

## Century Optional Upgrades

<p><b>Color Gelcoat FRP Canopy w/Fin Set</b></p> <p>Century proudly introduces our highest Quality FRP colored canopy w/ Fins (Blue, Yellow &amp; Green) for all 30/46 SE</p>  <p>CN2242AP Red, Yellow, Blue CN2242G Canopy w/ Fins Green CN2242B Canopy w/ Fins Blue CN2242Y Canopy w/ Fins Yellow</p>	<p><b>CNC Machined Aluminum Servo Arm Pack</b></p>  <p>(Raven 30/50)</p> <p>To completely eliminate slop on control surfaces (for plastic servo outputs).</p> <p>CN2189A (Fut) Arm set CN2185A (JR/Air) Arm set CN2181A (Hitec) Arm set</p>	<p><b>CNC Machined Finish Cap &amp; Washer</b></p>  <p>(Raven 30/50)</p> <p>Boy! these caps and washers make you look like a "PRO" (colors: Silver, Red, Blue, Gold, Purple, Green, Black 10pcs/pack)</p> <p>CN2217 (screw cap) CN2218 (nut washer)</p>	<p><b>Tuff landing Gear Systems</b> (Raven &amp; all 30 heli)</p>  <p>3 times tuffer than most 30-40 size helicopter landing gear. Tuff struts act as shock absorbers which help reduce jolts caused by hard landings.</p> <p>CN2243 Tuff landing gear</p>
<p><b>CRASH KIT</b></p> <p>our kits will save some of you hard earned cash. We have crash kits available for 30 and 50.</p>  <p>CN2230HS Crash Kit - 30 CN2230FS Crash Kit - 50</p> <p>( Includes tailboom, Wood blades, Flybar, Main Shaft &amp; Head Spindle )</p>	<p><b>Reversible One Way &amp; Hex Start System</b></p>  <p>Adapts to starter shaft push into rubber insert. For all 30/46 SE (come with adapter). Extension adapts to most starters.</p> <p>CN0427 One way hex start CN0427WD extension only</p>	<p><b>Aluminum Turbo Cooling Fan</b> (Hawk, Falcon &amp; Raven)</p>  <p>Increased 15% air flow, lower engine drag and smoother high speed operation.</p> <p>CN2202A Turbo cooling fan</p>	<p><b>Speed Torpedo HV II Tuned Muffler</b></p>  <p>Finally a more powerful, larger, quieter tuned muffler come out to improve your engine performance.</p> <p>CN3033 for R30 CN3033B for R50</p>
<p><b>Neon Glow Color Hot Dog Paddles</b></p>  <p>3D switchless inverted pilots must try out these lightning quick paddles! 3&amp; 4 mm.</p> <p>CN2079Y Neon Yellow 3mm - 30 CN2079R Glow Red 3mm - 30 CN2079O Glow Orange 3mm - 30 CN2079YA Neon Yellow 4mm - 50 CN2079RA Glow Red 4mm - 50 CN2079OA Glow Orange 4mm - 50</p>	<p><b>Hot Dog 3-D Carbon Fin set</b></p>  <p>3D Hot Dog pilot can't miss this light and durable carbon fiber tail fin set.</p> <p>CN2240H Hawk carbon fin set</p>	<p><b>2oz Header Tank w/ CNC Machined Mount or Die-cut Mount</b></p>  <p>CN2137 CN2213</p> <p>CN2213 Machined Mount CN2137 Die Cut Mount</p>	<p><b>Millenium Tuned Pipe</b></p>  <p>Feature the highest performance and quality construction for all the Raven 30 and 50 class.</p> <p>CN3055H for R30 CN3055F for R50</p>
<p><b>Carbon Fiber Tail Boom</b></p>  <p>(Raven 30/50)</p> <p>3D flying has high demands from your helicopter, a carbon tail boom exceeds all standards for strength and stiffness.</p> <p>CN2126H Carbon fiber tail boom 30 CN2126F Carbon fiber tail boom 50</p>	<p><b>O.S. Throttle Extension</b></p>  <p>Aluminum C.N.C. machined throttle extension (purple anodized)</p> <p>CN2153 32SXH, 46FXH &amp; TT36H CN2154 50SXH</p>	<p><b>10mm Hot Dog Main Shaft Thrust B.B. Kit</b></p>  <p>Any pilot moving into 3D or aerobatics should miss this item. Transfers all loading from the regular radial bearings to the thrust bearing.</p> <p>CN2220A Thrust Kit 10mm</p>	<p><b>Carbon Graphite Tail Boom Support</b></p>  <p>Super high quality, extremely light weight and ready to install dual tail boom support kit.</p> <p>CN2128 Carbon Tail Struts R30 CN2128C Carbon Tail Struts R50</p>

# Raven 30/50 V2

## Instruction Manual



### SPECIFICATIONS

	R30	R50
⇒ MAIN ROTOR	550mm	600mm
⇒ TAIL ROTOR DIAMETER	9.7 in	9.7 in
⇒ OVERALL LENGTH	46 in	47.5 in
⇒ HEIGHT	15 in	15 in
⇒ BLADES	550mm	600mm
⇒ ENGINE	32 ~ 40	50

**Century Helicopter Products**

Designed and Developed in USA

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## Raven Replacement Parts

CN2230HS	Raven 30 Crash Kit -(Wooden Main Blades, Main Shaft, Tail Boom, Feathering Shaft and Flybar)	1	HI3133A	Clear Windshield ( for HI3130B Canopy)	1
CN2230FS	Raven 50 Crash Kit -(Wooden Main Blades, Main Shaft, Tail Boom, Feathering Shaft and Flybar)	1	HI3138A	Fuel Tank w/ Fittings	1
HW3000	Hardware Pack	1	HI3145	Ball Links (16 L, 6 S)	1
HW3005A	Hardened Start Shaft Assembly	1	HI6146	Metal 120 Degree Swashplate Set/ CCPM - 10mm	1
HI3007	Starter Shaft Bearing Blocks	1	HI3152C	Washout Set - 10mm	1
HI3009	Cooling Fan	1	HI3152A	Radius Link With 12mm Pin	2
HI3010A	Machined Clutch Bell & Lining	1	HI3160C	Rotor Head Block - 10mm	1
HI3010B	Clutch Gear Only 26T	1	HI3167B	Seesaw Off Set Plate	2
HW3011	Clutch Shoes	1	HI3167D	Seesaw Bearing Cup - R30	2
HW3017	Engine Mount - 30	1	HI3167E	Special Ball Set M3X6	2
HW3018A	Engine Mount - 46/50	1	HI3167F	Seesaw Bearing Cup - R50	2
HI3020A	Cooling Fan Shroud	1	HI3167G	Seesaw Tie Bar, Screw & Spacers	2
HI3040	Counter Drive Gear	1	HW3170A	Washout Pins 2x30mm	2
HW3042	Primary Drive Shaft	1	HW3173	Flybar - R30 (3mm)	1
HW3045	Alloy Drive Gear 13T - R30	1	HW3173A	Flybar - R50 (4mm)	1
CN2224	Alloy Drive Gear 14T - R50	1	HI3176B	Flybar Control Arm - R30 (3mm)	2
HW3053A	Main Shaft - 10mm	1	HI3176C	Flybar Control Arm - R50 (4mm)	2
HW3054A	Main Shaft Lock Ring - 10mm	1	HI3179	Flybar Paddles - R30 (3mm)	2
HI3056	Main Gear	1	HI3179A	Flybar Paddles - R50 (4mm)	2
HW3057	Tail Drive Bevel Gear	1	HW3180A	Feathering Shaft - 6mm	1
HW3059	Tail Drive Primary Shaft - R30	1	HI3181	Damping Rubbers	2
HW3059A	Tail Drive Primary Torque Shaft w/Spacer - R50	1	HI3184	Rotor Blade Grip	2
HW3062	Tail Boom - R30	1	HI3189A	Bell Mixing Arm Set	1
HW3062A	Tail Boom - R50	1	HW3192A	Linkage Set (CCPM) - R30/50	1
HW3063	Tail Drive Shaft Set - R30	1	HW3202B	Tail Boom Support Struts - R30	2
HW3063C	Tail Drive Shaft Set - R50	1	HW3202C	Tail Boom Support Struts - R50	2
HW3064E	Tail Pitch Control Rod & Connector - R30	1	HI3205	Servo Mounting Tab Set	10
HW3064F	Tail Pitch Control Rod & Connector - R50	1	HI3206	Tail Pushrod Coupler	1
HI3067A	Tail Fin Set R30/50	1	HW3204	Throttle Extension	1
HW3070	Tail Gearbox Input Shaft - R30	1	CN0402	Hex Start Adapter w/set screw(5mm)	1
HW3070A	Tail Gearbox Torque Input Shaft - R50	1	CNLR1003	Micro Washer 3x5x0.5T	10
HW3073	Tail Gearbox Output Shaft	1	CNLR1013	Black M2 Steel Ball - Short (servos)	2
HI3074	Tail Gear Spacer Tube	1	CNLR1014	Stainless M3 Steel Ball - Short (ail bellcrank)	2
HI3075	Tail Gear Set	1	CNLR1015	Stainless M3 Steel Ball - Med (washout arms)	2
HI3078	Tail Gearbox L&R	1	CNLR1016A	Stainless M3 Steel Ball - Long (bell mixer)	2
HI3087	Tail Pitch Slider Set	1	CNLR1017	Stainless M3 Steel Ball - Special Long Thread (seesaw)	2
HI3089	Tail Pitch Ball Links	2	CN2322	Aerotech 3D 550mm pre-built wood blade (pair) - R30	1
HI3096A	Tail Blade Grip (1 piece/ 3BB type)	2	CN2400	Hurricane 3D 550mm Sym Carbon Main Blades (pair) - R30	1
HW3098A	Tail Rotor Hub	1	CN2411	Hurricane FAI 560mm Semi Carbon Main Blades (pair) - R30	1
HI3099	Tail Rotor Blades (Pair)	1	CN2412	Hurricane 3D 600mm Sym Carbon Main Blades (pair) - R50	1
HI3102A	Tail Pitch Lever Set - Standard R30	1	CN2413	Hurricane FAI 600mm Semi Carbon Main Blades (pair) - R50	1
HI3102B	Tail Pitch Lever Set - BB Type R50	1			
HI3106	Tail Pushrod Guide Set	3	<b>Ball Bearings</b>		
HI3107	Upper Side Frames	2	CNBB0360F	Ball Bearing 3x6x2.5 (Tail Pitch Lever)	2
HW3112C	Lower Side Frames	2	CNBB0730	Ball Bearing 3x7x3 (Flybar, Mixing arms)	2
HW3115B	Upper Servo Frame Set CCPM - R30/50	2	CNBB0930	Ball Bearing 3x9x2.5 (Tail Grips)	2
HW3115C	Lower Servo Frame Set & Battery Tray	2	CNBB0840	Ball Bearing 4x8x3 (Flybar R50)	2
HI3122	Landing Struts (Plastic) - R30	1	CNBB49T	Ball Bearing 4x9x4 Thrust (Tail Grips)	1
HI3122A	Landing Struts, Low Profile (Plastic) - R50	1	CNBB1150	Ball Bearing 5x11x4 (Start Shaft, Tail Output Shaft)	2
HW3123	Landing Skids (Alloy) - R30	2	CNBB1350	Ball Bearing 5x13x4 (Counter Shaft, Input Tail Shaft)	2
HW3123A	Landing Skids (Alloy) - R50	2	CNBB1360	Ball Bearing 6x13x5 (Main Blade Grip)	2
HW3127A	Hex Frame Spacers, Extension Rod & Canopy Side Mount	1	CNBB1260T	Ball Bearing 6x12x4 Thrust (Main Blade Grip)	2
HI3129B	Canopy Quick Mount	1	CNBB1060	Ball Bearing 6x10x3 (Pitch Plate)	2
HI3130B	Canopy Only	1	CNBB1980	Ball Bearing 8x19x6 (Lower Main Shaft)	2
HI3131J	Raven 30/50 Decal Set	1	CNBB1019	Ball Bearing 10x19x5 (Upper Main Shaft)	2
HI3132F	Raven 30/50 Instruction Manual	1	CNBB1812	Ball Bearing 12x18x4 (Clutch Bell)	1
			HW3050	Autrotation One Way Bearing Set	1

## Raven 30/50 Upgrade Parts

CN0427A	One way Hex start system w/hex adapter - 5mm	CN2213	2oz Header Tank w/ Machined Mount Bracket - <b>purple</b>
CN0520	Carbon torque tube tail drive 2 B.B - R30	CN2214B	Air Filter (OS32-50, TT36-46)
CN2007A	Trainer Pod 30/46 w/4 fiberglass Legs	CN2215A	Head Button (silver)
CN2008A	Trainer Pod 50/60-Gas w/4 long fiberglass Legs	CN2215AB	Head Button (B-black, P-purple)
CN2015	Hardened Tip Hex Wrench Set (4 piece ground tips)	CN2217P	Machined Aluminum Anodize Color Caps - <b>purple</b>
CN2016	4.8V on-board Battery Monitor/Alarm	CN2218P	Machined Aluminum Anodize Color Washers - <b>purple</b>
CN2018	PG2000 II remote on/off Piezo Gyro	CN2126H	Ultra Light Carbon Graphite Tail Boom - R30
CN2046	Basic Heli Setup Tool Kit (pitch gauge, blade balancer, pliers & etc.)	CN2126F	Ultra Light Carbon Graphite Tail Boom - R50
CN2052	Accuratech Machined Blade Balancer	CN2240H	Ultra Light Carbon Graphite Tail Fin Set
CN2079R	Fast 3-D Hot dog fly bar paddles (R red, O orange, Y yellow) - R30	CN2128	Ultra Light Carbon Graphite Tail Boom Supports - R30
CN2079RA	Fast 3-D Hot dog fly bar paddles (R red, O orange, Y yellow) - R50	CN2128C	Ultra Light Carbon Graphite Tail Boom Supports - R50
CN2122	Carbon fiber flybar stiffeners - R30	CN2263	Constant Tail Drive - R30
CN2123	Carbon fiber flybar stiffeners - R50	CN2263A	Constant Tail Drive - R50
CN2137	2 oz Header Tank w/ Universal Bracket - <b>purple</b>	CN3033	Speed torpedo 30 HV Muffler - <b>Polished Aluminum - R30</b>
CN2155	Piston Locking Tool - <b>purple</b>	CN3033A	Speed torpedo 46 HV Muffler - <b>Polished Aluminum -R50</b>
CN2153	Machined Throttle Extension - OS32SX,46FX, TT36H - <b>purple</b>		
CN2202	Aluminum Turbo cooling fan - <b>purple</b>	CN3055H	Millennium 30 Tuned Pipe Set - R30
CN2207	CNC Machined Washout Mixing Arms (2)	CN3055F	Millennium 46/50 Tuned Pipe Set - R50

## 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 Hawk 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

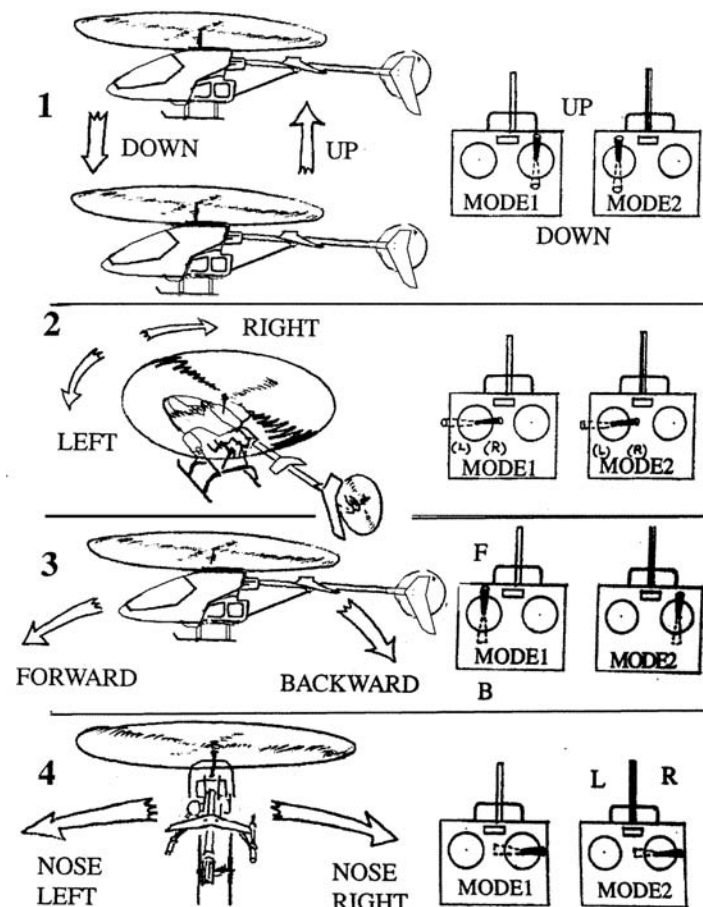
All trim adjustments are to allow you to lift the helicopter straight up and can be made one click or detent at a time on the radio.

(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.



## Building Instructions for the Raven eCCPM helicopter kits.

### Introduction

Congratulations on your purchase of Century Helicopter Product's newest RC helicopter model. The Raven eCCPM is a new breed of helicopter, ideal for beginners new to the hobby through to expert pilots. In order for our helicopters to improve, we needed to provide higher value for a better price, but this needed revising. Our result is this kit you are about to start building, offering the best design and quality of the 30 and 50 class and including features commonly found only in more expensive kits. This kit will exceed your expectations for precision control at an affordable price.

### 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.

### 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:

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www.centuryheli.com

## Starting the engine for the first time.

### Necessary Items "Not Included" in the kit



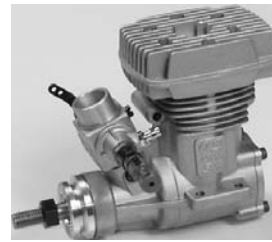
6 Channel Helicopter Radio or Equivalent.



PG2000 II piezo gyro  
CN2018



Glow Remote Adapter  
CN2222



32-40 Helicopter Engine  
50 Helicopter Engine



Tuned Muffler 30 size CN3033  
Tuned Muffler 46 size CN3033B

### Necessary Tools for Assembly and Adjustments

Main Blade Pitch Gauge  
w/Paddle Gauge  
CN2026



Needle Nose Pliers  
& Cutter Pliers



15% or 30%  
Heli Fuel



12 Volt Start Battery



5.5mm, 7mm, Phillips  
Screw Driver



4 Way Wrench  
CN2031



5

Ball Link  
Plier  
CN2034



Hobby  
Scissors



Metric  
Ruler



Hobby Knife



Allen Key Set CNBN10946



Fuel  
Line

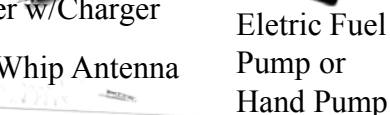


12 Volt  
Starter

Glow Starter w/Charger



Electric Fuel  
Pump or  
Hand Pump



Whip Antenna



Fuel Filter



Tie-Wraps



Glow Plug



Loctite



Servo Tape



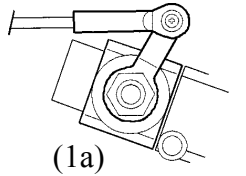
Lubrication CN2024T



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:

**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 20. Starting the engine at full power will possibly damage the engine and will damaged clutch components on the helicopter.



(1a)

**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 rechargeable). 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 muffler 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.

- 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.
- 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.
- 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.

## 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 learning 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.

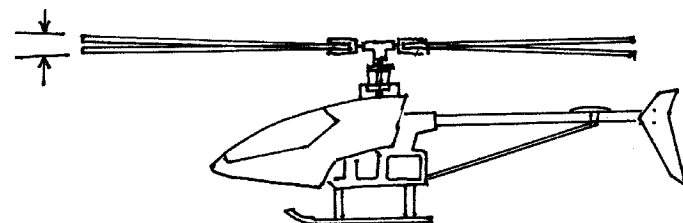
**Q.** The engine rotates and tries to start but doesn't.  
**A.** The glow plug may be getting old. The glow plug batteries are weak. The starter may be turning the wrong direction.

**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 factory set, beginners should not adjust it!

### Adjusting the Blade Tracking

**Pitch** In steps 41-44 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.






















## Raven 30/50 Construction Manual

This manual has been written for both the Raven 30 and 50 helicopter. CN1060 Raven 30 kit and CN1061 raven 50 kit. The main portion of the manual covers the full construction of both kits with labeling for both 30 & 50 respectively.

