helicopter.

Blade Bolt Tension

**Blade Bolt tension on main blades should be set by starting from loose blades, tighten the bolts a little at a time until the blades will hold straight as the helicopter is tipped on its side. Slightly tighter is good. Too tight and a vibration will occur, too loose and a boom strike can happen. Tail blades can be set the same way.

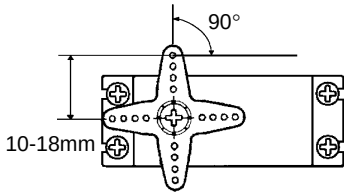
PG2000 Dual Rate Gyro & Setup Instructions

(purchased separately)

The following instructions cover the PG2000 gyro however are useful to review to make final adjustments for the gyro and the check the rudder pushrod is smooth in the complete movement range.

Helicopter Servo Setup:

1. Disconnect the tail pushrod from the rudder servo and check that the pushrod is smooth and requires only a gentle force to move from one endpoint to another through the entire range of movement. Make necessary changes if needed.
2. Following the rudder instructions provided with the helicopter set the pushrod length so the pitch slider is centered within it's movement range and has the proper 5° of tail pitch to hold the helicopter straight in a hover while the collective/throttle stick is at the hovering position on the radio. Experiment with the position of the steel ball or "z" bend on the servo horn to achieve maximum mechanical throw while the rudder ATV / EPA remains at 100% in both directions. Now go back to the ATV/EPA settings and reduce both directions to 90%, this will ensure that no overdriving will occur.



3. Position the control ball or "z" bend on the servo horn at 10-18mm from the center of the servo for best performance. For beginners getting started use 10-14mm.

Mounting the gyro:

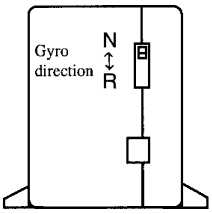
1. The PG2000 is best located inside the canopy away from the engine and fuel system. Most manufactures will suggest a location for the gyro based on the older mechanical type of gyro, not to be confused with the PG2000's piezo technology.
2. The surface that the gyro will be mounted need to be prepared with a mild cleaner that will not degrade the surface that the foam tape with adhere to (rubbing alcohol is recommended.)
3. Using two pieces of foam tape, double up and attach to the bottom of the gyro base. Then attach the gyro with the adjustable pots facing an open direction for access. The gyro should be mounted so the case of the gyro does not contact the helicopter frame or other radio components or wiring.

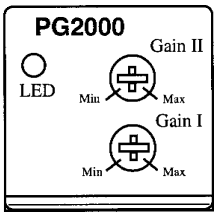
Final Connections:

1. First of all, please connect the rudder servo (or any function you expect to be assisted by PG2000 Piezo Gyro) to your receiver directly. Turn on the transmitter and receiver. Your helicopter (or aircraft/surface models) should be set up as per the manufacturer's instructions. On your transmitter set all subtrims, trim offsets and mechanical trims to zero (neutral). Move the collective stick to the hover position (usually 50%) and install the servo horn in the neutral position.
2. Turn your transmitter and receiver's power off. Disconnect the rudder servo from the Receiver and connect the wiring harness. Connect the black lead to the rudder channel on the receiver, the red lead to the Gear/Aux switch channel and the servo to the gyro.
3. Turn the power on and the green LED will flash rapidly for 5 seconds, during this time do not move the helicopter or the rudder stick. The green LED will become solid when the gyro has initialized. At this time re-trim the rudder channel using your sub-trims to return the servo horn to the neutral position.

Adjustments:

Only use a plastic screw driver to make changes on the gyro.





Gyro Configuration & Setup:

The following chart lists the gyro settings by radio manufacturer. Gain I and Gain II correspond to the switch position on the radio however the PG2000 is unique in that Gain II is for hovering maneuvers and Gain I is for forward flight. The difference being the percentage gain available in each switch position.

Futaba / Hitec	**Switch**
Gain I	Back
Gain II	Front
Gyro Direction	R
JR / Airtronics Z	**Switch**
Gain I	Front
Gain II	Back
Gyro Direction	N

Gain Settings:

Gain I	Forward Flight	Range 20% - 85%
Gain II	Hovering	Range 35% - 100%

Start with the switch in **Gain II** (hovering) set at 50%. Bring the helicopter to a hover and keep increasing **Gain II** until the tail starts to oscillate (hunt). At this point reduce **Gain II** setting slightly (5-10%). To set ***Gain I*** (forward flight), start at 50%, and bring the helicopter into forward flight and continue to increase ***Gain I*** until the tail oscillates (hunts), again at this point reduce slightly (5-10%). Due to translational lift (air flowing under the rotor disk in forward flight) ***Gain I*** may appear to be the same as **Gain II** yet it is a lower setting.

Mechanical Gain:

A. If hunting occurs at less than 65% in Gain II while hovering - then move the rudder pushrod connection one hole inwards on the servo arm.
B. If no hunting occurs at 100% in Gain II in hover - move the rudder pushrod connection one hole outward on the servo arm. Note, the ATV/EPA settings need to be reduced to avoid overdriving the tail.

Revolution Mixing:

Due to the high sensitivity of the piezo gyro, the revo mix settings will be lower than the default setting in most radios. To correctly set for the UP direction, hover the helicopter and apply full throttle/collective and watch the tail rotation. Again for the DOWN direction, hover at a higher altitude lower the power/collective stick and watch the rotation.

Nose turns left	increase revo value to increase tail pitch
Nose turns right	decrease revo value to decrease tail pitch

Final Adjustments - Radio Setup

Now that the servo installation into the helicopter is finished the following pages should be reviewed. As various types of radios can be used to setup the helicopter, some of the following information may not apply.

Servo Direction (Servo Reversing)
Check that all servos move in the correct directions, see the diagram on pg 36.

Dual Rates
For beginners (using the flybar weights) the dual rate values should be set at 100% for both switch positions until hovering has been mastered.

Normal position: (high rate) 100%
Switch position 1: (low rate) 75%

Exponential
The exponential function allows adjustment of how sensitive the cyclic controls are when the machine is hovering. This should be left at 0% (linear) until all trimming is complete.

Sub Trims
The sub trims on the outside of your transmitter are used to fine tune the servo center positions while testing or in-flight. If the trim has to be moved more than 2-3 divisions then readjust the linkage length to set the trim back in the center.

Pitch & Throttle Curve Adjustments
The ultimate goal for adjusting the curves on your helicopter is to reduce how much the tail rotor moves during flight and aerobatics. This leads to maintaining a consistent main rotor RPM which can only be achieved through adjusting the individual values which control the pitch and throttle at a given stick position.