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

### Symbols used to help assist you in building the kit:

 Full Scale Drawing	 Repeat Steps as specified	 Partially tighten	 Helpful Tip
 Apply oil	 Apply threadlock	 Purchased Separately	 Cut away Shaded Portion
 Special Attention	 Apply JB Weld	 Apply Grease	
 Remove oil residue from fasteners before applying any threadlock agent.	 Tap holes with machine screws before installing steel balls in plastic.	 Tap holes with machine screws before installing self tap screws in plastic.	 Tap holes with machine screws carefully in plastic holes with bottoms.
Hardware Description and Identification: M3x6 = 3x6mm and can refer to screws or ball bearings.			
 M - metric 3 - diameter 6 - length	 M - metric 3 - diameter 6 - length	 M - metric 3 - diameter 6 - length	 M - metric 3 - inside Ø 6 - outside Ø

### Recommended Tools & Accessories

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

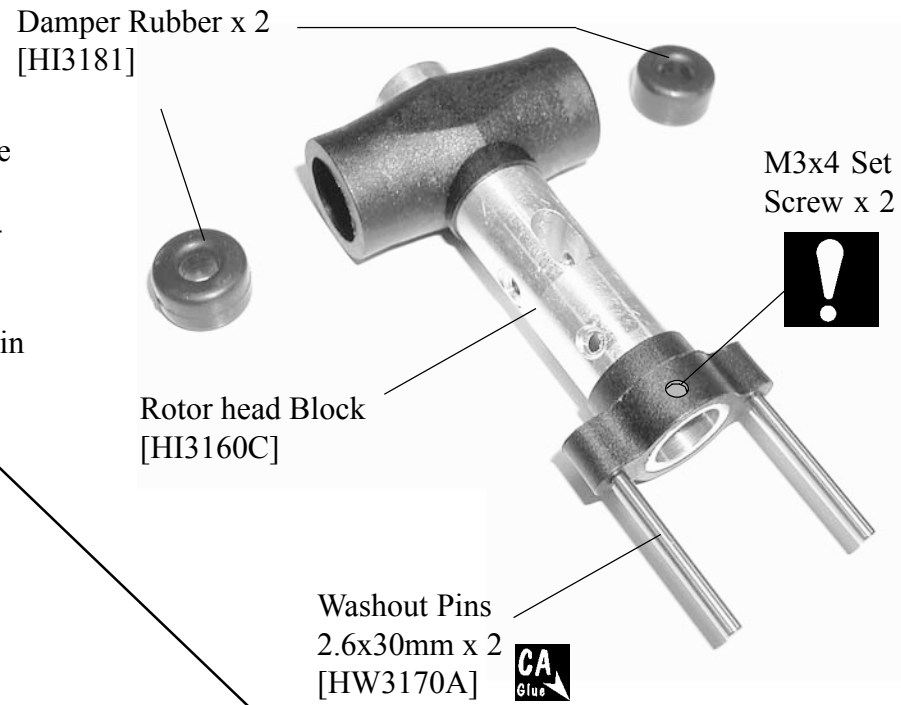
Screwdrivers - Slotted and Phillips head.  
Long-Nosed Pliers.  
Allen Wrenches - 1.5mm, 2.0mm, 2.5mm.  
(supplied in kit) + 3.0mm  
Appropriate Socket Wrench  
(glow plug wrench for engine shaft nut)  
Hobby Scissors  
Double Sided Foam Tape ( 1/16" - 3/32" )  
Foam Rubber ( radio packing )  
JB Weld ( bond clutch lining )  
Thread lock liquid (e.g. Loctite)  
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:

Part#CN2015 Hardened Tip Hex Screw Driver Set  
Part#CN2026 Pitch Gauge with Paddle Gauge.  
Part#CN2034A 15° Curve Tip Ball link Pliers.  
Part#CN2052 Main Blade Balancer.  
Part#CN2054 Special Glow Plug Wrench Set.  
Part#CN2055 Ball Link Sizing Tool.  
Part#CN2070 Universal Flybar Lock.  
Part#CN2155 Piston Locking Tool.  
Part#CN2219 Ball Link Easy Driver.  
Part#CN2255 Control Rod Gauge.  
Part#CNWI26555 5.5mm Nut Driver.  
Part#CNWI26570 7.0mm Nut Driver..

## Step 1 Rotor Head Block

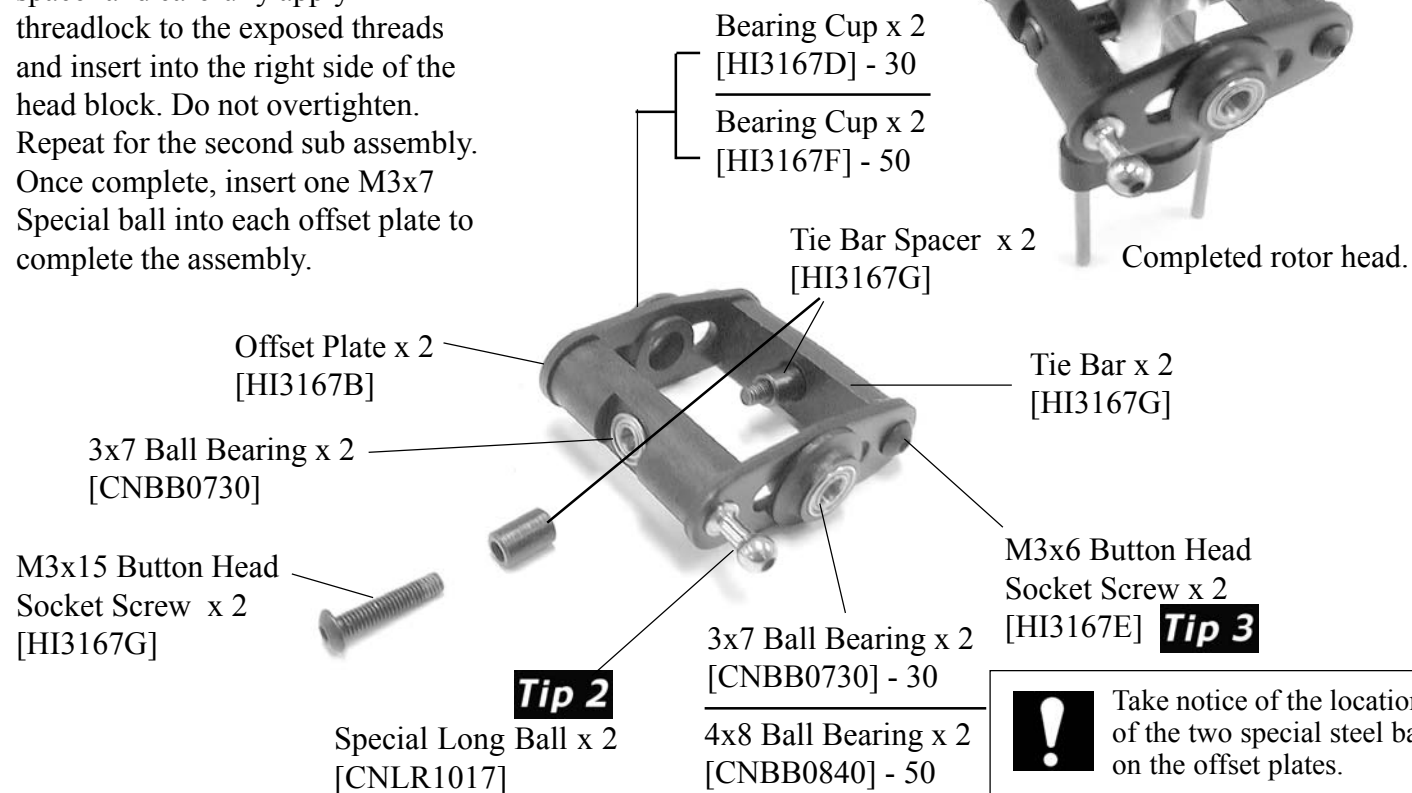
From parts bag 1: Press in the Damper Rubbers and the Washout Pins into the Head Block. Apply one drop of medium CA glue after the pins are fully seated. The two M3x4 set screws are for static tracking of the blades. Install the two M3x4 set screws and torque evenly to maintain static tracking of the rotor blades.



Completed Rotor Head from Step 1

## Step 2 Seesaw Assembly

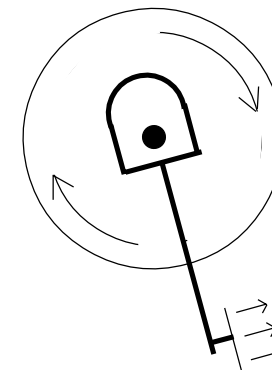
From parts bag 1: Insert one ball bearing into each bearing cup and insert into the offset plate. Apply one small drop of medium CA glue to the back side of the bearing cup to secure to the offset plate. Insert one ball bearing into each tie bar. Insert one M3x6 button head screw through the right side hole of the offset plate into one tie bar. Make two identical sub assemblies. Note that the bearing cups face outwards from the head block. Insert one M3x15 button head screw through the tie bar bearing, slide one steel spacer and carefully apply threadlock to the exposed threads and insert into the right side of the head block. Do not overtighten. Repeat for the second sub assembly. Once complete, insert one M3x7 Special ball into each offset plate to complete the assembly.



Completed rotor head.

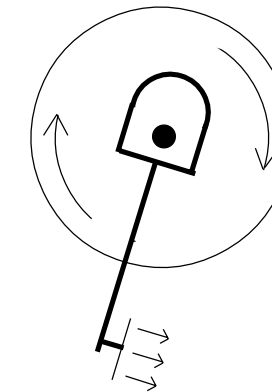
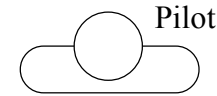
## Tail Rotor Setup

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 hovering in front of you.



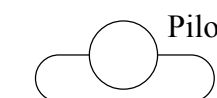
1 Nose rotates left at hover.

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. These settings are set when using regular piezo rate gyros, if using a Heading Hold gyro remove all tail mixing. 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.

## 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 diagrams on pg 31-34.

### 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.

### 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 & 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 (by degrees)

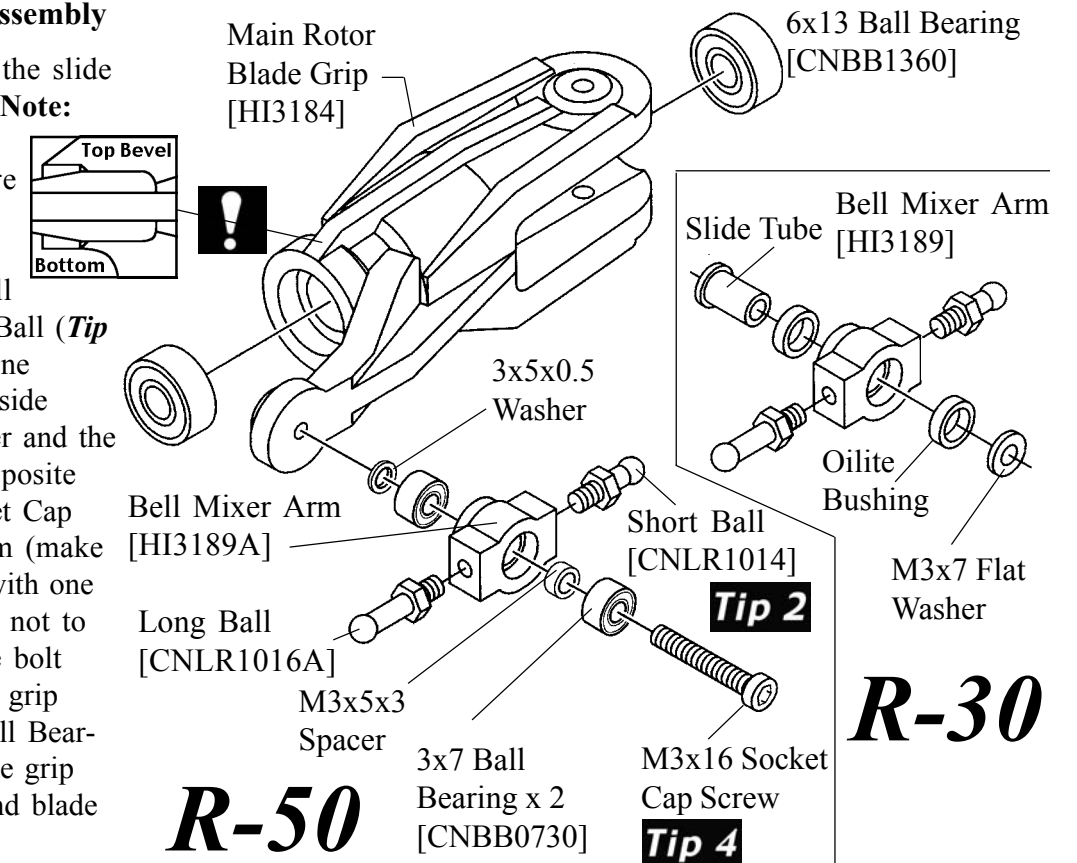
Flight Mode	Setup Method	Low Pitch (low stick)	Hovering (mid stick)	High Pitch (high stick)
N	Beginner	0	5	9
N	Hovering	-2	5.5	9
1	Stunt & Aerobatics	-10	5.5	10
2	3D**	-10	0	10
H	Autorotation	-10	5	12

( 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.

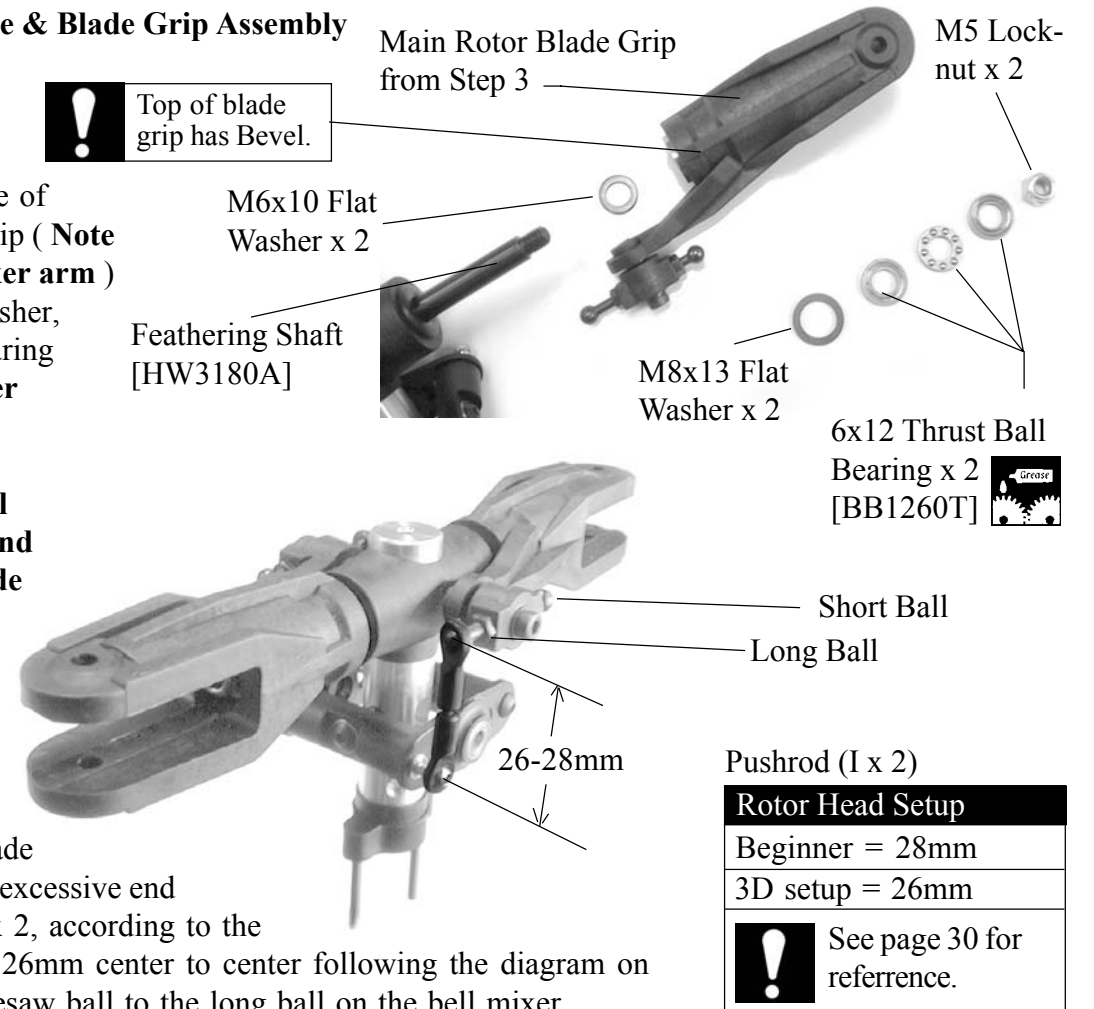
### STEP 3 Main Blade Grip Assembly

From parts bag 1: **R30** 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. **R50** install one Long Ball and one Short Ball (**Tip 2**) into the Bell Mixer, press one 3x7mm Ball Bearing into one side followed by one 3x5mm spacer and the one more bearing from the opposite side. Insert one M3x16 Socket Cap Screw (**Tip 4**) through the arm (make sure the flush side faces out) with one 3x5x0.5 Washer being careful not to overtighten the screw. File the bolt flush to the inside of the blade grip mount. 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

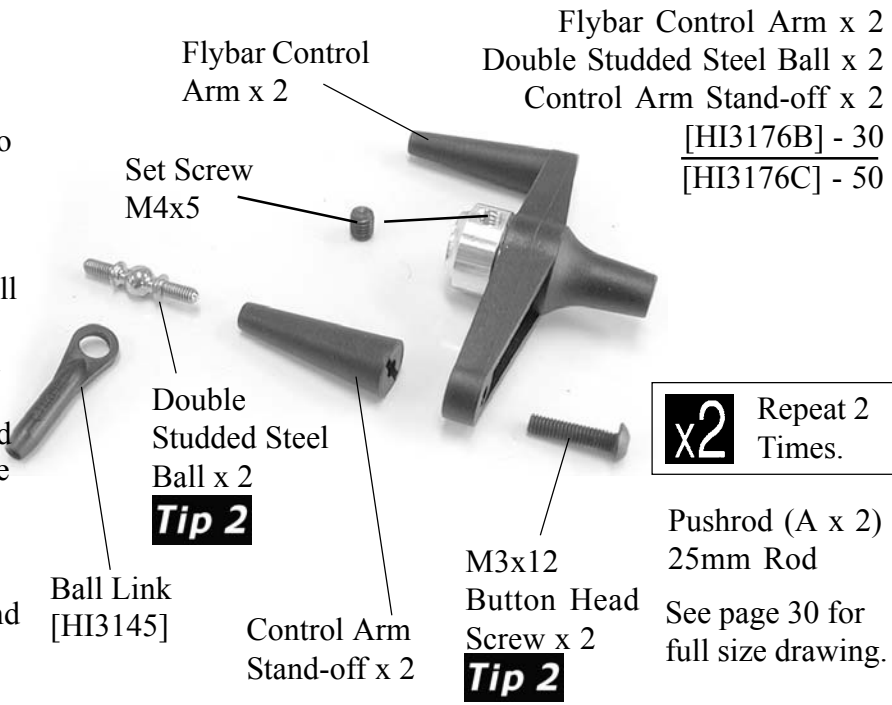
From parts bag 1: Insert the Feathering Shaft into the head block, slide one M6x10 Washer on each side of the shaft. Install the blade grip ( **Note the direction of the bell mixer arm** ) followed by one M8x13 Washer, one M6x12 Thrust Ball Bearing ( **install the first steel washer (large inside diameter) followed by the ball race, remember to grease the ball race, followed by the second steel washer (smaller inside diameter)** ) and one M5 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, according to the table in the box, measuring 26mm center to center following the diagram on page 30, and connect the seesaw ball to the long ball on the bell mixer.



Rotor Head Setup	
Beginner	= 28mm
3D setup	= 26mm
! See page 30 for reference.	

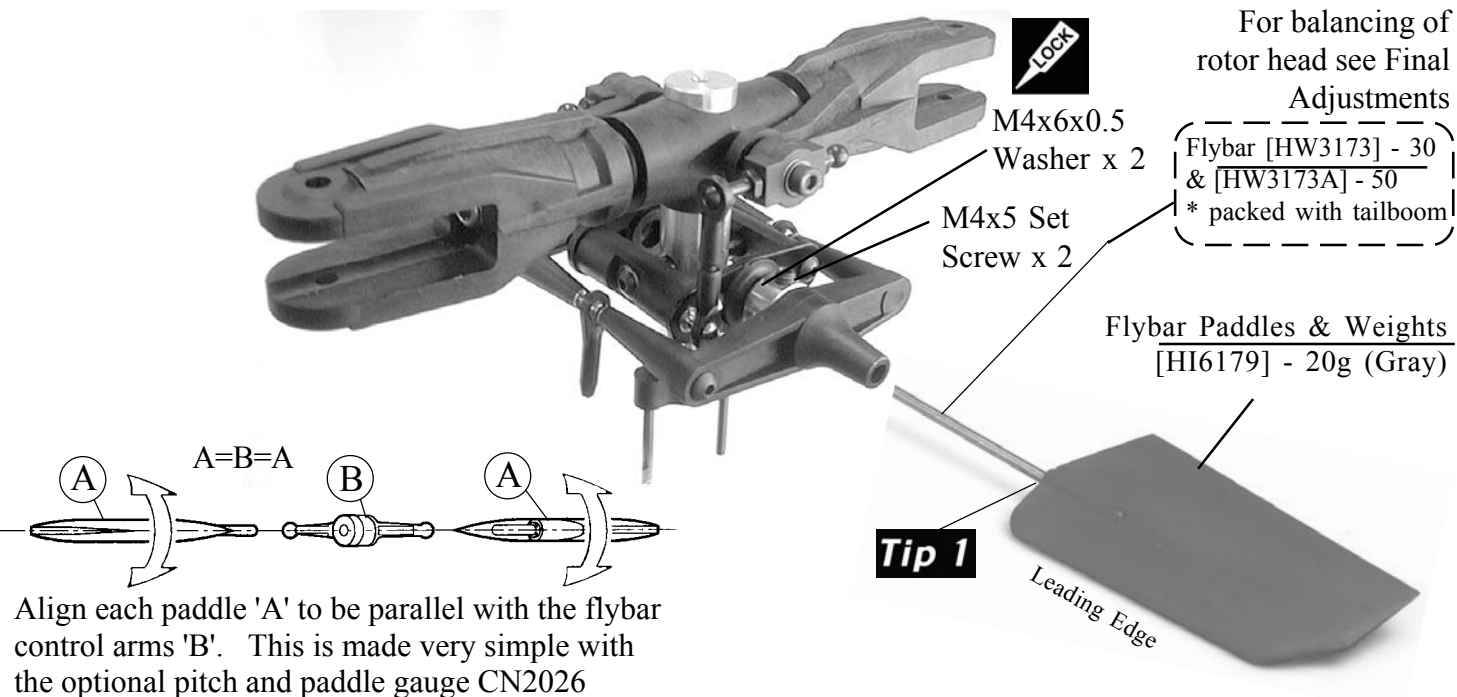
### STEP 5 Flybar Control Arm Assembly

From parts bag 1: Using an available M3x12 Button Head Screw, insert approximately half the length of the screw to form threads into the smaller, tapered ends of the control arms and the control arm stand-offs. Assemble Pushrod A (47mm center to center) and press one ball link end onto each double studded steel ball, making sure that pressure is applied from the side of the ball link with the Century name. All ball links are designed to be installed in one direction only. While holding one flybar control arm, start threading the double studded steel ball. When it becomes difficult to turn with fingers, start the control arm stand-off and use as a driver until tight. Complete the second flybar control arm.



### STEP 6 Flybar & Flybar Paddle Assembly

Slide and center the Flybar through the seesaw arm assembly. Carefully look at Flybar Control Arm and notice that when installed correctly, the securing set screw is on top. **Insert one 4x6x0.5 washer against each bearing** then the flybar control arm. Insert one M3x12 Button Head Socket Screw into each Flybar Control Arm, securing the assembly together. Loosely tighten the M4x5 Set Screws into the round aluminum inserts. Using a ruler, check the distance between the end of the flybar and the control arm and adjust until the lengths are the same. Slide the Flybar Weight (**Tip**: the flat end of the weight touches 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. Remove one set screw at a time, apply threadlock (**Tip 1**) and tighten in place. Using two M3x3 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

## Radio Components & Balancing

Optional Equipment  
PG2000 II Piezo Gyro  
#CN2018

### Gyro

Having completed all the assembly for the helicopter, all that remains is mounting the radio receiver, receiver battery and the gyro.

Mount the gyro on the radio tray, some rearrangement from the picture is required to mount everything. If using the PG2000 II, 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 onto a clean flat surface. Keep all wires and components away from the gyro housing. Do not use straps or elastics to secure the gyro.

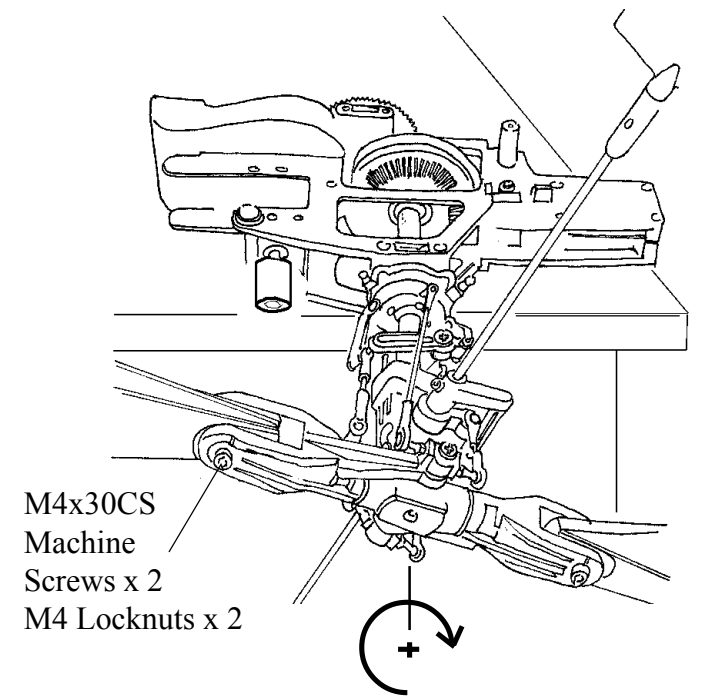
Install the gyro using double sided foam tape (supplied with gyro) put a full strip along the bottom of the gyro unit and press onto the surface. For a good bond make sure both surfaces are clean and dry.

### Receiver, Battery Pack

Using the foam rubber, wrap the battery pack, receiver and gyro controller 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. \*\* The actual arranged components will be different than the picture illustrates.

### Balancing the Rotor Head

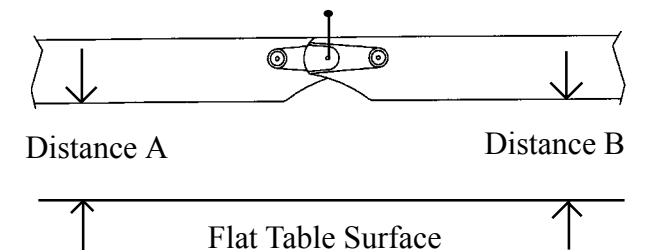
Balance is the most important part in maintaining a safe and reliable helicopter. First check the blades for balance, this can be done on a balancer but can be done directly on the helicopter by tipping the helicopter on its side at the edge of a table and attaching the blades. Temporarily remove the 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.



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

### Balancing the Rotor Blades

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.





### Step 46 Canopy & Decals

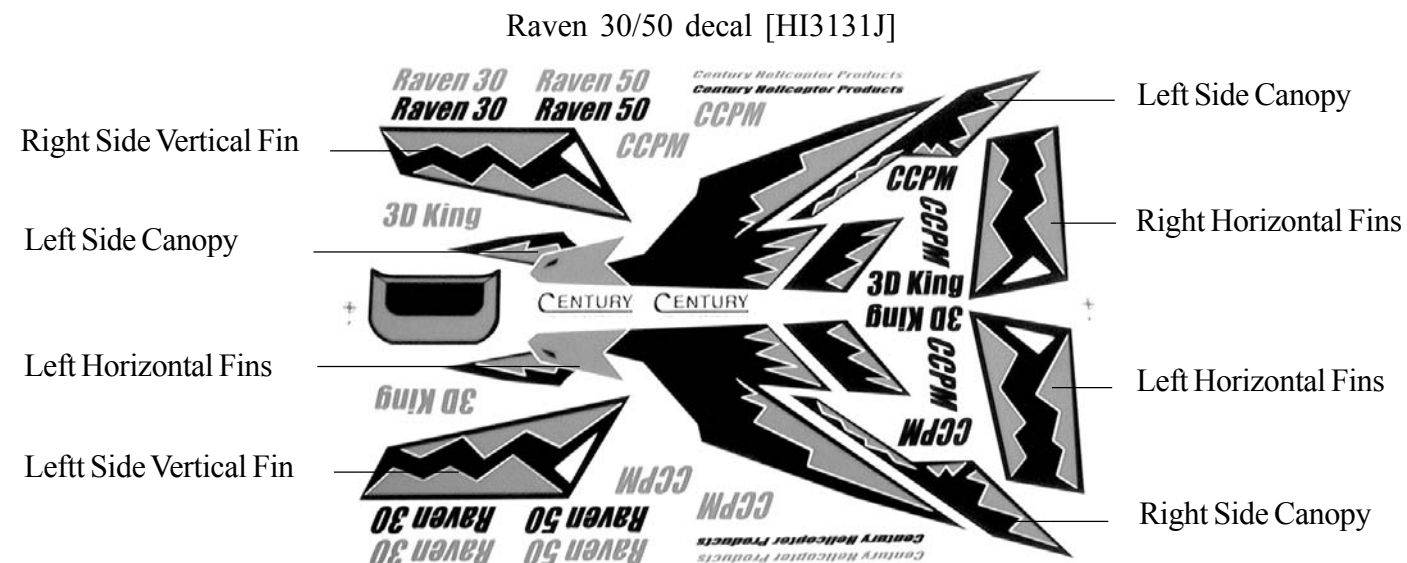
The Canopy has a line molded into the plastic to follow when trimming the windshield part out, be careful, trim the innermost line leaving the 6mm band for attaching the windshield. Using a sharp hobby knife carefully scribe a line several times into the plastic until you cut through the material. Similarly 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.

### Step 47 Canopy Mounts

The two holes for the rear canopy mount have to be **close the rear and bottom edge as shown** and attach the two rubber mount on canopy.



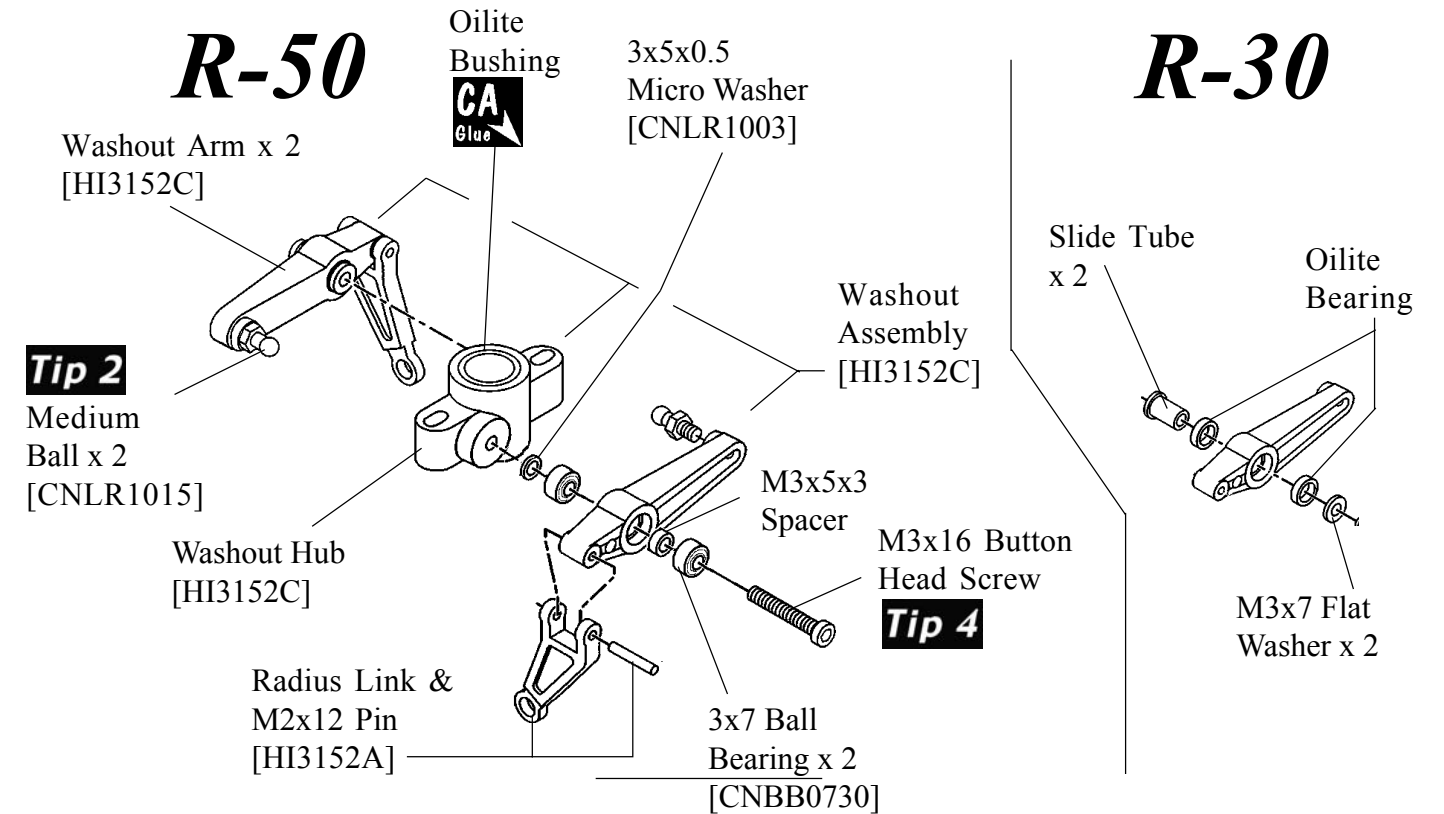
To improve the adhesion of the decals to the body, peel the decal off the backing and apply one coat of spray adhesive (spray glue) to the sticky side, commonly found in your hobbyshop. For those who would prefer to paint the canopy.



### STEP 7 Washout Assembly

Before starting, carefully apply two or three drops of CA to the seam between the top and bottom oilite bushings and the plastic washout hub. Do not get any adhesive on the inside surfaces that will slide against the main shaft. Let dry completely.

Attach two Medium Balls (**Tip 2**) to the Washout Mixing Arms ( **Note, attach from the flat side of the arm**). **R30** using one slide tube inserted from the flat side and secured using one 3x16mm Button Head Screw and one 3x7mm Flat Washer per arm. **R50** Press one 3x7mm Ball Bearing into one side followed by one 3x5mm spacer and one more bearing from the opposite side. Slide one M3x16 Button Head Screw through the bearings in the arm and slide one 3x5x0.5 washer between the bearing before tightening into the washout hub. Note, the screw is attached on the left when installed later on the main shaft. Press the radius link on to the inner short balls on the Swashplate.



**Tip 2**

Medium Ball x 2 [CNLR1015]

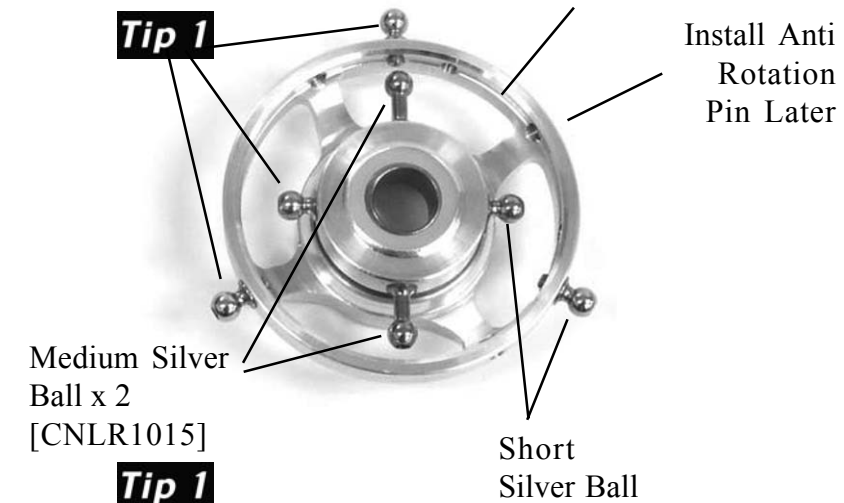
**Tip 4**

Short Silver Ball x 5 [CNLR1014]

Swashplate Assembly [HI6146]

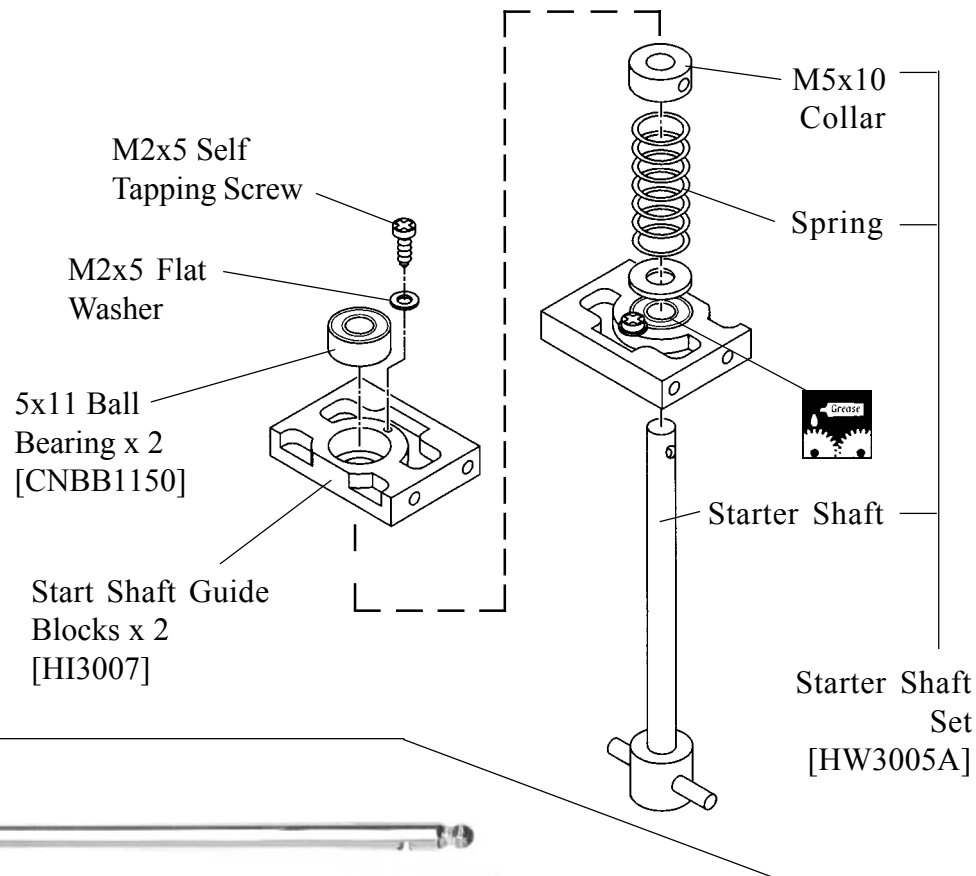
### Step 8 Swashplate Assembly

Starting with the inside race, apply threadlock and attach two short balls (**Tip 1**) directly across from each other, similarly attach two medium balls to the remaining holes. Attach three short balls (**Tip 2**) to the outside race, each 120 degrees apart. The extra location is used for the anti-rotation bracket assembled later.