Pitch Curve Adjustment
The following chart shows the values for the collective pitch measured in degrees which are made on the helicopter using a pitch gauge. The Travel Adjustment function (if available makes these settings easy).
For the beginner it is recommended to set the low stick position to 0 degrees to avoid damaging the helicopter while reducing the power during the first few flights. These settings will need slight adjustment to keep the helicopter at a consistent height at mid stick.

Pitch Curve Values

Flight Mode	Setup Method	Low Pitch (low stick)	Hovering (mid stick)	High Pitch (high stick)
N	Beginner	0	5	9
N	Hovering	-2	5.5	10
1	Stunt & Aerobatics	-10	5.5	10
2	3D**	-10	0	10
H	Autorotation	-10	5	12

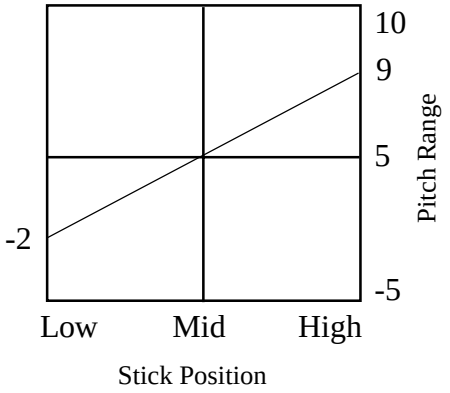
(N - Normal flight mode, 1 - Stunt mode one, 2 - Stunt mode two, H - Throttle hold-autorotation)

Note** In order to avoid binding at high pitch angles the flybar control arms need to be reset at an angle of 10-15 degrees down from parallel.

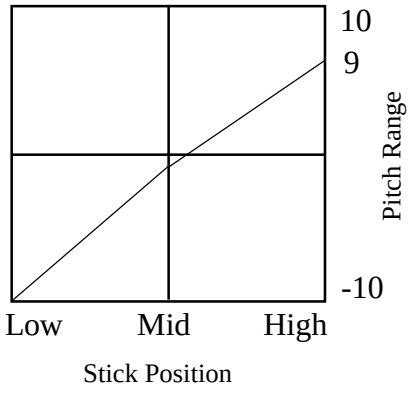
Travel Adjustment (endpoints)
Using endpoints to adjust to the limits of how far the servo is allowed to move is very convenient for fast set-up. If binding occurs simply reduce the travel in that direction. ** Note: by changing one side only (high or low stick) the servo travel is no longer linear which will tend to make that control surface unstable. It is better to set the high/low adjustments the same, or make actual pushrod adjustments.

Pitch Curve

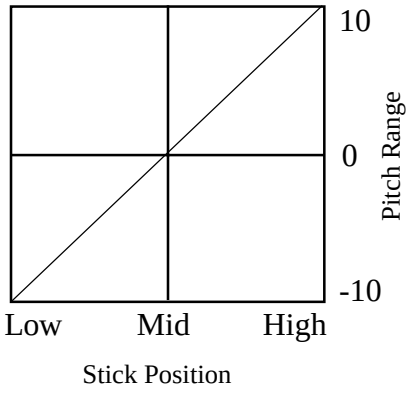
Hovering - (linear) Normal Flight Mode



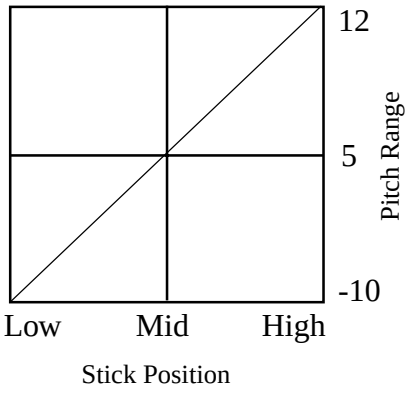
Aerobatic Flying - Flight Mode 1



3D Flying - Flight Mode 2



Autorotation - Throttle Hold

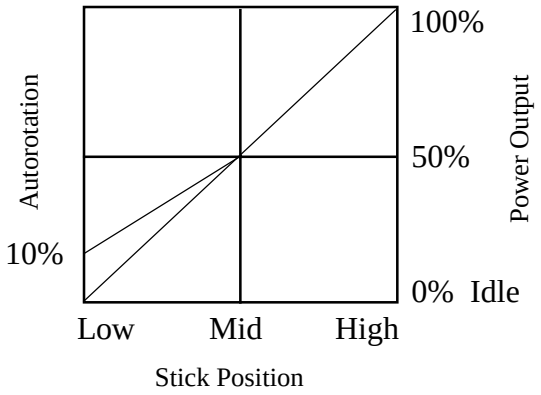


Throttle Curve Adjustments

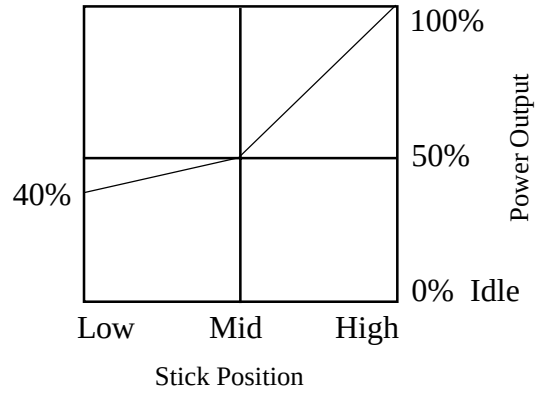
After several tanks of fuel the engine will be run-in, at this time you can modify throttle settings but remember that the smoother the engine the less adjustment required. Not all engine / muffler / fuel combinations are the same which will shift some of the values shown below.

Throttle Curve

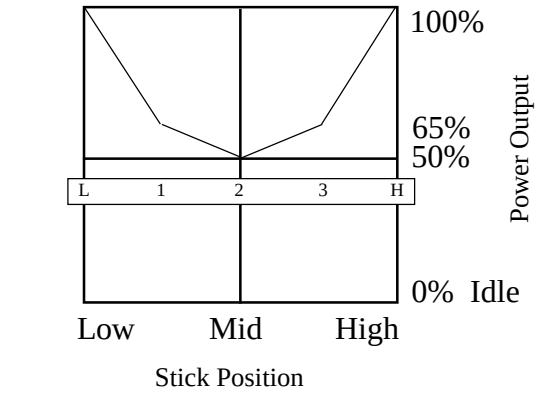
Hovering - (linear) Normal Flight Mode



Aerobatic Flying - Flight Mode 1



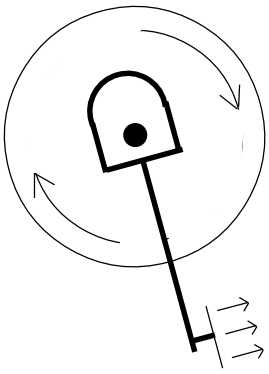
3D Flying - Flight Mode 2



Tail Rotor Setup

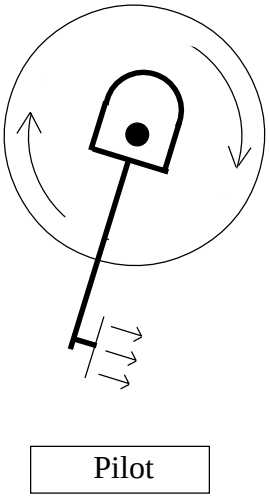
What separates airplane radio equipment from the helicopter version is in the control of the individual curves discussed earlier and in the Revo-mixing.