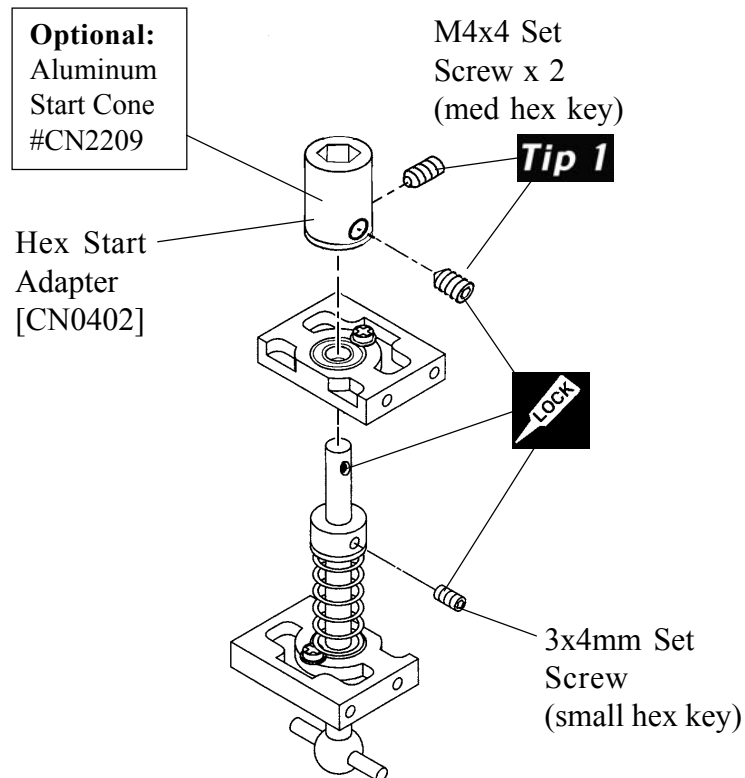


**Step 9**  
**Starting Shaft Bearing Blocks**

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 then slide the M5 Flat Washer, spring and finally the M5x10 Collar.



**X** One way Hex Starter Extension (Optional Part #CN0427)



**Step 10 Starting Shaft & Hex Coupler**

From parts in bag 2: After sliding the top bearing block in place, attach the hex starter adapter CN0402 to the starting shaft using threadlock on both 4x4mm set screws. Align one set screw to fit into the machined indentation in the hardened start shaft. For added strength apply a locktight to the shaft before the hex coupler is attached. Apply some lubricant on the shaft after assembly to ensure smooth vertical movement inside the inner races of the bearings when engaging and disengaging the start system. Position the M5 collar so the end of the start shaft clears the fan, verify after installing the lower frames.

**Engine Start Procedure with Hex Coupler**

When removing the hex start extension after the engine has started, it is recommended that you use a two step procedure.

Step #1: Lift the hex extension upwards just enough to disengage the start shaft while keeping the extension inserted in the hex coupler (CN0402).

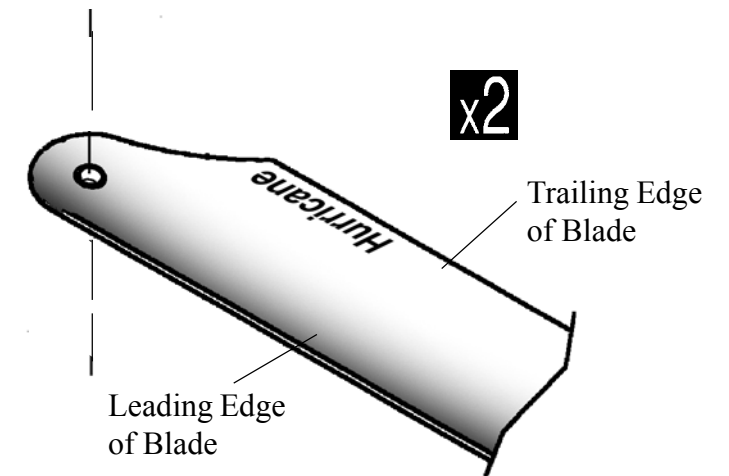
Step #2: After the coupler has stopped turning, then remove the extension completely.

**Step 45B Care and installation of Hurricane Carbon Blades - Raven 50**

The Main Rotor Blades included in **Raven 50** the kit are pre-finished and balanced carbon rotor blades. Care must be taken in handling composite blades to keep them in excellent condition. Do not compress any portion of the blade from the trailing edge to the center spar as it is hollow. In the event of a crash-landing discard rotor blades, scuffs or marks on the blade tips maybe the only visible damage however there is no method for inspecting the internal structure of the rotor blades for stress cracks which can cause total blade failure at an unpredictable time. Also, do not store rotor blades indoors in direct sunlight or near heat sources for any period of time. Simply wipe blades clean after flying.

Blades rotate clockwise, so observe the leading edge. To install the blades, slide the root into the rotor grip and insert one 4x30mm Socket Cap Screw through the top grip and secure using one 4mm Locknut. Repeat for opposite rotor blade. Blade bolt tension will affect how the blades perform. To set proper tension, start from loose blades (bolt is loose enough for the blade to pivot freely from the grip) and 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 tail boom strike can happen. Tail blades can be set the same way.

**R-50**



The Raven 50 contains symmetrical rotor blades for sport and aerobatic flying. For your convenience you can also use semi-symmetrical for smooth aerobatics and scale flying.

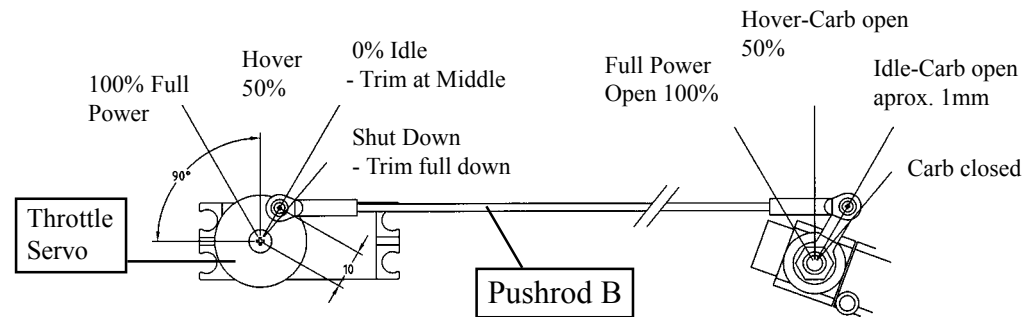
**Step 45C Replacement High Performance Rotorblades Main & Tail**

Raven 30	
CN2400	Hurricane Carbon 3D Symmetrical 550mm
CN2414	Hurricane Carbon Sport Semi-Symm 550mm
CN265501	Rotortech Carbon 3D Competition Symmetrical 550mm
CN265522	Rotortech Carbon 3D Sport Symmetrical 550mm
CN260853	Rotortech Carbon Tail Blades Symmetrical 85mm

Raven 50	
CN2412	Hurricane Carbon 3D Symmetrical 600mm
CN2413	Hurricane Carbon Sport Semi-Symm 600mm
CN266001	Rotortech Carbon 3D Competition Symmetrical 600mm
CN266022	RotorTech Carbon 3D Sport Symmetrical 600mm
CN260853	Rotortech Carbon Tail Blades Symmetrical 85mm

## Step 44 Throttle Linkage

From Bag 4: Attach one steel ball and one 2mm nut, to both the Throttle servo horn and the Throttle Extension from Step 18 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.



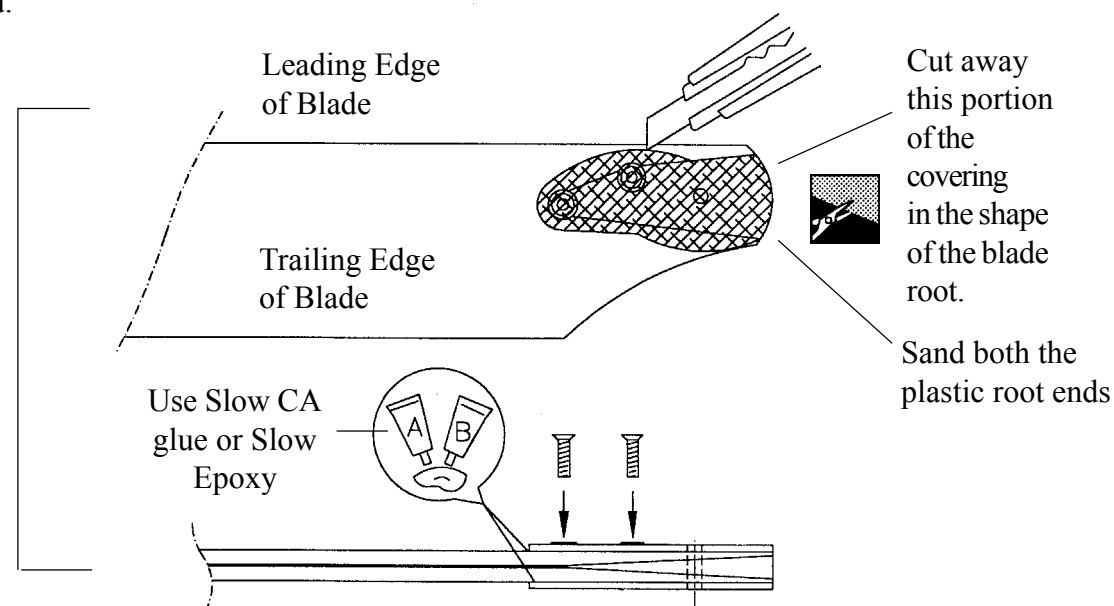
**Tip** Pushrod B will vary in length slightly as the position of the carburetor is different for each engine manufacturer. Following the above instructions will allow you to get the carburetor setup correctly.

## Step 45A Aerotech Main Blade Assembly - Raven 30

The Main Rotor Blades in the Raven 30 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 necessary to insure the blades will not separate from the helicopter during flight!!** ). Temporarily install the root ends ( see note ) onto the blades by cutting the covering over the holes and using a pencil, mark 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 inside portion of the covering with a sharp hobby knife. Using some sandpaper roughen the plastic root ends and glue them in place with Slow CA or slow Epoxy glue. Install the blades onto the rotorhead to dry. This will ensure the thickness is correct when finished.

# R-30

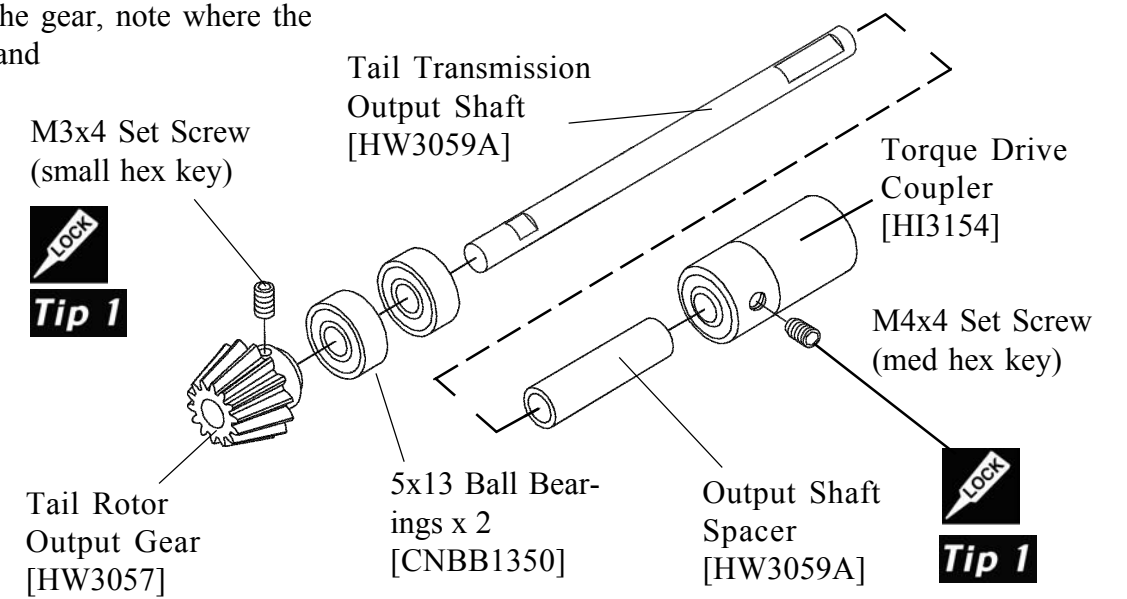
HW3190  
(Main blade set)



**!** **Note:** The plastic root ends have a top and bottom which are different when viewed from the large end. Test fit the parts to be sure that the total thickness of the blades is 12mm. The 3mm brass tube and four M4x20 flat washers are not needed on the helicopter.

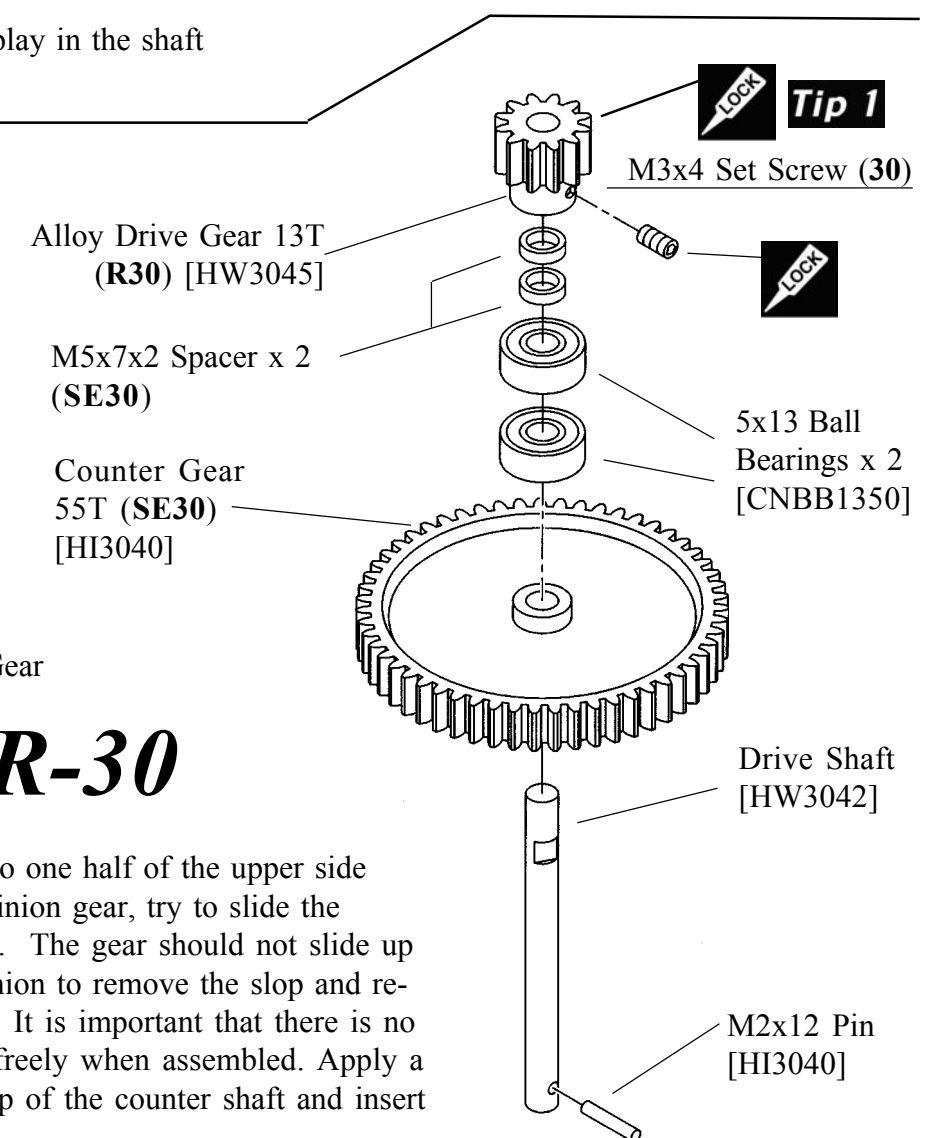
## Step 11B Torque Drive Pinion Gear

From parts bag 2: Using threadlock, insert one M3x4 Set Screw (**Tip 1**) into the gear, note where the flat spot is on the shaft and slide the gear on and tighten (**make sure the set screw is positioned over the flat spot**) the set screw. Slide two Ball Bearings onto the shaft and install into one half of the upper frames. Next add the spacer, apply threadlock to the M4x4 set screw and insert into the torque drive coupler. Slide the drive coupler over the long flat spot until there is no end play in the shaft and tighten the set screw in place.



## Step 12 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. **R30** slide two M5x7x2 spacers onto the shaft and slide the Alloy Drive Gear onto the shaft aligning the flat spot on the shaft. Insert one M3x4 set screw (Tip1) into the Alloy Drive Gear and tighten in place.



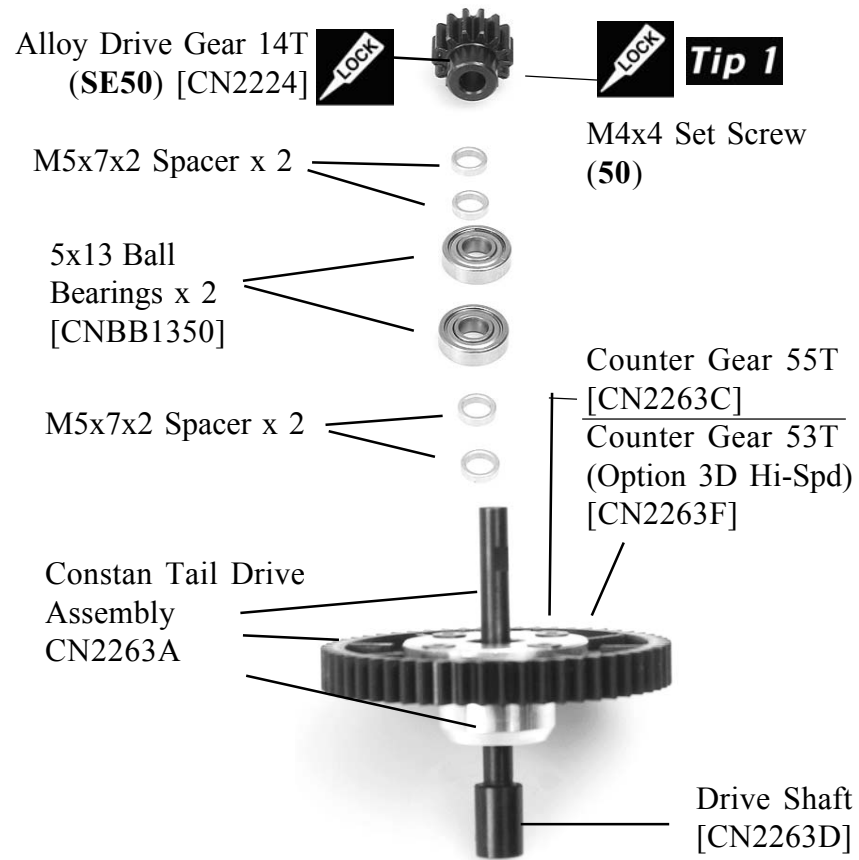
# R-30

**Tip 1** 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. Apply a small amount of red locktight to the top of the counter shaft and insert into the pinion gear.(not the set screw).

From parts bag 2: Assemble the Constan Tail Drive Gear Assembly (R50), start by pressing the shaft through the Counter Gear then slide two M5x7x2 spacers, then slide the two M5x13 Ball Bearings. Again slide two M5x7x2 spacers onto the shaft and slide the Alloy Drive Gear onto the shaft aligning the flat spot on the shaft. Insert one M4x4 set screw (Tip1) into the Alloy Drive Gear and tighten in place.

**Tip 2**

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 bearing.



# R-50

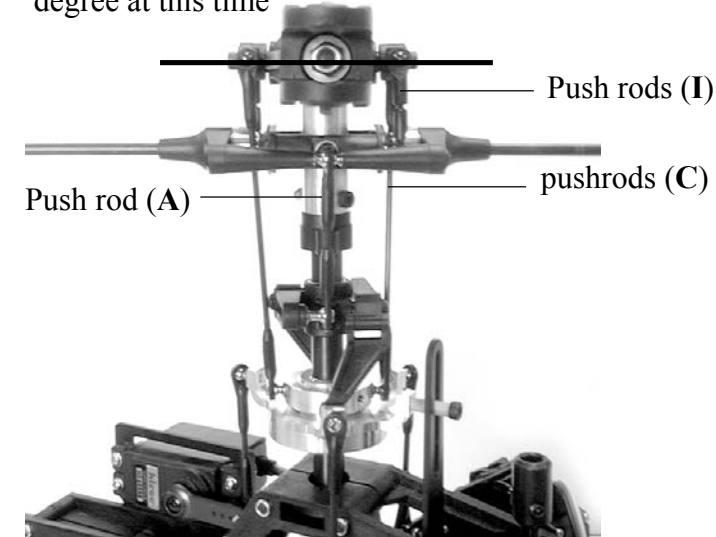
## Step 13 Main Gear Assembly (R50)

The Main Gear is **“NOT” pre-assembled** Insert the aluminum center hub into the main gear then install the “C” spring ring onto end of hub. The Main Shaft has a step in the end of the shaft that is inserted through the auto-rotation assembly. Insert the bottom end through the constan tail drive auto rotation gear assembly aligning the holes and secure the Main Shaft using one 3x16mm Socket Cap Screw and one 3mm Locknut.



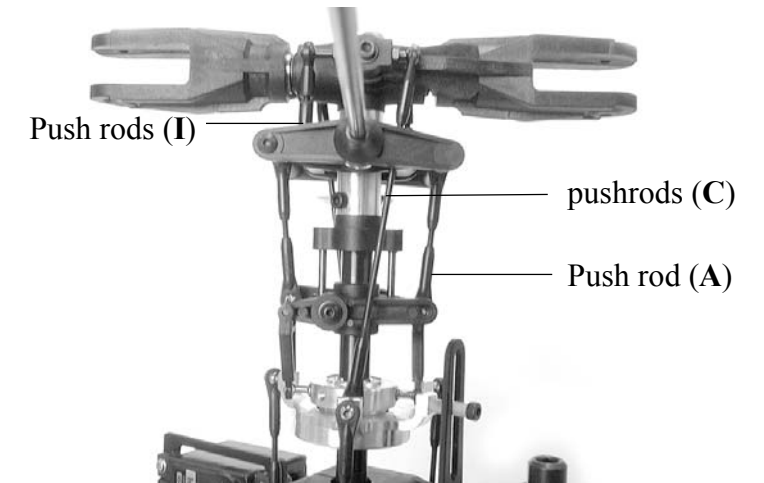
## Step 42 Rotor Head Linkage

Blade grips shown ‘0’ degree at this time



- 2 Flybar to Washout pushrods (A),
- 2 Bell Mixer to Seesaw pushrods (I),
- 2 Bell Mixer to Inner Swashplate pushrods (C),

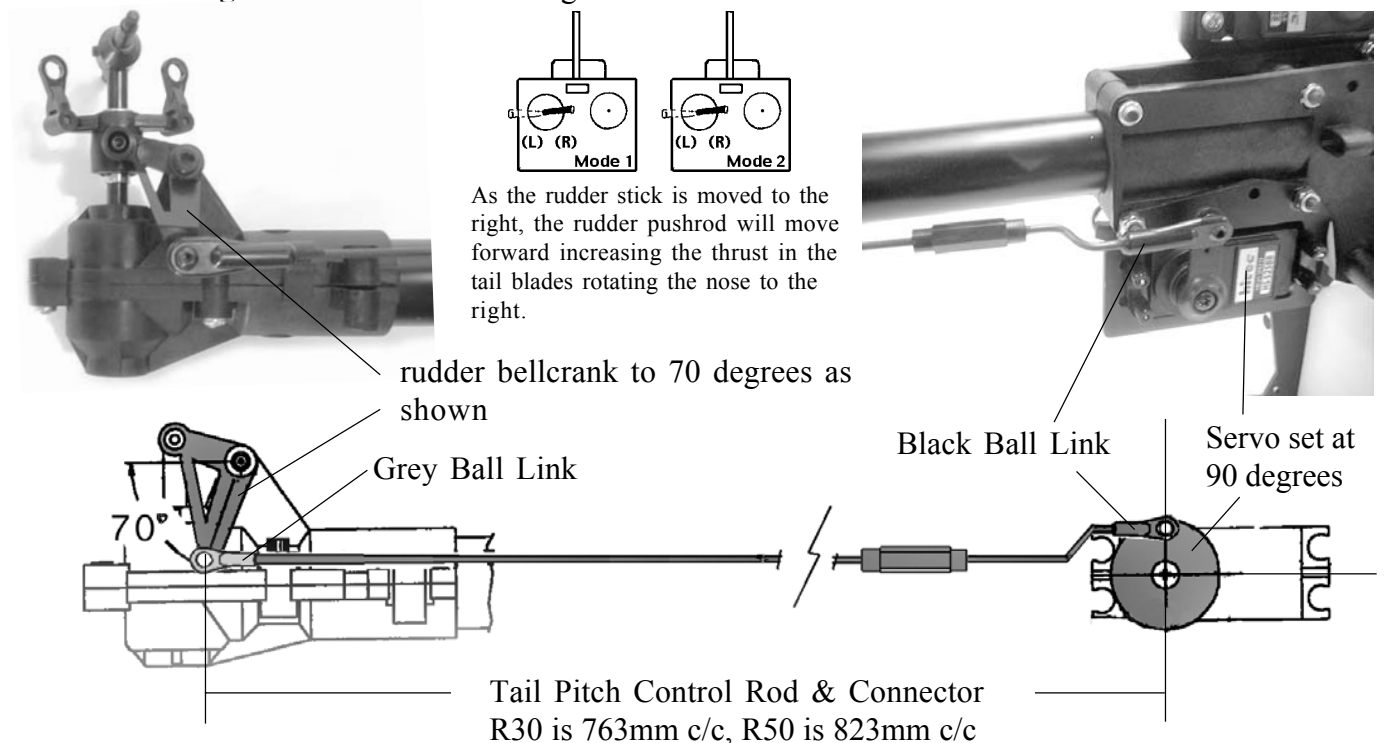
When attaching all pushrods, make sure same length pushrods are actually the same length from the beginning otherwise it will be difficult later to figure out where the linkage problems are coming from. Attach the following:



## Step 43 Rudder Linkage

The Rudder linkage 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. From Bag 4: Install one steel ball and one 2mm nut at a distance of 12-14mm from the center of the servo remember to use threadlock. The Rudder Pushrod (G) will at this point be installed with one grey ball link at the tail gearbox and one black ball link at 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 adjust the length of the pushrod to align the rudder bellcrank to 70 degrees as shown in the diagram.



### Step 41 CCPM Swashplate Linkage

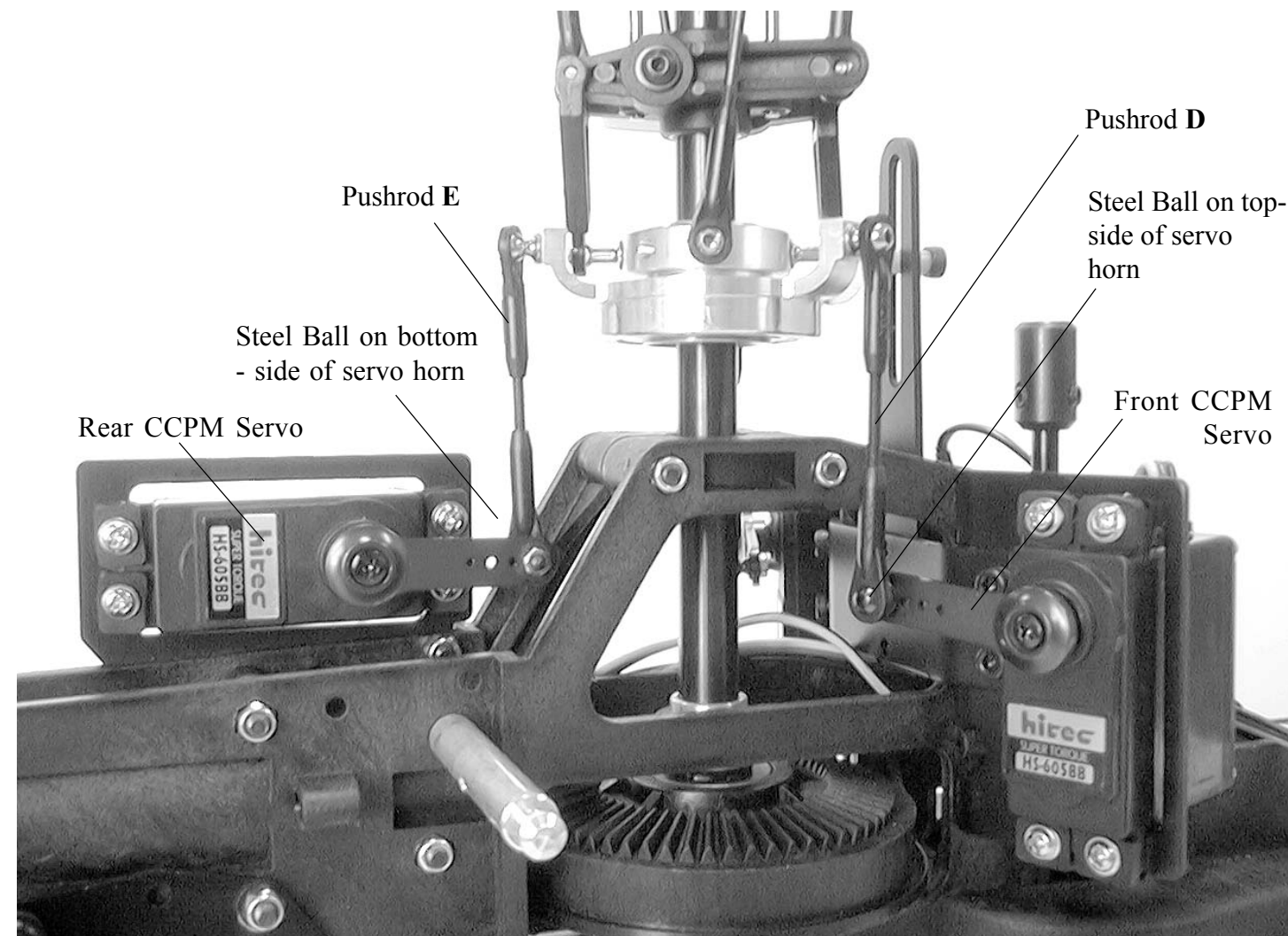
There are three servos are mounted on the front and rear servo brackets. They work together to tilt the swashplate producing the collective pitch, roll cyclic pitch (aileron control) and the fore-aft cyclic pitch (elevator control). The servo horns provided in the radio will not be long enough to achieve the full collective range, the control ball is required to be mounted at a distance of 25-26mm from the center of the servo. It is recommended to use Century's **optional** metal servo arms as follows:

(CN2189 - Futaba, CN2185 - JR/Airt, CN2181 - Hitec) for all standard plastic output shaft servos.  
(CN2279 F-Futaba, J-JR, H-Hitec ) for all metal output shaft servos.

Attach one steel ball with one 2mm nut to the **under-side** of the rear servo horn and to the **top-side** of the two horns for the front servos using threadlock. With the radio turned on and the trims centered, attach the rear servo horn parallel to the body of the servo and the CCPM Rear (**E**) Pushrod. Similarly, attach the front servo horns mounted 90 degrees to the servo with the CCPM Front (**D**) Pushrods.

Move the collective stick to its maximum position and watch for any roll (aileron) or pitch (elevator) inputs. If an input is found, the problem will be one of the following in the table. The table describes the symptom and the steps to correct them.

Symptom	Corrective Solution
metal control ball distance	move ball location to match other servos, or carefully use ATV
angle of horn & servo not 90°	use subtrims to set exactly at 90 degrees
angle of horn & linkage not 90°	use subtrims to set exactly at 90 degrees, noticeable at extremes
swashplate not level	adjust pushrod length to level



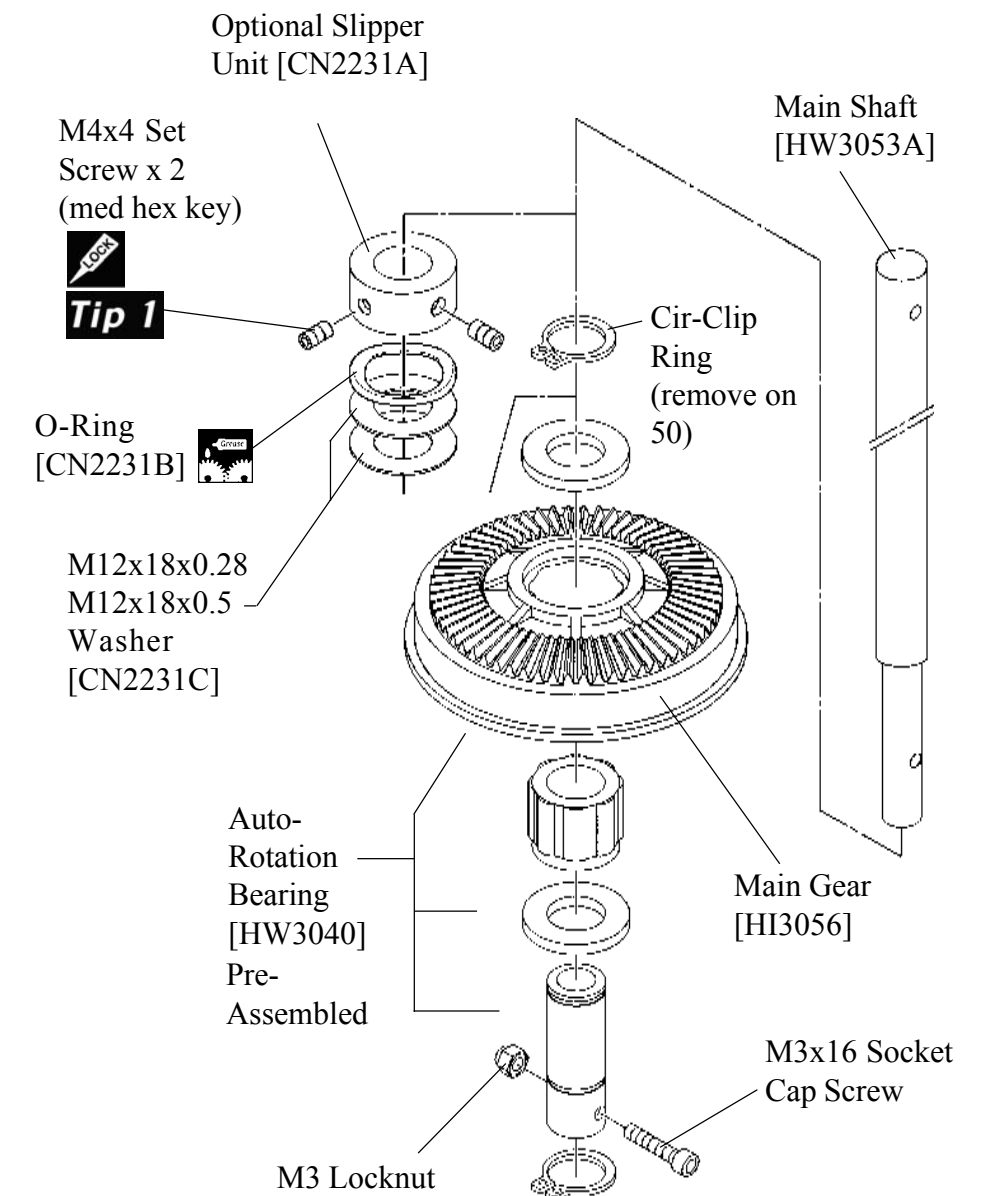
### Step 13 Main Gear Assembly R30

The Main Gear is **pre-assembled with the Auto-Rotation Bearing installed**. From parts bag 2: The Main Shaft has a step in the end of the shaft that is inserted through the auto-rotation assembly. 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.

**!** At some time in the future you will need to change the main gear. The main gear assembly can be easily taken out of the mechanics by removing only the main shaft. Tilt the gear assembly from the front to clear the alloy drive gear and slide the assembly out through side of the upper side frames. Also note, when removing the auto-rotation bearing, it **MUST** be re-installed into the new gear in the same direction, otherwise when power is applied, the gear will not drive the main shaft, only the tail gears will turn.

### Step 14 Slipper Assembly - R30 Optional only (Only if do not using CN2263A Constan Tail Drive Assembly)

The slipper drive unit will continue to turn the tail rotor blades in the event of an auto-rotation. Before installing the main shaft the Cir-Clip must be removed from the top of the main gear assembly, use Cir-Clip pliers that have special tips to spread the clip (very useful when changing the main gear). Slide the thin washer followed by the thick washer and grease the o-ring and set in place. Install two set screws (**Tip 1**) and slide against the o-ring, apply enough pressure that when the main shaft is turned the main gear rotates. Remove and apply threadlock to one set screw at a time.

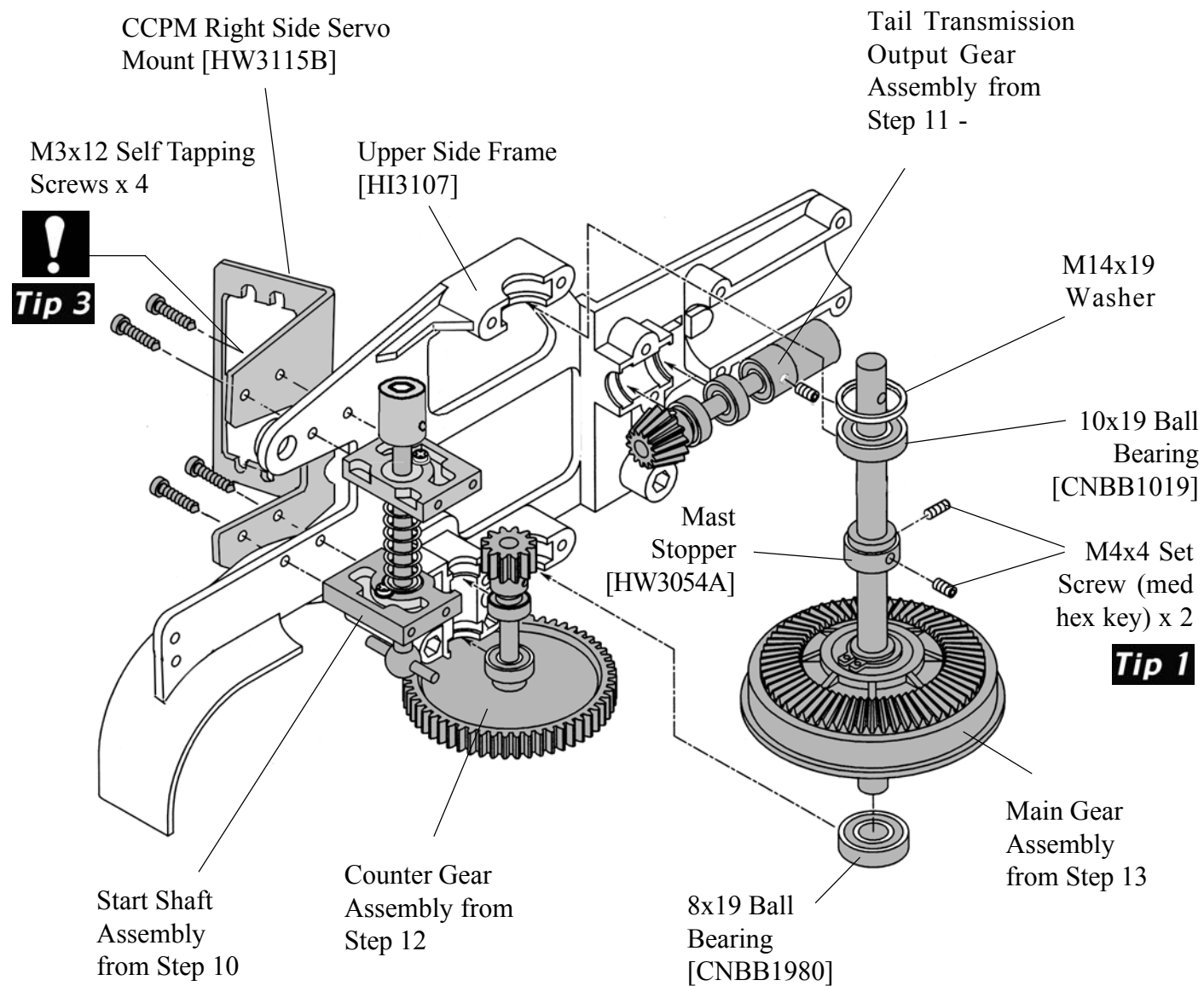


## Step 15 Upper Side Frames

From parts bag 2: Install two 4x4mm Set Screws (**do not apply locktight at this time**) in the Mast Stopper (note the raised inner diameter must face the ball bearing) and slide the mast stopper on the main shaft followed by one M10x19 Ball Bearing and one M14x19 Spacer (the spacer must be installed on top of the bearing). Slide one M8x19 Ball Bearing onto the bottom of the main shaft.