Take a moment to consider the helicopter <u>hovering</u> in front of you.



1 Nose rotates left at hover.

Problem: Not enough pitch in tail rotor to match torque setting of engine.
Action: Increase pitch by shortening the rudder pushrod.



2 Nose rotates right at hover.

Problem: Too much pitch in tail rotor to match torque setting of engine.
Action: Decrease pitch by lengthening the rudder pushrod.

Once the tail rudder pushrod is adjusted correctly so the tail does not rotate (don't consider wind now) the revolution mixing can be adjusted.

Revolution Mixing

The revolution mixing function allows the helicopter to climb or descend without the tail rotating. There is a high & low setting on the helicopter radio.
The values shown will vary depending on engine, blade pitch and fuel but provide a starting point for the beginner.

For each flight mode setting, there will be different Revo-mixing amounts. For forward flight the settings will be lower than hovering due to the aerodynamic forces effecting the helicopter. Here is a starting point for revo values:

High Stick Setting:	40	Normal Flight
Low Stick Setting:	20	Mode

These values correspond to the total travel for the tail rotor pitch. To adjust the high setting, hold the helicopter at hover and increase the throttle so the helicopter climbs steadily. Notice the direction the nose rotates:

	Nose rotates	
High & Low	left	increase revo value to increase tail pitch.
	right	decrease revo value to decrease tail pitch.

To adjust the low setting, start from a high hover and decrease the throttle to descend, notice which direction the helicopter rotates.

Gyro Gain Adjustment

The gyro assists in holding the tail rotor, actually compensating for changes in wind direction or quick movements.

First check that the gyro is installed correctly by watching the rudder servo. While holding the rotor head move the rudder stick to the right and observe the direction the servo arm moves. Now quickly rotate the nose to the left, the servo horn should move in the same direction. If the rudder servo horn moves in the opposite direction reverse the gyro direction.

Generally the starting setting for the gyro gain is 60%, keep increasing the gain setting until the tail starts oscillating back and forth, then reduce the setting slightly.

Problem: Tail rotor makes sudden uncontrolled rotations.
Solution: The gyro direction is possibly set in the wrong direction.

Before Flying your Helicopter

Before each flight, check that all bolts and screws are tight. Simply flying your helicopter, will loosen any screws which are not threadlocked or secured with a lock nut.

First Flights For the beginner pilot, a training pod is strongly recommended to assist in learining to hover the helicopter with substantially reduced risk of crashing. These systems provide an on ground training capability to allow pilots to become familiar with the helicopter before actually leaving the ground.

Starting Your Engine

Fuel 15-30% Helicopter fuel is recommended containing more oil. Use a fuel filter between the fuel gallon and the heli to remove any dirt that could stall the engine. Fuel the helicopter by removing the fuel line from the carburator and replace when finished.

Needle Valve Following the engine manufacturers instructions, turn the main needle valve until closed and open to the setting the instructions call for. Different engines will have different settings.

Radio Always turn the transmitter on first, then the helicopter & gyro and reverse when finished, turn off the heli & gyro first then the transmitter. If the radio acts erratically or intermittent, find the problem before starting the engine.

Glow Plugs Using a glow plug connector, remove the canopy or optionally use a remote glow plug connector to heat the glow plug. Warning!! glow plugs operate at 1.5V not 12V.

Engine Before starting the engine, check the correct direction of rotation and make sure the electric starter is turning the same direction.

Starting Start the engine from low throttle with the trim centered. Holding the rotor head in one hand, angle the starter and press down slightly to engage the starting shaft into the fan. Start the electric starter until the engine starts. If the engine does not start recheck all previous points. The main blades will not turn until the engine RPM is above idle.

Stopping To stop the engine, with the throttle stick in the low position, move the trim all the way to the low position.

If the Engine Does Not Start

Q. The engine does not turn easily with the starter.
A. The starter battery may be too weak or the engine is flooded. For flooding, remove the glow plug and turn the engine over several times to clear the combustion chamber of fuel and retry.

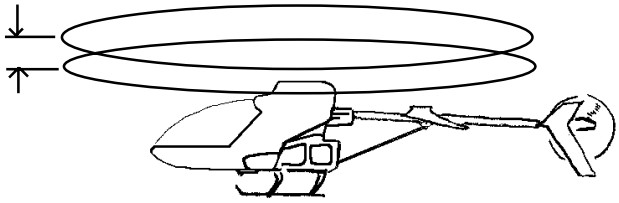
Q. The engine rotates and tries to start but doesn't.
A. The glow plug may be getting old. The glow plug batteries are weak. The starter may be turning the wrong direction.

Q. The engine just does not start.
A. The glow plug may be burned out. Fuel may not be getting to the engine, check for a clogged fuel line, dirt in the carburator or the main needle needs to be opened out slightly.

Q. The engine starts but immediately stops.
A. There is a clog in the fuel line, the carburator is not open enough at idle- open the throttle trim by 1-2 clicks. Helicopter engines have a low speed needle which is factury set, beginners should not adjust it!!

Adjusting the Blade Tracking

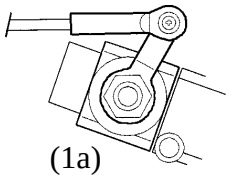
Pitch In steps 37 you setup the pitch range using a pitch gauge and setting the pushrods on the servo horns at specific distances. Once the helicopter is flying the pitch setting have to be fine tuned. Using appropriate training gear, increase the throttle until just before the helicopter lifts off and sight the rotor disk from 15' back. If there appears to be 2 rotor disks then adjust Pushrod C until only one disk appears. Using colored tape mark one blade so you can adjust the correct blade.



Starting the engine for the first time.

The model engine is the single most difficult part of model helicopters to the beginner, second only to learning to fly. For this reason we have taken the time to go through starting the engine the first time with you to help you to understand the basic operation and tuning of the engine.