Align the right side servo mount over the holes for the starter shaft assembly and insert four M3x12 Self Tapping Screws<sup>1</sup> to secure in place. (**Tip3- observe the correct direction of the block assemblies**). Position the main gear/main shaft assembly, (**note the orientation of the mast stopper, the raised inner diameter should be facing upward, towards the inner race of the top ball bearing**) the counter gear assembly and the tail transmission output shaft assembly in the designated locations (see diagram below) on the upper right side frame (**Make sure the bearings are fully seated in the recesses.**)

At this time prepare the 3 CCPM, rudder and throttle servos by installing the rubber grommets provided with the radio system. Wait to install the brass eyelets until the orientation to mount the servo is known. The eyelets have a flange that should face the surface that the servo flange is being mounted against.



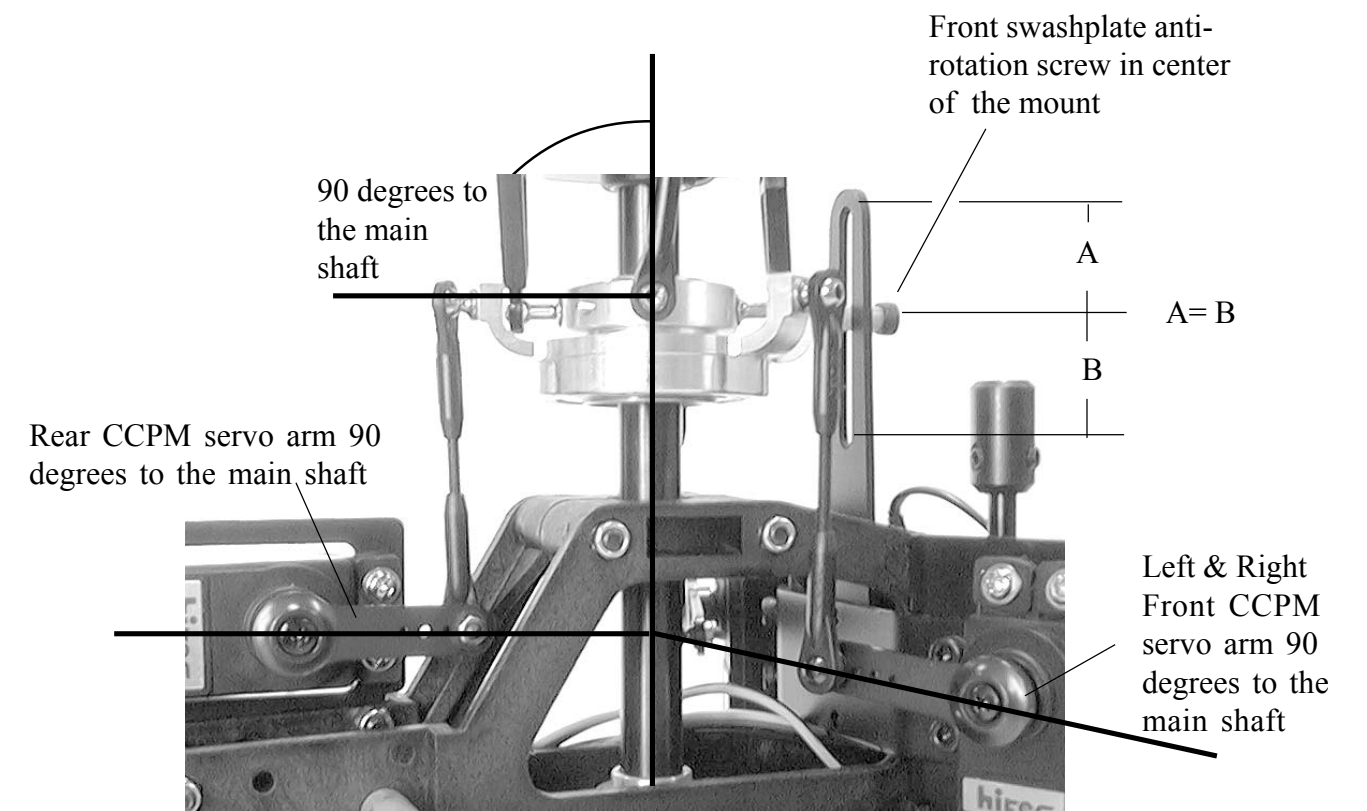
**Note 1:** Be careful when tightening the eight 3x12mm self tapping screws into the start shaft block assemblies as excessive force will strip out the plastic holes.

## Servo Setup & Adjustments

In the steps 41 through 42 over the next few pages the pushrod hardware will be mounted to the servos horns and ultimately the pushrods 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.

### CCPM Servo Guidelines

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 three servos work together. This will result if the items in Step 40 have been followed and the ATV function for the three ccpm servos has been set very, very accurately to eliminate pitch change when moving the aileron or elevator sticks. This will become obvious in the next steps.



After installing the three cyclic pushrods, the swashplate should sit level.

### Step 40 Pushrod Setup and Adjustments

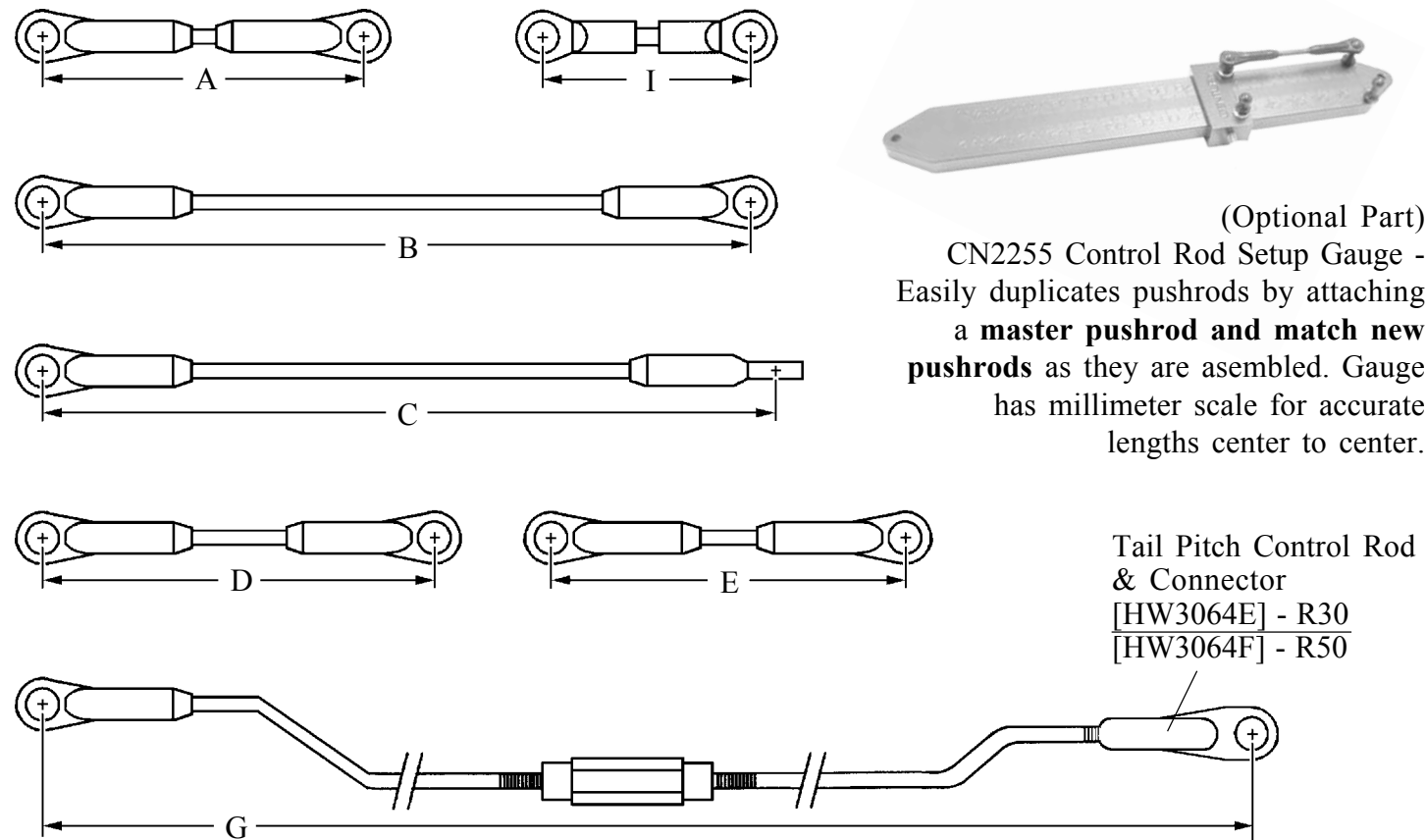
Make up all the control pushrods according to the specified lengths shown in the table. Please note that the dimensions listed are from center to center of the ball ends (this has changed from earlier manuals). Depending on the servo brand, the servo horn offers different patterns for fine tuning.

After attaching the pushrods to the helicopter, the washout arms will be level at 0° (horizontal) collective for 3D flying. Beginners should follow the setup steps and pitch curves for Hovering in the final adjustments. 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.

**!** Note: All dimensions are in millimeters and are measured from the centers of the control balls or ball ends.

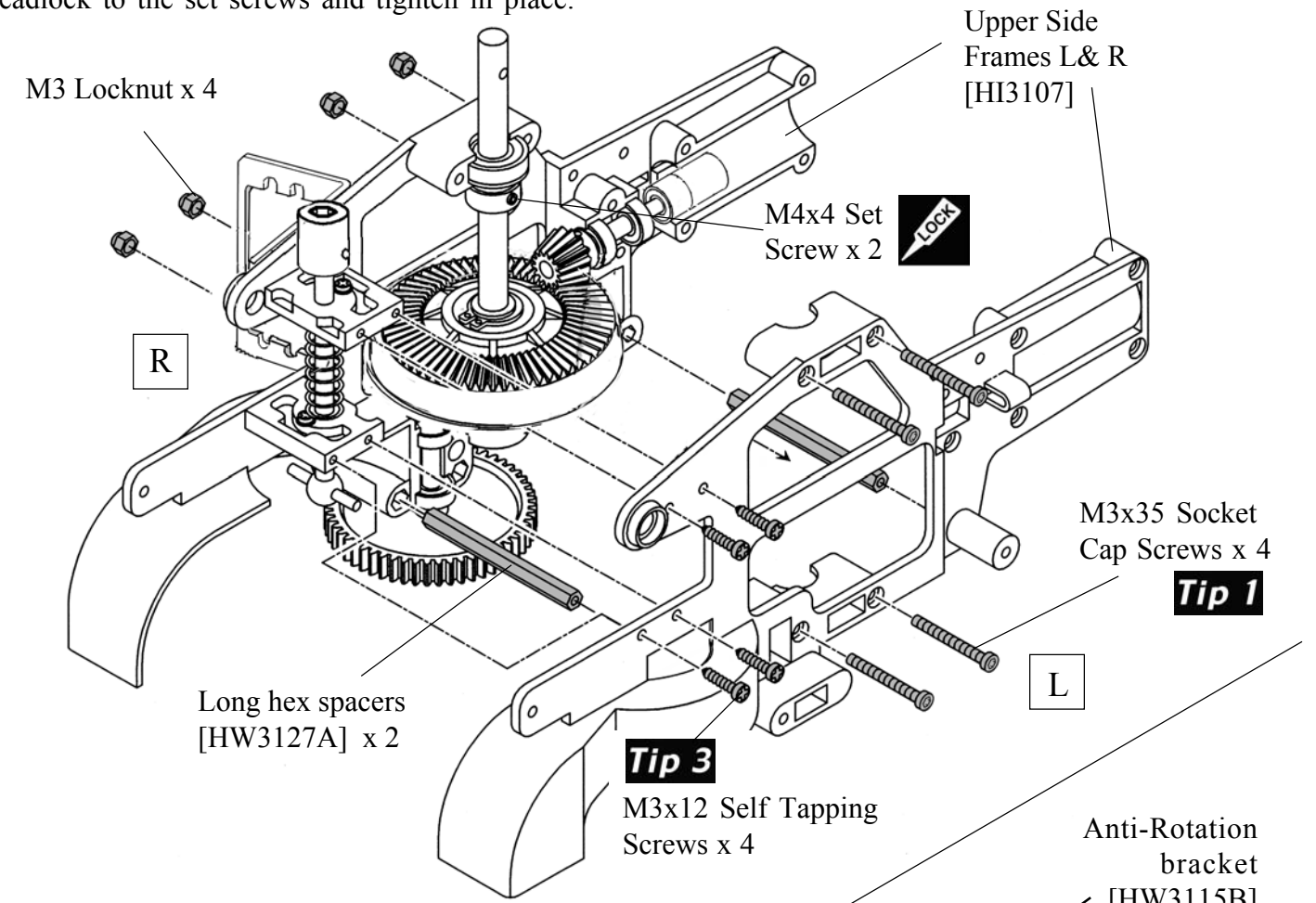
Ball Link Set [HI3145]	Pushrod Set [HW3192A]	Location	ID	Rod	Sport	3D
		Washout to flybar (2)	A	25	44	47
		Throttle servo 30	B	75	96	96
		Throttle servo 50	B	75	92	92
		Bell mixer to SWP (2)	C	80	97	99
		Front CCPM servo (2)	D	35	55	55
		Rear CCPM servo	E	25	48	48
		Bell mixer to seesaw (2)	I	15	28	26
		Tail rotor pushrod 30	G		763	763
		Tail rotor pushrod 50	G		823	823

Due to the different types of radio and servos that are chosen to install into the helicopter, match each pushrod to the lengths in the table for optimum setup.



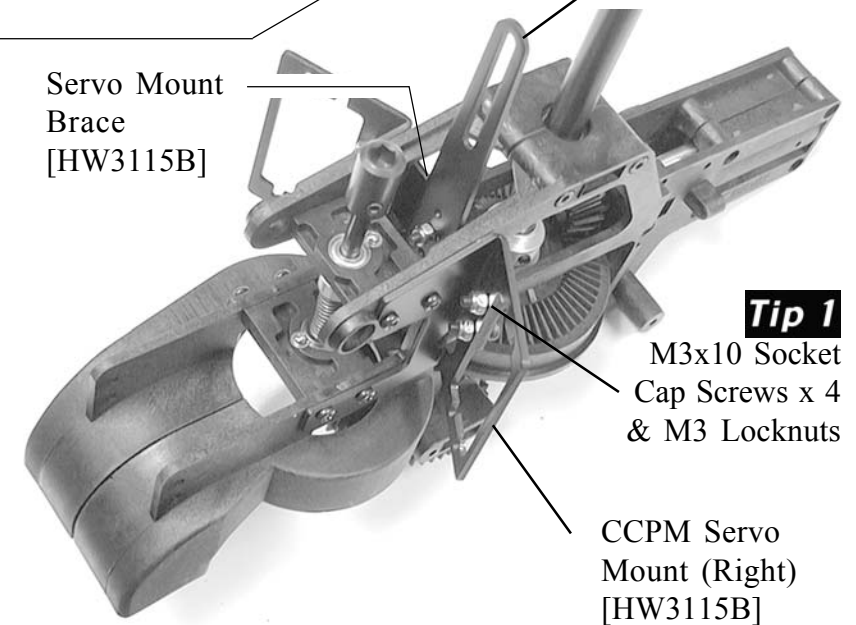
### Step 16 Upper Frame Assembly & Front CCPM Servo Mounts

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. Attach the left side CCPM Servo Mount using four M3x12 Self Tapping Screws (Tip3) into the starting shaft blocks. Install the upper left side frame, taking care that the bearings are aligned with the mating recesses and secure the frames with four M3x35 Socket Cap Screws (Tip1) through the main shaft bearing block positions and four M3 locknuts. While pushing DOWN on the main shaft (make sure the main gear rotates), push the mast stopper against the upper ball bearing, apply threadlock to the set screws and tighten in place.



#### Step 16A CCPM Servo Mounts & Anti-Rotation Bracket

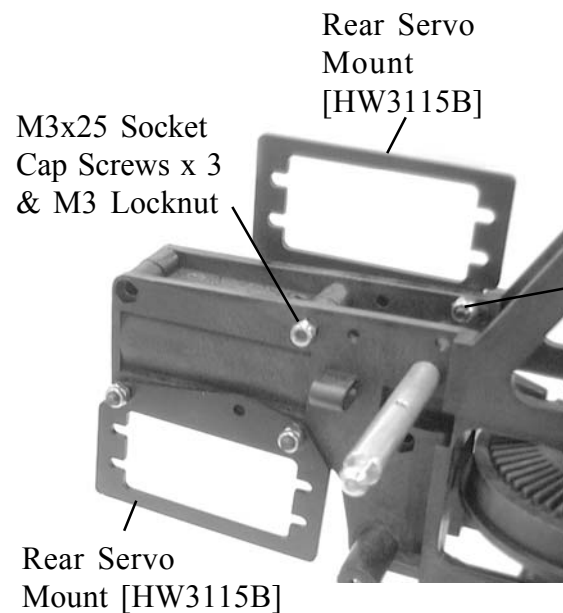
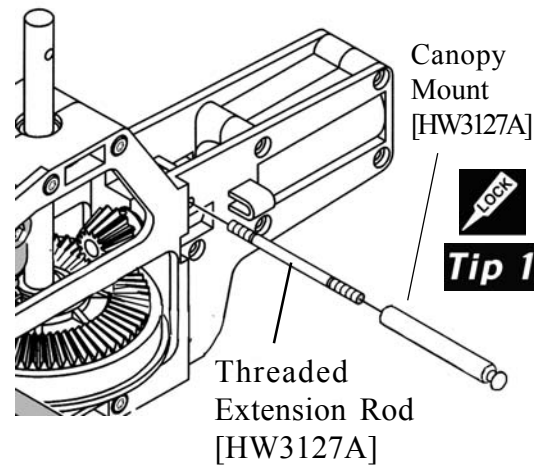
From parts bag 2: Attach the Servo Mount Brace using four M3x10 Socket Cap Screws and M3 Locknuts through the holes on the CCPM Servo Mounts. Look at the servo mount brace and notice the two tabs when properly installed face forward. Attach the anti-rotation bracket to the front of the brace with one M3x10 Socket Cap Screw and a M3 Locknut (hold the locknut with pliers and tighten the bolt with the provided hex key).



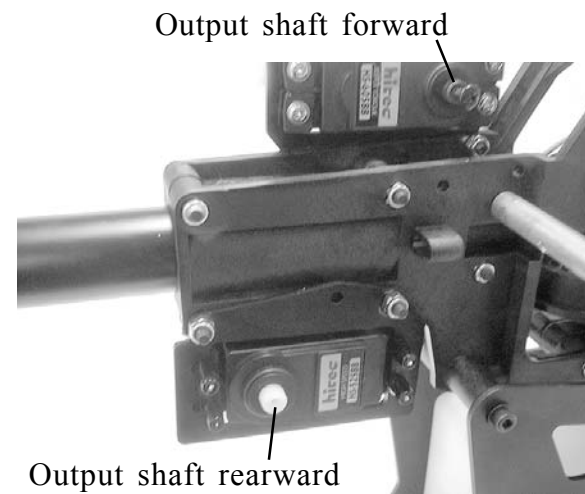
Install both CCPM front servos at this time, with the output shaft of the servos positioned upwards and the servo flange inserted from behind the servo mount. Using the screws provided, insert the screws from the servo top through the grommets (insert the eyelets between the grommet and the mount bracket) and attach the servo mount tabs from the bottom of the servo.

### Step 17 Rear CCPM Servo Mount and Rudder Servo Mount

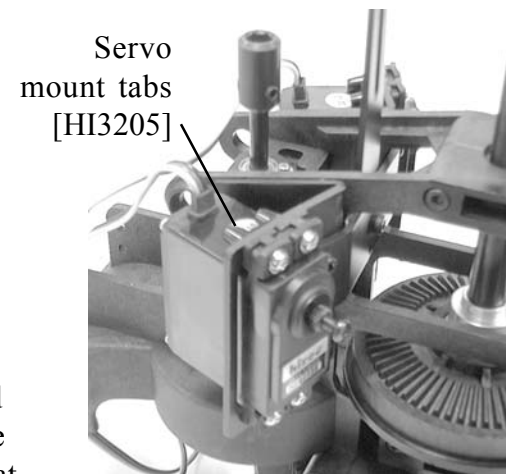
From parts bag 2: Slide one Threaded Extension Rod through the upper position of the tail output bearing recess and secure two round Canopy Mounts ( *Tip 1* - one per side ) using threadlock. Examine the servo mount brackets, the rear CCPM servo mount uses the holes that are 31.5mm apart while the rudder servo mount uses the holes spaced at 45mm.