Items to recheck:


(1a)

1) Servo direction for the throttle channel. Turn on the transmitter switch, then the switch on the helicopter, move the throttle/collective stick to the low position, the carburetor arm should look exactly like the diagram (1a). Watch the throttle servo. As you raise (increase) the left stick the throttle pushrod will move towards the front of the helicopter, all carburetors work the same, as the throttle arm is rotated by the throttle pushrod, the barrel of the carburetor rotates counter-clockwise as it opens. If this does not happen you need to reverse the servo direction and reset the throttle arm in Step 17. Starting the engine at full power will possibly damage the engine and will damaged clutch components on the helicopter.

2) Fueling the engine. Open the gallon of fuel and insert draw line from the fuel pump into the fuel, remove the fuel line at the carburetor inlet and connect to the fueling line of the fuel pump. Fill the tank until you start to see bubbles moving in the pressure line to the muffler. Reverse the pump for 1 second and disconnect the lines starting with the fueling line and reconnect to the carburetor. Recap the fuel to keep moisture out. Only fuel the model when you are setup and actually ready to start the engine, it is common for the carburetor to fill with fuel while sitting on the bench over a brief period of time. More common is the engine flooding while trying to start. This the case as you are starting with an electric starter the engine initially turns easily but soon slows down.

3) Last pre-flight checks. Make sure that both the radio Tx and Rx have been charged overnight and the glow starter (if recharge-able). Do a range check, walk away from your helicopter with the antenna fully collapsed to 30 paces and have someone verify that all control surfaces are operating. If you do not make this distance have an experienced modeler check over your setup, do not fly until then.

4) Cranking the engine over. When a brand new engine does not start there are only three major possibilities: a) the glow plug is not hot enough or already burned out or b) fuel is not getting to the carburetor or c) too much fuel is entering the carburetor. This is assuming you have gone through step 1 in this page. Connect the starter to a 12Volt source and verify that the starter will turn the starting cone counter-clockwise. Connect the glow starter connector to a 1.5Volt source or use a rechargeable glow starter. Do not connect yet.

- Move the throttle stick to the low position with the trim in the center.
- Look at the fuel line entering the carburetor, is there fuel in the line, if not pull the fuel line off and check.
- If there is no fuel in the line, reconnect and push down on the start cone and turn the engine by hand until you see fuel entering the carb. make one more revolution. Putting a finger over the exhaust hole will help.
- Connect the glow starter to the glow plug, place one hand firmly on the rotor head, **absolutely** at all times keep your hand on the rotor head, should the engine start anywhere above idle you will only have a few seconds to put the starter down and pull the fuel line off the carburetor line going to the engine. It is a good idea to make sure you are standing/kneeling on the fuel line side.
- Place the starter on the starting cone and push down, before you start, rotate the cone with the engine engaged backwards (clock wise) until you feel the compression increase.
- Press the button on the electric starter, there will be an initial popping sound as the engine turns over and within a few seconds the engine should start. If it does, while holding the rotor head put down the electric starter and move the throttle trim down until the engine continues to run at the lowest speed without quitting. If the engine starts to die simply move the trim up one or two clicks. Do not move the throttle stick from the low position.

5) The engine does not start. Do not continue to crank the engine over if it does not start.

a) Remove and check the glow plug, is the glow plug dry or wet? Connect to the glow starter or the glow connector and verify that the element glows a bright orange to a white color, if you get an orange glow then your glow starter is not supplying enough power to the glow plug.

b) If the glow plug is wet, then the engine is receiving fuel. If the glow plug is dry, no fuel is reaching the engine. Try re-priming the engine, point #3 step 4. Again verify that the engine is receiving fuel.

c) Is the engine very difficult to turn over, to the point that the electric starter is unable to turn the cone? If yes, you have successfully filled the engine and carburetor with fuel, do not force the starter as you can damage the starter and prematurely wear out the starting cone and ultimately the starting shaft will fail. First, disconnect the glow starter and pickup the helicopter and tip forwards and backwards with the muffler side down. This will drain the muffler of raw fuel. Next turn the cone until the half past the highest compression point, here the exhaust port will open and again drain through the muffler. Try to start again. Same problem, remove the glow plug and spin the engine (without) plug and any excess fuel will be expelled, replace glow plug and try again.

If the engine still doesn't start, contact an experience modeler to help you with starting the engine, the problem maybe very simple.

Basic Hovering

Hovering When all is set, ready and checked, attach your training gear/pod and start the engine.

(1) Place the helicopter pointing into the wind and stand behind the model about 15' away.
(2) Always watch the nose of the helicopter, move the rudder left and the nose will move left.
(3) Start by increasing the throttle slowly until the helicopter rises 2-6 inches off the ground then set it back down.
(4) Repeat this process until you become comfortable with the holding the model in the same spot for a few seconds then land it.

After some time at this you can increase the height slightly up to 1 foot (be very carefull not to get too high) as you are practising taking off and landing. This is the most basic but required skill for the beginner to learn.

Beyond Hovering

It cannot be stressed enough that mastering the hovering skill is crucial to becoming a good helicopter pilot. As you progress in your learning, always practise hovering until you are completely comfortable in holding the helicopter in any direction at any altitude. Perfecting hovering enables you to learn all the types and styles of helicopter flying, forward flight, loops and rolls, 3D (aerobatic flying) and anything you want to do with your helicopter as it can be set up for beginner through to expert. Lastly, have fun!!

Pre-Flight Checklist

1. After turning radio on, move each servo separately, looking for unusual or excessive movement.
2. Lubricate the main shaft above the swashplate and the pitch slider on the tail output shaft with oil.
3. Inspect the main and tail rotor grips for play or binding.
4. Turn the main gear in both directions to feel if a problem is developing in the drive train.
5. Check the glow plug and fuel lines for signs of wear.