Position the rear servo mount bracket on the left side of the mechanics just behind the main shaft, the front of the mount has a right angle notch beside the hole. Insert one 3x10mm Socket Cap Screw through the servo mount and into the upper side frames with one 3mm Locknut to secure in place. Insert one 3x25mm Socket Cap Screw and match the 3mm Locknut into the molded hole for the locknut in the upper frames. At this time install the remaining 3x25mm Socket Cap Screw and 3mm Locknut into the rear-most hole in the upper frames, **leave these loose until the tail boom assembly is ready to be installed.** Install the rear CCPM servo from the right side so that the output shaft is facing the front of the mechanics and the servo flange is on the right side of the bracket. Insert the servo screws through the grommets, the servo mount and into the servo mount tabs, secured from the bottom of the servo.



Similarly position the rudder servo mount on the right side of the upper frames, noting that the right angle notch is now facing the rear of the helicopter. Insert two 3x25mm Socket Cap Screws through the two lower holes in the upper frame assembly, through the rudder servo mount and secure with two 3mm Locknuts. **Again leave these loose for now.** Insert the rudder servo similarly with the output shaft facing the rear but the servo flange should be on the left side of the bracket.



### Step 39 CCPM Radio Review & Setup

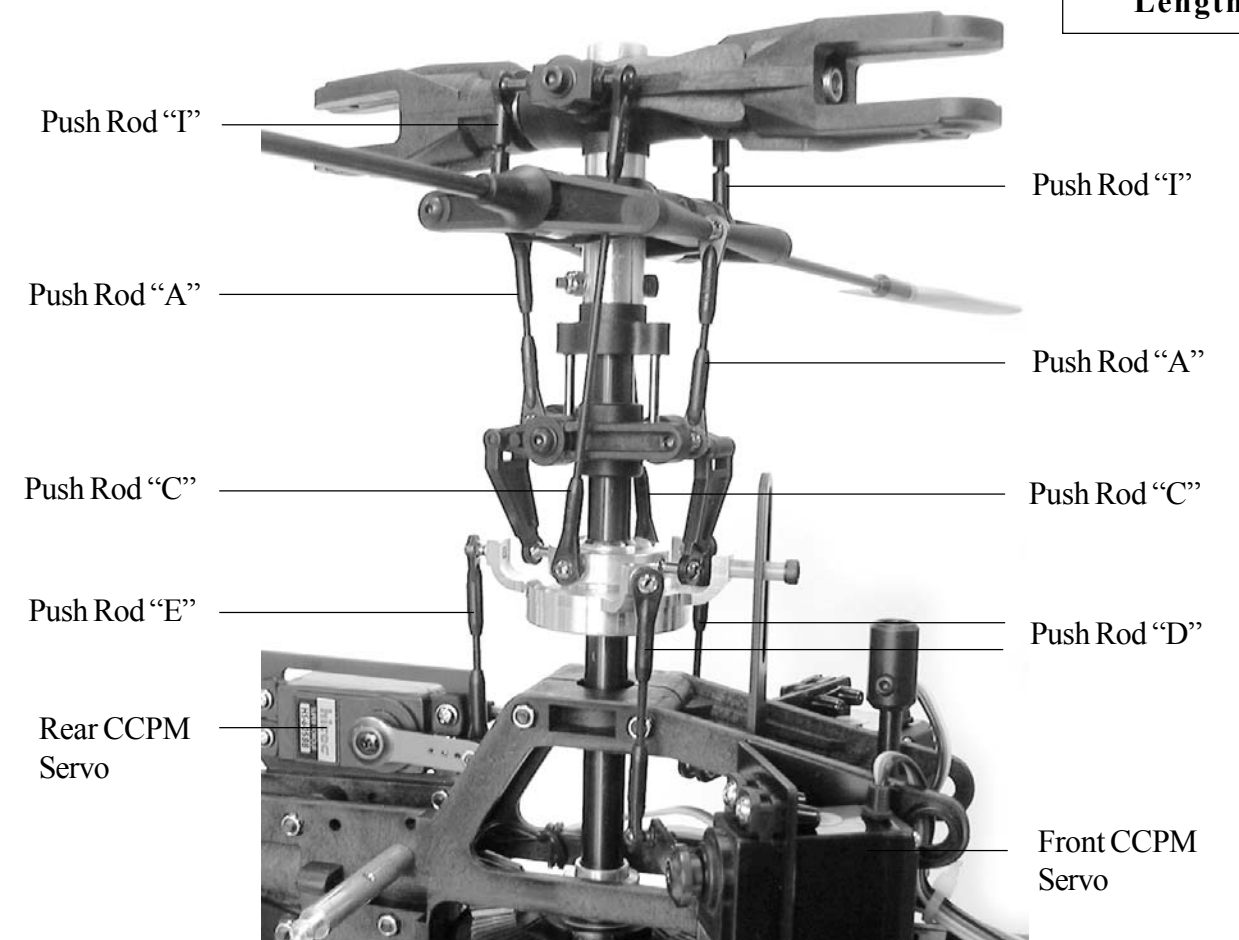
The next section covers setting the pushrods and servos that will control the helicopter. It is important at this time that you review the instructions provided with your radio that controls the ccpm mixing for the 3 cyclic servos. Reviewing the radio instructions will assist you in becoming familiar with the functions that affect the individual servos and affect the interaction of the three servos working together to control the swashplate.

#### Radio Setup Procedure

1. It is best to choose a new model memory (if available) and use the Reset feature to remove any previous settings or mixes, remember this usually also returns the radio configuration to single servo.
2. Locate and activate the swashplate mixing for 120° ccpm (most manufacturers set single servo by default).
3. Return both the aileron and elevator subtrims to neutral along with any hover pitch knobs to neutral.
4. Adjust the servo reversing switch to make sure the servos are moving in the correct direction, together as the collective stick is raised. If the servo reversing does not correct the movement of a servo, there is always a travel adjustment function inside the swashplate mixing menu. Change the default setting to be opposite, for example, if set to +60 then change to -60 and change any servos that are affected.
5. After each servo horn is mounted, it is critical that the horn be 90 degrees to the respective pushrod.

### Step 40 Pushrod Setup and Adjustments Relation Picture

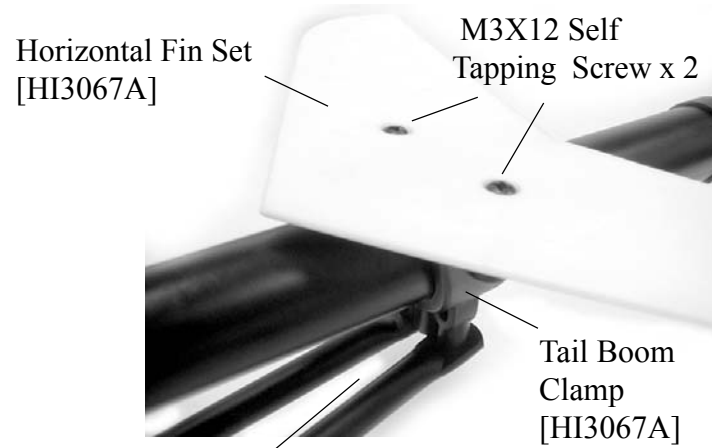
See next page for Pushrod Lengths



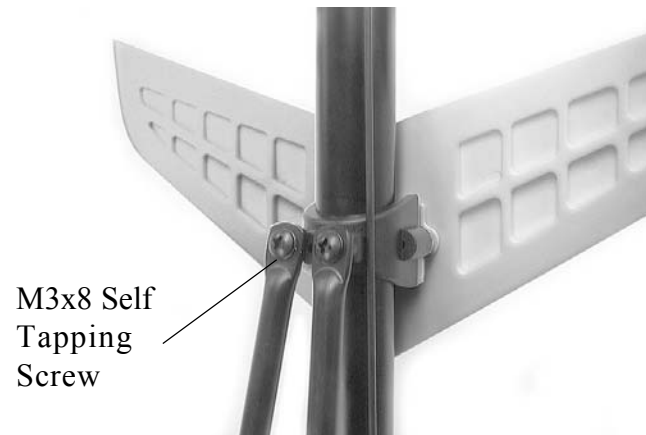
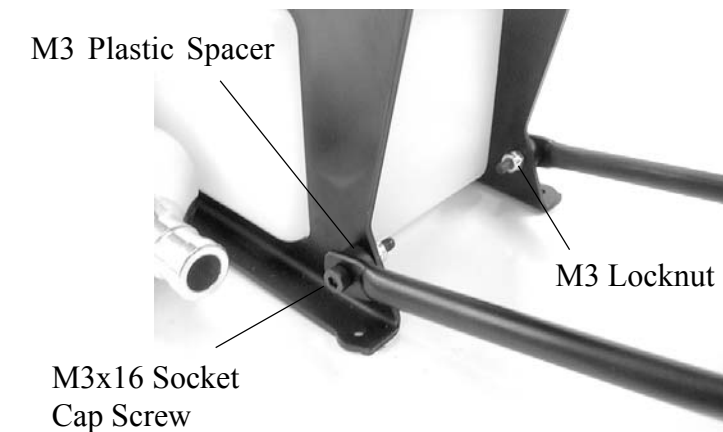


### Step 38 Tail Fins & Support Struts

Position two of the pushrod guides in front of the horizontal fin and one behind. Attach the Horizontal Fin on the tailboom using two 3x12mm Self Tapping Screws through the fin, the fin mount and into the Tailboom Clamp. Space the fin along the tailboom at the position where the Tail Boom supports intersect the tailboom. **Note: the mount for the strut is angled, test fit the strut to position the clamp in the correct direction.** Secure each strut one at a time using one 3x8mm Self Tapping Screw through the strut hole and into the horizontal fin clamp. Attach the lower end to the outside of the lower frame assembly using one 3x16mm Socket Cap Screw inserted through the hole in the strut, then add one 3mm plastic spacer and finally through the hole in the lower side frames, secure with a 3mm Locknut from the inside.



Tail Boom Support Struts  
[HW3202B] - R30  
[HW3202C] - R50

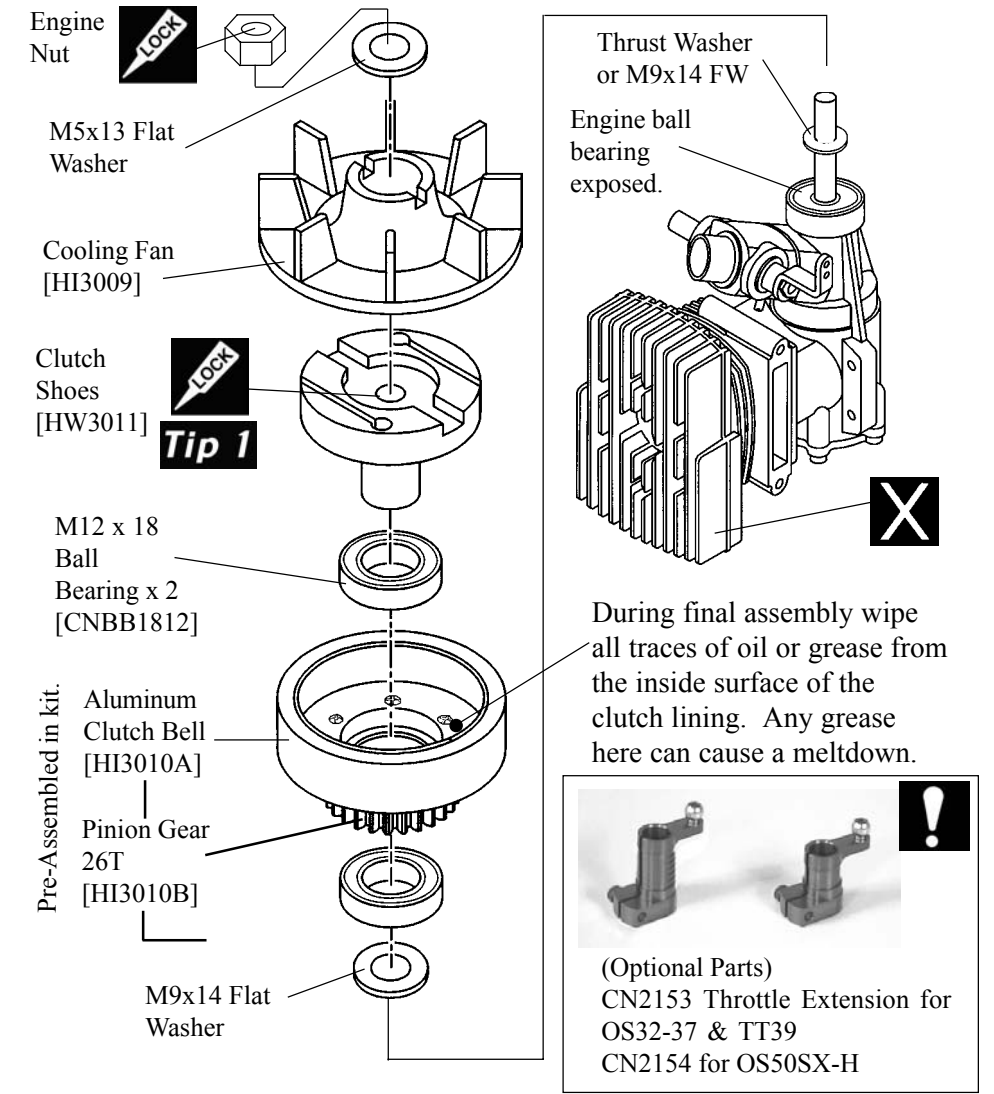


Ball links can be attached to both ends of the rudder pushrod and the pushrod guides can be adjusted in position to get smooth actuation from the rudder servo to the tail rotor bellcrank. Once the pushrod moves smoothly, apply a few drops of medium CA glue to bond the pushrod guides in place. It is extremely important that the guides are bonded, as a loose pushrod guide will move, continually changing the center or neutral position of the rudder channel. This will affect all other setup adjustments and make flying the helicopter difficult to impossible.



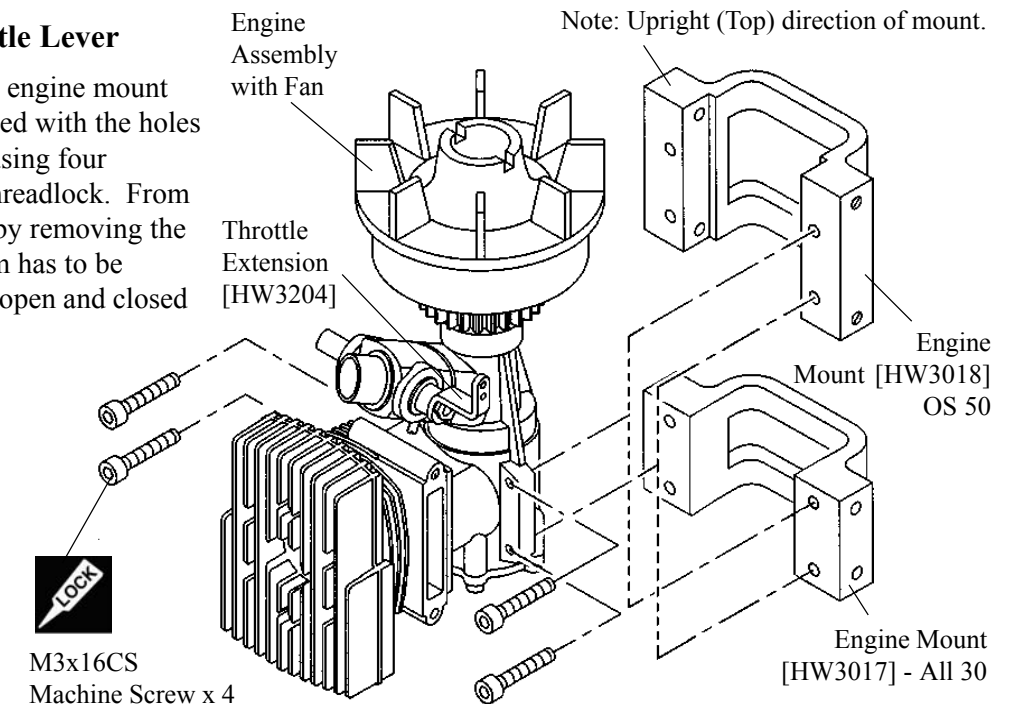
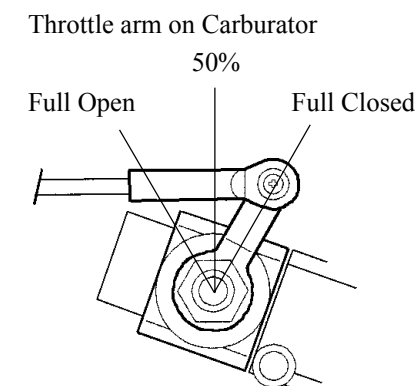
### Step 18 Clutch, Fan & Engine Mounting

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 (**Tip 1**) on the crankshaft, engine nut and 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.



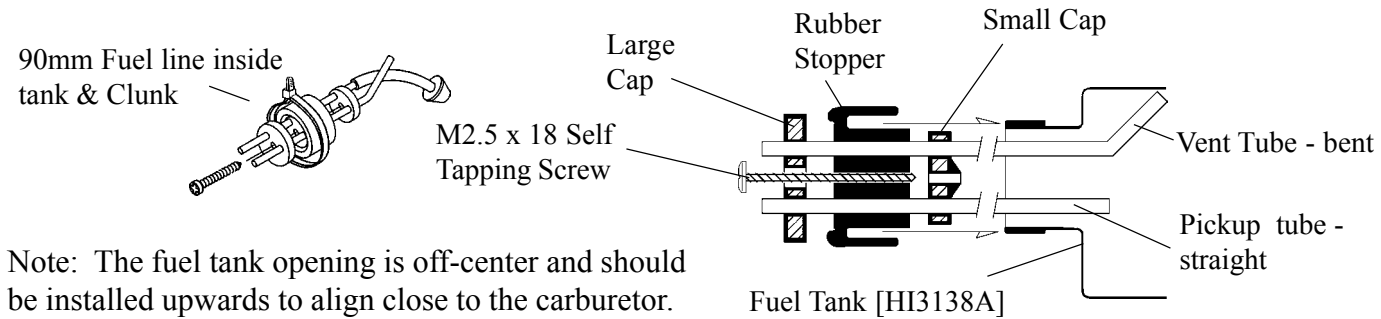
### Step 19 Engine Mount & Throttle Lever

Secure the engine assembly on to the engine mount (46/50 make sure the mount is installed with the holes closest to the bottom of the engine) using four 3x16mm Socket Cap Screws using threadlock. 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 20 Fuel Tank Assembly