PRE-FLIGHT CHECK UP & TRIM ADJUSTMENTS

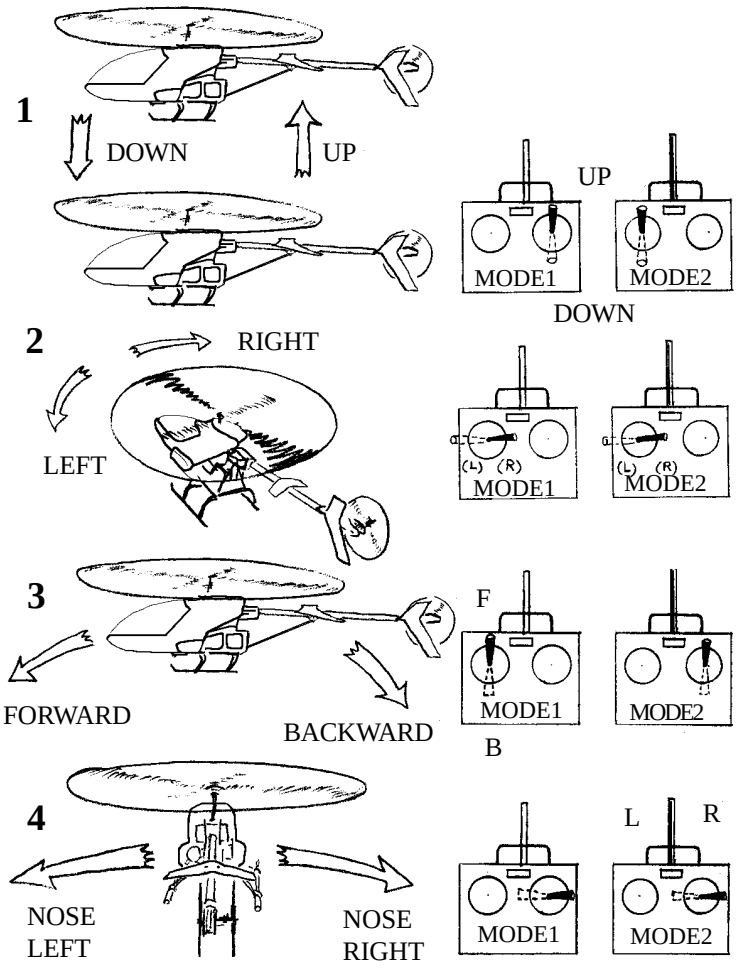
All trim adjustments are to allow you to lift the helicopter straight up and can be made one click or detent at a time on the radio.

(1) **Collective & Throttle:** Slowly raise the throttle stick, the helicopter should lift off at half stick. If it tends not to lift off increase the hover pitch on the radio or increase the throttle trim. If the helicopter lifts off before mid stick decrease these settings.

(2) **Rudder:** When the helicopter is ready to take off, make a correction trim first then use the rudder stick to control the Left & Right. Note, now is a good time to make a final adjustment on the gyro, see gyro manual.

(3) **Elevator:** If at hover the helicopter tends to move forward, move the trim down, if it moves backward move the trim upwards Use the elevator stick to control the Forward & Backward.

(4) **Roll (Aileron):** If at hover the helicopter tends to move left, move the trim right, if the helicopter moves to the right move the trim left. Move the Aileron stick to control the slide of the helicopter to the Right & Left.



Falcon III Bag Parts List

Bag 1

Rotorhead Block	1
Offset Plate	2
Tie Bar	2
Center Hub	1
Bearing Holder	2
Spacer M4x6x1.5	2
Ball Bearing M3x7x3	2
Oilite Bearing M3x10x4	2
M3x6 Self Tapping Screw	2
M3x6 Phillips Mach Screw	2
Special Ball M3x6	2
Main Blade Grip	2
Bell Mixer	2
Slide Tube	2
Short Ball	2
Long Ball	2
M3x16 Socket Cap Screw	2
M3x7 Flat Washer	2
Flybar Paddles	2
Flybar Weights	2
M3x4 Set Screw	2
Washout Hub	1
Washout Arm Assembly	2
Slide Tube	2
Short Ball	2
M3x16 Socket Cap Screw	2
M3x7 Flat Washer	2
Swashplate	1
Short Silver Ball	2
Medium Silver Ball	3
Medium Black Ball	2
Feathering Shaft	1
Damper	2
Bearing M6x13x5	4
Bearing M6x12x4 Thrust	2
M5 Locknut	2
M2.5x30 Pin	2
M6x10 Flat Washer	2
M8x13 Flat Washer	4
Flybar Control Arms	2
Short Steel Ball	2
Rod M2x15	4
Long Ball Link	4
Short Ball Link	4
M3x5 Set Screw	2

Bag 3

Clutch Shoe	1
Clutch Bell w/Gear	1
Ball Bearing M12x18x3	2
Cooling Fan	1
Engine Mount	1
M3x12 Socket Cap Screw	4
M3x16 Socket Cap Screw	4
M3x11 Flat Washer	4
M9x14 Flat Washer	1
M5x13 Flat Washer	1
Left Lower Sideframe	1
Right Lower Sideframe	1
Cooling Fan Shroud	1
M2.5x10 Self Tapping Screw	5
M3x12 Self Tapping Screw	2
M3x7 Flat Washer	2
Fuel Tank	1
Fuel Line 56mm	1
Long Vent Tube	1
Short Pickup Tube	1
Rubber Stopper	1
Large Cap	1
Small Cap	1
Clunk	1
M2.5x18 Self Tapping Screw	1
Cable Tie Wrap	1

Bag 7

Tail Rotor Blade	2
Tail Gearbox (R)	1
Tail Gearbox (L)	1
Horizontal Fin	1
Vertical Fin	1
Tail Rotor Grip Half w/Ball	2
Tail Rotor Grip Half	2
Tail Rotor Hub	1
M3x4 Set Screw	1
M3x10 Socket Cap Screw	2
M2x8 Phillips Mach Screw	4
M2 Hex Nut	4
Bearing M3x10x3	2
Pitch Slider Assembly	1
M2x8 Pin	2
Tail Pitch Ball Link	2
Tail Pitch Bellcrank	1
M2.5x16 Phillips Mach Screw	1
M5x2 Steel Ball	1
M2x5 Flat Washer	1
Short Steel Ball	1
Tube M3x8	1
M3x16 Socket Cap Screw	2
M3x16 Socket Cap Screw	2
M3x10 Socket Cap Screw	1
M3 Locknut	5
Large Bevel Gear	1
Small Bevel Gear	1
Tail Rotor Input Shaft	1
M2x12 Pin	2
M4x4 Set Screw	2
M3x5 Set Screw	2
Bearing M5x13x4	2
Bearing M5x11x4	2
Tail Output Shaft	1
Spacer Tube	1
Frame Strut Fitting	1
Fin Strut Fitting	1
Horizontal Fin Mount	1
Drive Shaft Guide - Center	1
Drive Shaft Guide - End	2
Pushrod Guide	3
M3x30 Socket Cap Screw	2
M3 Locknut	2
M3x15 Self Tapping Screw	2
M3x12 Self Tapping Screw	3
M3x7 Flat Washer	1

Bag 2

Left Upper Sideframe	1
Right Upper Sideframe	1
Main Gear Assembly	1
Main Shaft	1
Tail Rotor Output Gear	1
Tail Trans. Output Shaft	1
Bearing M5x13x4	4
E-ring	1
M3x4 Set Screw	2
Counter Gear	1
Alloy Drive Gear	1
Spacer M5x7x2	2
Primary Drive Shaft	1
M2x12 Pin	2
Ball Links	4
M2.3x25 Pushrod	2
Short Steel Ball	5
Roll Cyclic Bellcrank	2
Slide Tube	2
Collective Shaft 6mm ø	1
Collective Hex Spacer	1
Collective Lever	1
Collective Arm	2
Ball Bearing M6x10x3	2
Short Ball	1
M3x10 Socket Cap Screw	4
Mast Stopper	1
Bearing M8x19x6	1
Bearing M10x19x5	1
Spacer M14x19x1	1
M3x16 Socket Cap Screw	5
M3x20 Socket Cap Screw	1
M3 Locknut	6
M4x4 Set Screw	2
Long Hex Spacer	2
Short Hex Spacer	2
Canopy Thumb Screws	2
M3x40 Threaded Stud	1
M3x35 Socket Cap Screw	4
M3x7 Flat Washer	4
Start Cone	1
Start Shaft	1
Collar M5x10x5	1
M3x4 Set Screw	1
Start Shaft Block Assembly	2
Spring	1
M2x16 Pin	1
M5x10 Flat Washer	1
M3x12 Self Tapping Screw	8
M3x6 Washer Head Screw	1
Fore Aft Cyclic Lever Ass.	1
Short Spacer	2
M3x7 Flat Washer	2
Long Threaded Axle	1
M3x30 Socket Cap Screw	2

Bag 4

Fuel Line	1
Rod - Aileron M2.3x128	2
Rod - Elevator M2.3x105	2
Rod - Coll/Swash M2.3x80	3
Rod - Throttle M2.3x75	1
M4x30 Socket Cap Screw	2
M4 Locknut	2
M2.3x10 Servo Screw	20
M3x25 Socket Cap Screw	5
M3 Locknut	5
M2x6 Self Tapping Screw	6
Hex Key M1.5	1
Hex Key M2.0	1
Hex Key M2.5	1
Long Ball Link	14
Throttle Extension	1
Steel Ball w/2mm Thread	7
M2 Hex Nut	14
Servo Mount Tabs	4
Pushrod Coupler	1
Special Rudder Ball Link	2

Bag 5

Servo Tray Top	1
Servo Frame Side	2
Switch Mount	1
Battery Tray	1
Inside Canopy Mount	1
Canopy Mount Hook	1
Canopy Mount Spacer	1
M3x30 Phillips Mach Screw	2
M3x6 Self Tapping Screw	2
M3x15 Self Tapping Screw	8
M3x12 Self Tapping Screw	2
M3x7 Flat Washer	2

Bag 6

Landing Struts - Plastic	2
Landing Skids - Metal	2
M3x4 Set Screws	4
M3x16 Socket Cap Screws	4
Spacer M3x9x4	4

In Tailboom

Tail Boom	1
Flybar	1
Tail Drive Shaft	1
Tail Drive Housing	1
Antenna Plastic Tube	1
Short Rudder Pushrod	1
Long Rudder Pushrod	1
Tailboom Strut	1

In Box

Instruction Manual	1
Registration Card	1
Canopy	1
Windshield	1
Decal Sheet	1
Main Rotor Blades	1

Falcon III Replacement Parts

CN2230FS	Crash Kit -(main Blades, Main Shaft, Tail Boom, Feathering Shaft And Flybar)	1
HW3000	Hardware Pack	1
HI3001	Starter Cone Set	1
HW3005	Starter Shaft Set	1
HI3007	Starter Shaft Bearing Blocks	1
HI3009	Cooling Fan	1
HI3010	Clutch Bell & Lining	1
HW3011	Clutch Shoes	1
HW3018	Engine Mount 46	1
HI3020A	Cooling Fan Shroud - FIII & SE	1
HW3024	Collective Pitch Lever Set	1
HI3031A	Aileron Bellcranks (L&R Cyclic) - FIII	2
HI3032A	Elevator Lever Set	1
HI3035A	Adjustable Cyclic Pushrod Links	2
HI3040	Counter Drive Gear 55T	1
HW3042	Primary Drive Shaft	1
HW3045	Alloy Drive Gear 13T	1
HW3050	Autorotation One Way BB Set	1
HW3053A	Main Shaft - 10mm	1
HW3054A	Main Shaft Lock Ring - 10mm	1
HI3056	Main Gear	1
HW3057	Tail Drive Bevel Gear	1
HW3059	Tail Drive Primary Shaft	1
HW3062A	Tail Boom - FIII	1
HW3063A	Tail Drive Shaft Set - FIII	1
HW3064D	Tail Pitch Control Rod & Connector - FIII	1
HI3067	Tail Fin Set	1
HW3070	Tail Gearbox Input Shaft	1
HW3073	Tail Gearbox Output Shaft	1
HI3074	Brass Spacer Tube	1
HI3075	Tail Gear Set	1
HI3078	Tail Gearbox L&R	1
HI3087	Tail Pitch Slider Set	1
HI3089	Tail Pitch Ball Links	2
HI3096	Tail Blade Grip Set	2
HW3098	Tail Rotor Hub	1
HI3099	Tail Rotor Blades (Pair) 86mm	1
HI3102A	Tail Pitch Lever Set	1
HI3106A	Tail Control Rod Clamps	3
HI3107	Upper Side Frames	2
HW3112A	Lower Side Frames - FIII & SE	2
HW3115A	Servo Mount Frame Set - FIII & SE	1
HI3122	Landing Struts (Plastic)	2
HW3123	Landing Skids (Alloy)	2
HW3127	Hex Frame Spacers	1
HI3129	Canopy Mount & Hardware	1
HI3130A	Canopy Only	1
HI3131G	Falcon III Decal Set	1
HI3132E	Falcon III Instruction Manual	1
HI3133	Windshield (For HI3130A)	1
HI3138A	Fuel Tank 10oz	1
HI3145	Ball Links (16 L, 6 S)	1
HI3146B	Swashplate Set - 10mm	1
HI3152C	Washout Set - 10mm	1
HI3152A	Radius Link With Pin	2
HI3160B	Rotor Head Block	1
HW3161A	Flybar Seesaw Shaft Set	1
HI3167A	Flybar Seesaw Complete Set	1
HI3167B	Seesaw Off Set Plate	1
HI3167C	Seesaw Tie Bar	1
HI3167F	Seesaw Bearing Cup - for 4x8 bearing	1
HI3167E	Special Ball M3x6	1
HW3170A	Washout Pins - 30mm	2
HW3173A	Flybar - 4mm	1
HI3176A	Stabilizer Control Arm - 4mm	2
HI3179A	Flybar Paddles - 4mm	2
HW3180A	Feathering Shaft - 6mm	1
HI3181	Damping Rubbers	2
HI3184	Rotor Blade Grip	2
HI3189	Mixing Arm Set	2
HW3190A	Main Rotor Blades (pair)	1
HW3192	Linkage Set (11 Rods)	1
HI3201	T/B Support Fittings	1
HI3205	Servo Mounting Tabs	4
HI3206	Tail Pushrod Connector	1
HW3202	T/B Support Strut	1
HW3203	Brass Bearing Set	1
HW3204	Throttle Extension	1

Ball Bearings

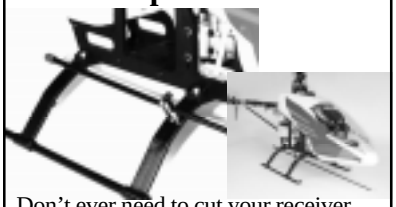
CNBB0480	Ball Bearing 4x8x3 (Flybar)	2
CNBB1030	Ball Bearing 3x10x4 (Seesaw Shaft, Tail Grips)	2
CNBB1350	Ball Bearing 5x13x4 (Counter Shaft, Tail Shaft)	2
CNBB1060	Ball Bearing 6x10x3 (Collective Axle)	2
CNBB1980	Ball Bearing 8x19x6 (Main Shaft - Lower)	1
CNBB1019	Ball Bearing 10x19x5 (Main Shaft - Upper)	1
CNBB1812	Ball Bearing 12x18x4 (Clutch Bell)	2
CNBB1150	Ball Bearing 5x11x4 (Start Shaft, Tail Shaft)	2
CNBB1812A	Ball Bearing 12x18x16 (Use Hw3050)	1

Falcon III Upgrade Parts

CN0427A	Hex start system w/hex adapter - 5mm
CN0402	Hex start adapter only - 5mm -**black**
CN0520A	Carbon torque tube tail drive 2 B.B - Falcon
CN2007	Trainer Pod 30-46 w/4 Legs
CN2008	Trainer Pod 60-Gas w/6 Legs
CN2015	Hardened Tip Hex Wrench Set (4 piece ground tips)
CN2016	4.8V Battery Monitor/Alarm
CN2018	PG2000 Dual Rate Piezo Gyro- **new**
CN2028E	7" Aluminum Starter Extension (must use with#2209)
CN2046	Basic Heli Setup Tool Kit (pitch gauge, blade balancer & pliers)
CN2052	Accuratech Blade Balancer -**blue**
CNQEC12	CNC Machined Aluminum Swashplate (10mm)
CN2079RA	Fast 3-D Hot dog fly bar paddles (R red, O orange, Y yellow)
CN2123	Carbon fiber flybar stiffeners (4mm flybar)
CN2137	2 oz Header Tank w/ Universal Bracket -**purple**
CN2155	Piston Locking Tool - **purple**
CN2153	Machined Throttle Extension - OS32SX,46FX,-**purple**
CN2176	CNC machined servo arm pack (5 pcs. Futaba **purple**)
CN2177	CNC machined servo arm pack (5 pcs. JR **purple**)
CN2179H	CNC machined servo arm pack (5 pcs. Hitec **purple**)
CN2202	Aluminum Turbo cooling fan - **purple**
CN2203	Ball Bearing Washout Mixing Arm Set with B.B
CN2204	Ball Bearing Bell Mixer Arm Set with B.B
CN2205	Ball Bearing Aileron Bellcranks Set with B.B
CN2208B	Metal Swashplate Anti-rotation Bracket - **black**
CN2208P	Metal Swashplate Anti-rotation Bracket - **purple**
CN2209P	Machined Aluminum Start Cone-**purple**
CN2209B	Machined Aluminum Start Cone-**purple**
CN2210	Canopy Quick Mount(2) - **purple**
CN2213	2oz Header Tank w/ Machined Mount Bracket - **purple**
CN2214B	Air Filter (OS32-46, TT36-46)
CN2215B	Machined Head Button (TM) - **black**
CN2215P	Machined Head Button (TM) - **purple**
CN2216	Rear Rudder Servo Mount Set
CN2217P	Machined Color Caps - **purple**
CN2218P	Machined Color Washers - **purple**
CN2224	Speed Up Gear 14T - increase to 9.1:1 ratio
CN2225	Hardened Start Shaft
CN2231A	Slipper Autorotation Drive Unit
CN2235	Triple Ball Bearing Tail Assembly
CN2126F	Ultra Light Carbon Graphite Tail Boom
CN2127A	Ultra Stiff Carbon Graphite Tail Fin Set
CN2128	Ultra Light Carbon Graphite Tail Boom Supports
CN2412	Hurricane Carbon fiber Blades - 550mm Fully Sym
CN2413	Hurricane Carbon fiber Blades - 550mm Semi Sym
CN2503	Vortex Carbon fiber Blades - 600mm Fully Sym 3D Pro
CN3033A	Torpedo 46 Speed Muffler -**Polished Aluminum**
CN3055F	Millennium Pipe -**Polished Aluminum**

Century Optional Upgrades

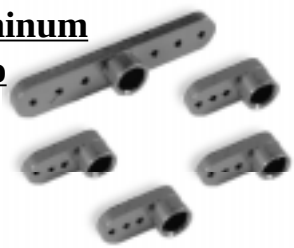
Carbon Graphite Whip Antenna



Don't ever need to cut your receiver antenna anymore, kit comes with a hollow fiber tube and CNC base mount. allows you to insert antenna into the tube. Antenna will be better protected and look so cool too!

CN2124 Antenna

CNC Machined Aluminum Servo Arm Pack



(Hawk, Falcon & Phoenix)

To completely eliminate slop on control surfaces.(purple)

CN2176 (Fut) Arm set
CN2177 (JR/Air) Arm set

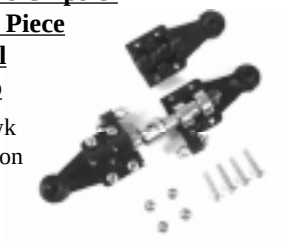
CNC Machined Finish Cap & Washer

Boy! these caps and washers make you look like a " PRO" (colors: Silver, Red, Blue, Gold, Purple, green, black 10pcs/pack)

CN2217 (screw cap)
CN2218 (nut washer)

Dual Ball Bearing Tail Blade Grips & One Piece Steel Hub

Hawk
Falcon

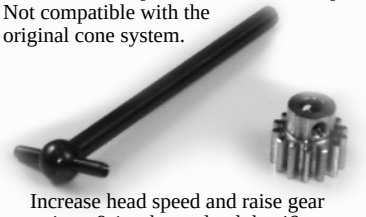


Heavy duty dual B.B tail grip permits solid precise control. One piece steel hub for long-lasting precision and durability.

CN2120 Dual B.B tail assembly

High Speed Gear & Hardened Start Shaft

Upgrading to the hex or cone start, this shaft has a flat spot machined at the top. Not compatible with the original cone system.



Increase head speed and raise gear ratio to 9.1 to better load the 46 engine.

CN2224 Speed up Gear 14T
CN2226 Hardened Start Shaft

Reversible One Way & Hex Start System

Adapts to starter shaft push into rubber insert. For Hawk,Phoenix & Falcon.(come with adapter).Extension adapts to most starters.

CN0427 One way hex start ext w/adapt.
CN0427A 5mm adapt

Aluminum Tail Blade Grips

(Hawk , Falcon & all 30-60 heli)

Aluminum C.N.C machined grips, color anodized use double B.B or thrust B.B (requires 2 ball bearings)

CN2212P Purple w/ball end
CN2212G Gold w/ball end
CN2212B Black w/ball end
CNBB1030 Bearing(2)(3x10x4)

FAI C.G. Correct Flybar Paddles

Pilots who don't care about 3D. don't know how to fly inverted, just regular sport flyers will love these paddles, smooth and precise control.

CN2114(Hawk,Phoenix & Falcon)

Neon Glow Color Hot Dog Paddles

3D switchless inverted pilots must try out these lightning quick paddles!

CN2079YA ..... (Neon Yellow)
CN2079RA ..... (Glow Red)
CN2079OA ..... (Glow Orange)

Remote Glow Plug Adapter

Eliminate removing the canopy to start the engine, comes complete with mounting hardware

CN2222 Glow Plug Remote Adapter

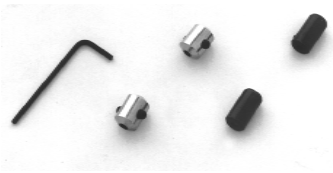
Hot Dog Main Shaft Thrust B.B. Kit

Hawk SE, Falcon III & SE

Any pilot moving into 3D or aerobatics should miss this item. Transfers all loading from the regular radial bearings to the thrust bearing.

CN2220A Thrust Kit - 10mm

3mm & 4mm Fly Bar Weights



The only way to balance the fly bar and eliminate excess vibration caused by out of balance paddles.

CN2029A 4mm weights (30-46)

Carbon Fiber Tail Boom

(Falcon III, SE)

3D flying has high demands from your helicopter, a carbon tail boom exceeds all standards for strength and stiffness.

CN2126F Carbon fiber tail boom Falcon

O.S. Throttle Extension

Aluminum C.N.C. machined throttle extension (purple andized)

CN2153 32SXH, 46FXH & TT36H

Carbon Graphite Tail Fin Set

Extremely light weight, high gloss carbon fiber fins.

CN2127A Hawk & Falcon

Carbon Graphite Tail Boom Support

Super high quality, extremely light weight and ready to install dual tail boom support kit.

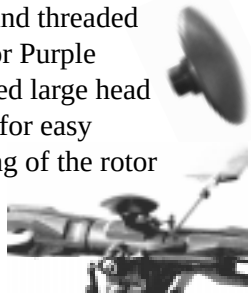
CN2128 Hawk,Phoenix & Falcon

Century Falcon III Upgrades

Head Button

(Hawk, Falcon & Phoenix)

Left hand threaded black or Purple anodized large head button for easy stopping of the rotor head.



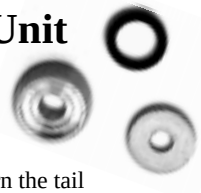
CN2215B Black
CN2215P Purple

Torque Tube Drive

Replace the wire drive system improving tail rotor response, especially if using a heading hold gyro.

CN0520A 46 Torque Tube Drive

Autorotation Slipper Unit



Getting started into auto-rotations? The slipper unit will continuously turn the tail rotor providing accurate rudder control while descending and landing. Adjustable for amount of slip through compressing the o-ring against the stainless plate.

A must for backwards flying !

CN2231A Slipper autorotation

Ball Bearing Bell Mixer Kit

(Hawk, Falcon & Phoenix)

Improving the performance is possible by upgrading to ball bearing type bell mixers.

CN2204 BB Bell Mixer kit

Ball Bearing Aileron Bellcranks Kit

(Hawk, Falcon & Phoenix)

Get more Precision aileron movement and improved 3D maneuverability

CN2205 BB Bellcranks

Ball Bearing Wash out Arm Kit

(Hawk, Falcon & Phoenix)

Ball Bearing Precision arms improving acrobatic & 3D maneuverability

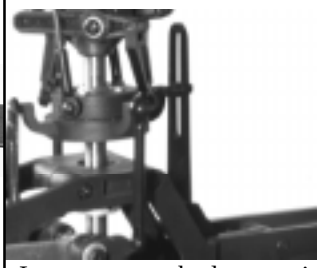
CN2203 Washout kit

Carbon Fiber Flybar Stiffeners

Carbon fiber flybar stiffener with purple aluminum ends.

CN2123 Stiffener 4mm (30/46)

Swashplate Anti-rotation Bracket



Improves swash plate precision control (purple &black)

CN2208P Anti-Rotation kit Purple
CN2208B Anti-Rotation kit Black

Canopy Quick Mounts

(Hawk, Falcon & Phoenix)

Fast "ON and OFF" your canopy and never lose canopy screws again. (purple)

CN2210 Quick Mounts

Metal Clutch Bell

Get ultimate positive drive and virtually balance free. Perfect for installing a governer.

CN2225 Clutchbell w/gear
HI3010A Bell only
HI3010B 2-Stroke Gear (26T)
HI3010C 4-Stroke Gear (33T)
CN2020L Clutch lining (2)

30-46 Size Metal Swash-plate 10mm

(Falcon 46 III & SE)

This beautiful CNC precision machined aluminum swashplate will increase acrobatic & 3D maneuverability. (black)

CNQEC12 Metal swash plate 10mm

Split Collars 10mm

The clamping nature of these collars will not mark the main shaft surface like the regular set screw type of mast stoppers.

CNQEC01 10mm Split Collars (2)

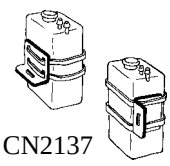
Aluminum Cone Start Systems

(Hawk, Falcon & Phoenix)

Adapts to Hawk, Falcon and most 5mm shaft helicopters. Extension fits most starter and works for all X-Cell, 7" long.

CN2226 Hardened s. shaft
CN2028E (Extension Purple)
CN2209 (Cone Purple)

2oz Header Tank w/ CNC Machined Mount or Die-cut Mount



CN2137

CN2213

CN2213 Machined Mount
CN2137 Die Cut Mount

Aluminum Turbo Cooling Fan

(Hawk, Falcon & Phoenix)

Increased 15% air flow, lower engine drag and smoother high speed operation.

CN2202 Turbo cooling fan

Crash Kit

Includes: Main Blades, Tail Boom, Feathering Spindle, Main Shaft and Flybar.

CN2230FS Crash Kit - FIII