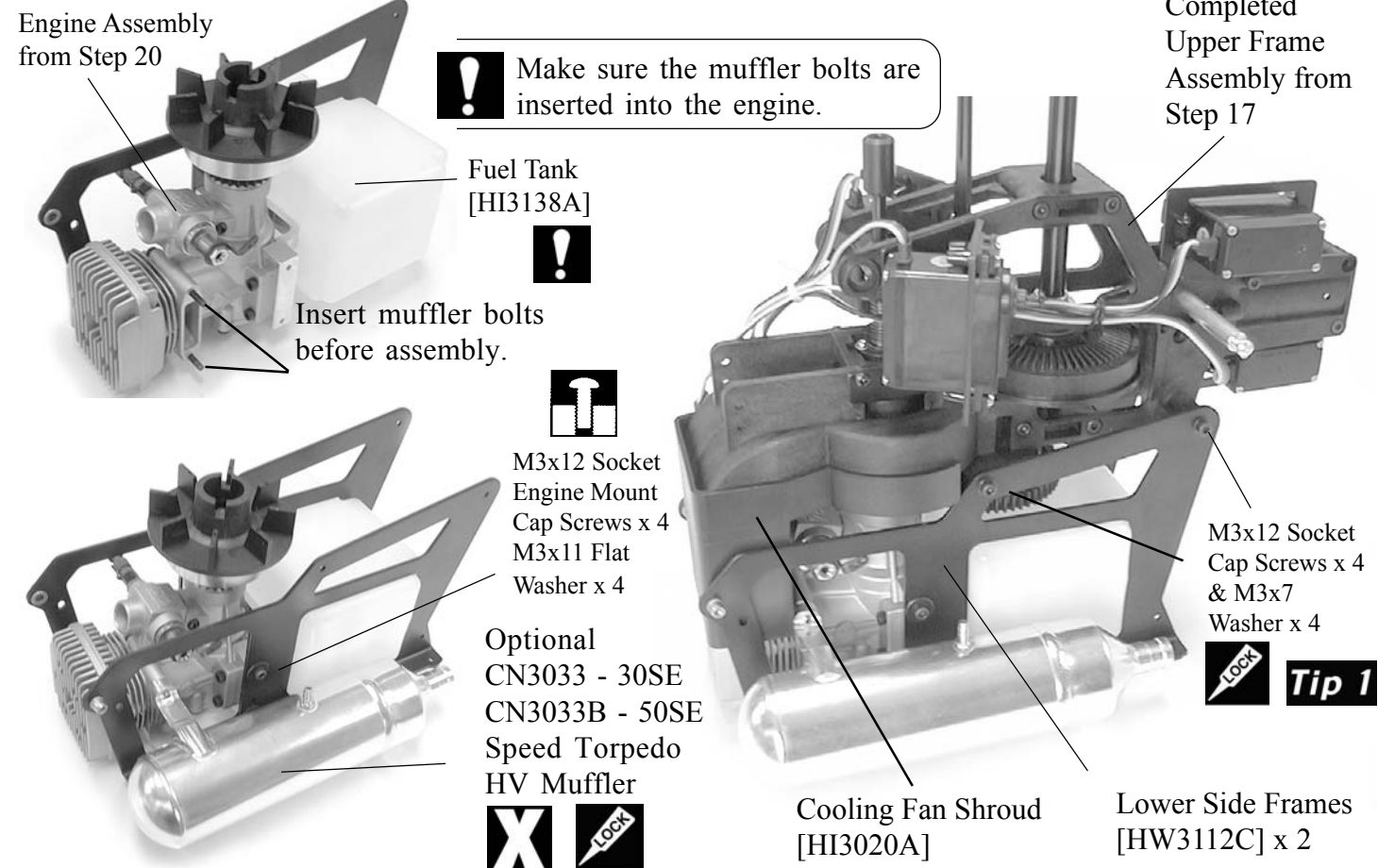
From parts bag 3, insert the two pieces of aluminum tubing through the large cap, rubber stopper and small cap, bend the long aluminum tube upwards and attach the short piece of fuel line and clunk to the short straight piece of tubing. Test fit the assembly into the Fuel Tank and make sure that the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



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

## Step 21 Lower Frame Assembly

Attach the right lower frame (R) to the upper frame assembly with two M3x12 Socket Cap Screws (**Tip 1**) and M3 Washers 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 and M3x11 Washers through the (R) side frame (leave these loose for now) into the engine mount. **Make sure the muffler bolts are inserted into the engine.** Slide the fuel tank assembly through the frame and attach the left lower side frame (L) to the upper side frames using two M3x12 Socket Cap Screws and M3 Washers using threadlock. Attach the remaining two M3x12 Socket Cap Screws and two M3x11 Flat Washers to the engine mount. Position the engine assembly and tighten the engine mount bolts when there is 1mm of gap between the clutch bell and the counter gear, using threadlock.

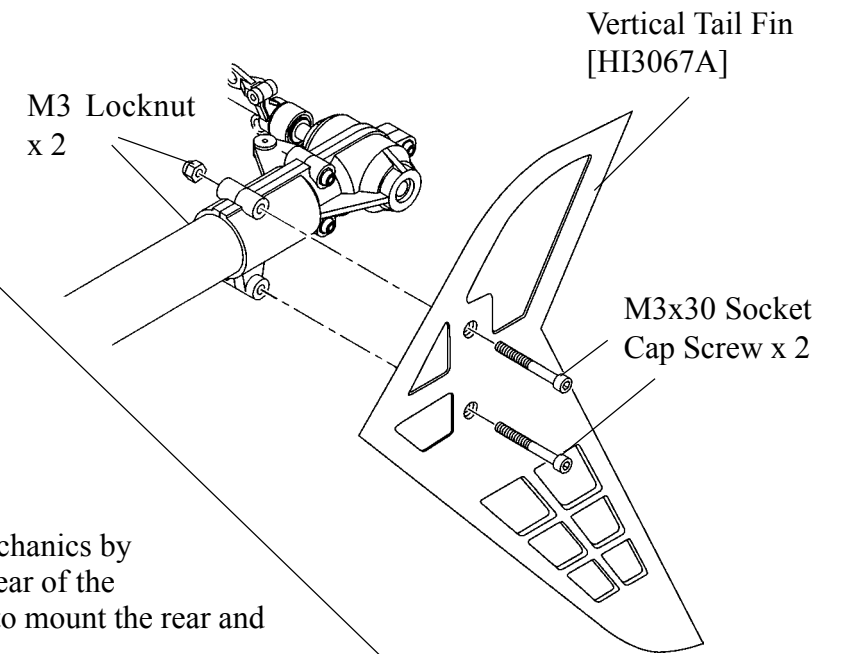


**Tip**

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 debris that can lead to a failure.

## Step 36 Vertical Tail Fin Assembly

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.

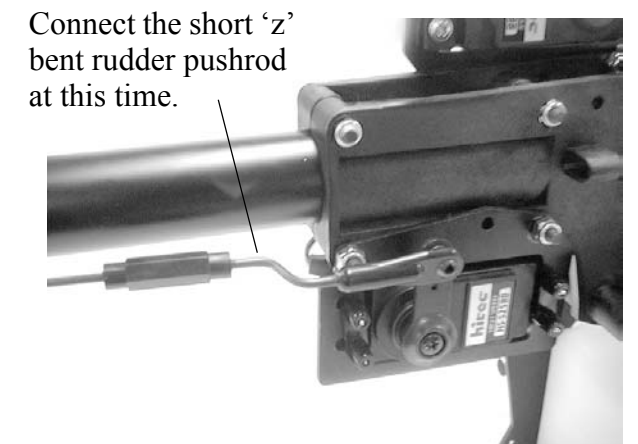
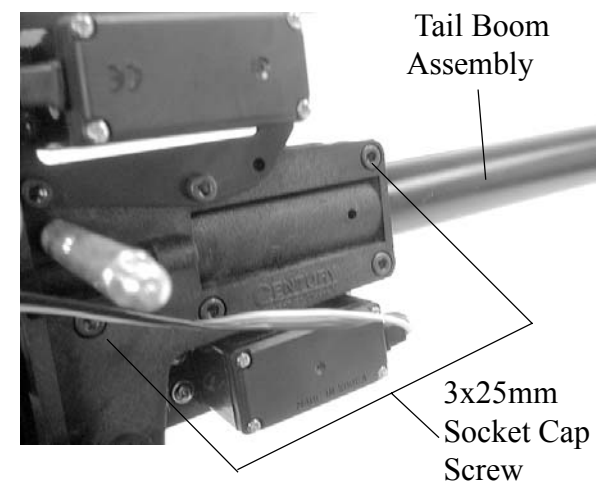


## Step 37 Tail boom Final Assembly

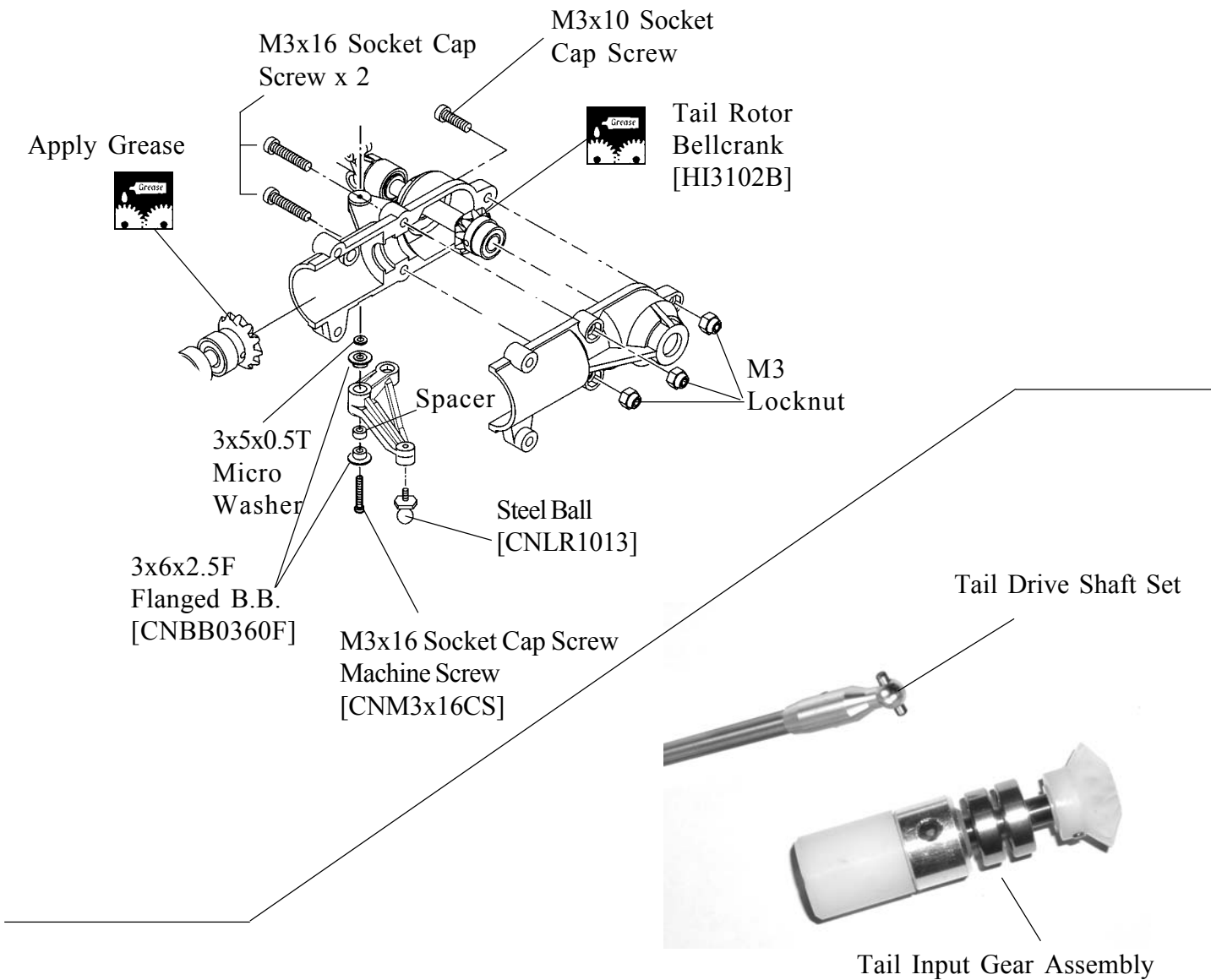
From parts bag 2: Insert one 3x25mm Socket Cap Screw into the lower position of the tail output bearing recess and secure with a locknut from the other side.

Attach the tail boom assembly to the main mechanics by sliding the tailboom tube into the hole in the rear of the upper frame. The screws previously installed to mount the rear and rudder servos may need to be loosened.

Slowly press the tailboom in, once the end of the torque tube drive shaft first touches the drive coupler, slowly rotate the tail blades while applying a small forward pressure. As soon as the two are aligned continue pressing in the tailboom until fully seated. Tighten all four Socket Cap Screws firmly to secure the tailboom.



### Step 35 Tail Gearbox Assembly



**Part 1.** 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.

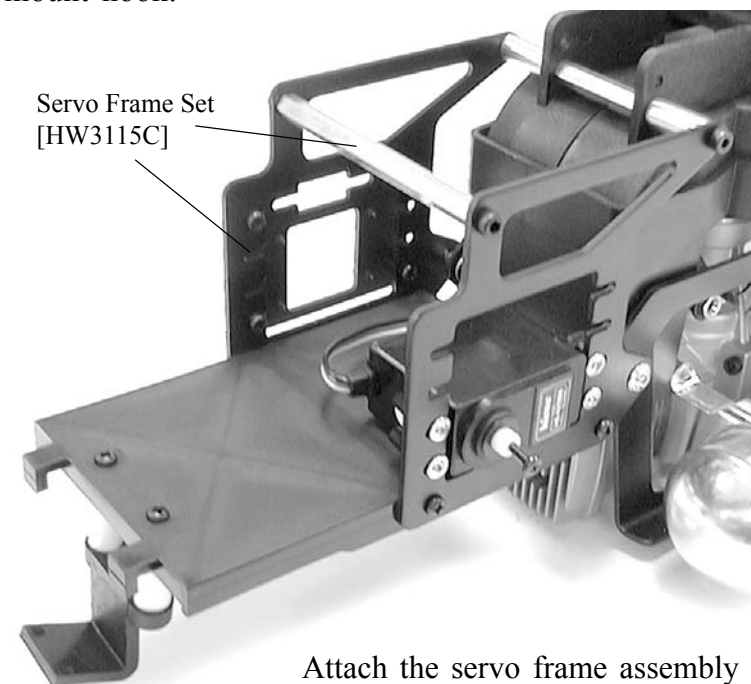
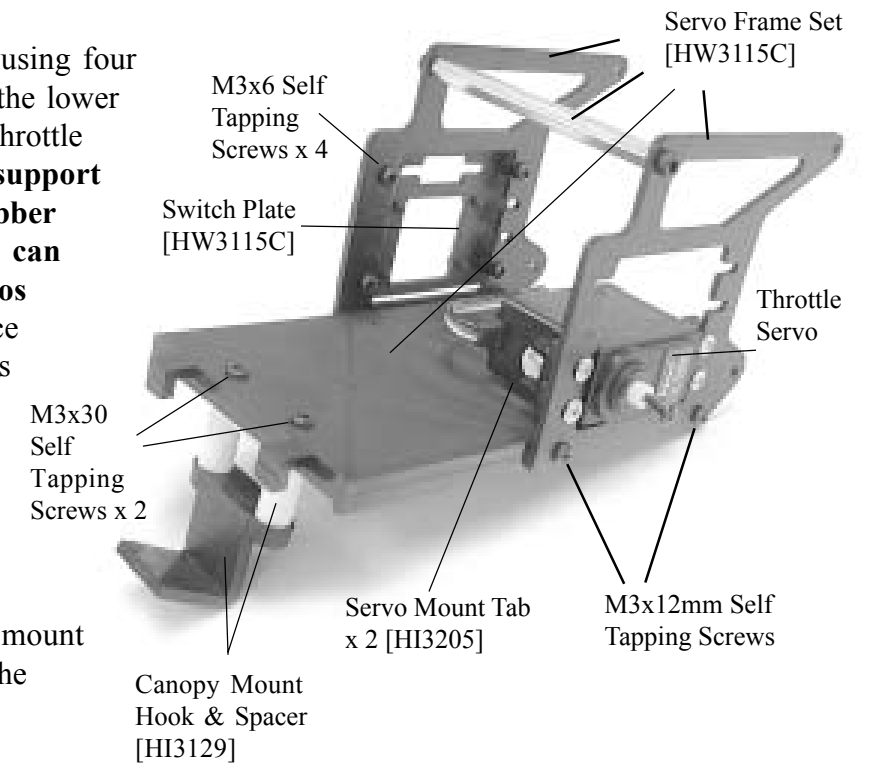
**Part 2.** While holding the tail bellcrank, thread in one short steel ball. Insert one ball bearing from one side, then insert the spacer followed by the second ball bearing. Insert one 3x16mm Phillips Machine Screw through the bellcrank assembly (from the bottom) and add one 3x5x0.5mm micro washer that will fit between the bellcrank and flange on the gearbox. As the screw is tightened, **make sure** the steel ball is engaged in the hole on the bellcrank and the bellcrank turns freely without binding.

#### 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 debris that can lead to a failure.

### Step 22 Servo Frame Assembly

From parts bag 5, assemble the servo tray using four 3x12mm Self Tapping Screws (**Tip 3**) into the lower holes of the battery tray. Next install the throttle servo from the **inside of the left vertical support in the lower position.** (**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** ). Notice that the output shaft of the servo is towards the front. Insert the servo screws from servo frame side through the slots and secure using the servo mount tabs provided. Using two 3x10mm Socket Cap Screws, attach the long hex spacer to the front-most upper holes in the vertical supports using threadlock. Attach the switch mount using four 3x6 Self Tapping Screws from the inside of the right vertical support and the canopy mount using two 3x30 Phillips Self Tapping Screws through the top of the battery tray, through the plastic spacer and into the canopy mount hook.



30mm Thread Hex Spacer & 18mm Hollow Round Spacer x 2 [HW3115C]

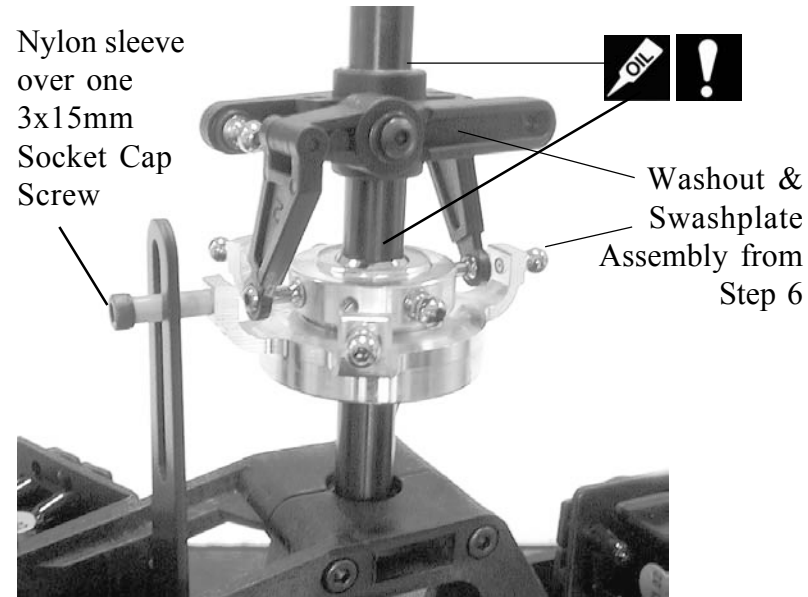


### Step 23 Servo Frame Assembly to Mechanics

Attach the servo frame assembly to the mechanics starting with one 3x30mm Socket Cap Screw inserted through the upper rear hole in the servo tray. Next slide one 18mm hollow spacer and insert through the lower hole in the front of the upper frames, stop just as the screw is flush with the inside surface. Apply threadlock to the threads on both ends of the 30mm hex spacer and place inside the upper frames. Tighten the screw into the hex spacer. Repeat for the other side. 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.

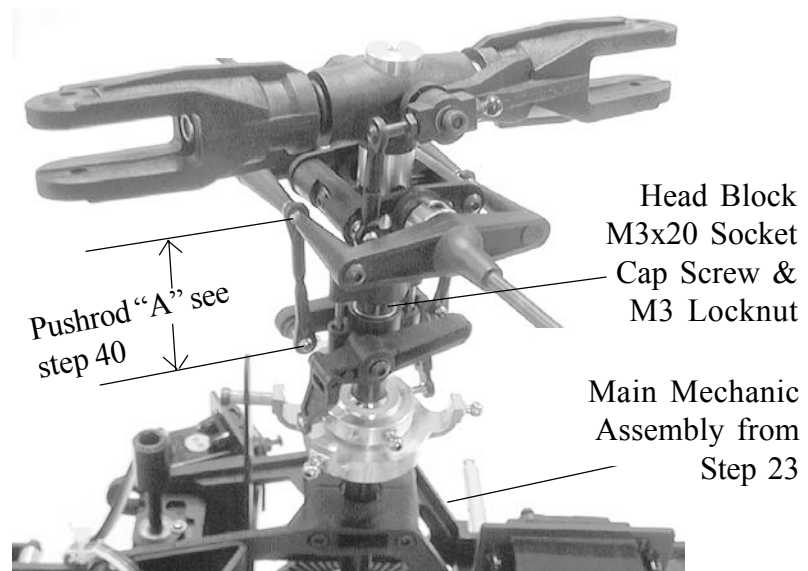
### Step 24 Final Rotor Head Assembly

Slide the washout assembly from Step 6 onto the main shaft. Slide the nylon sleeve over one 3x15mm Socket Cap Screw and insert through the anti-rotation bracket into the remaining open hole in the swashplate using threadlock. 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 3x20mm 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.



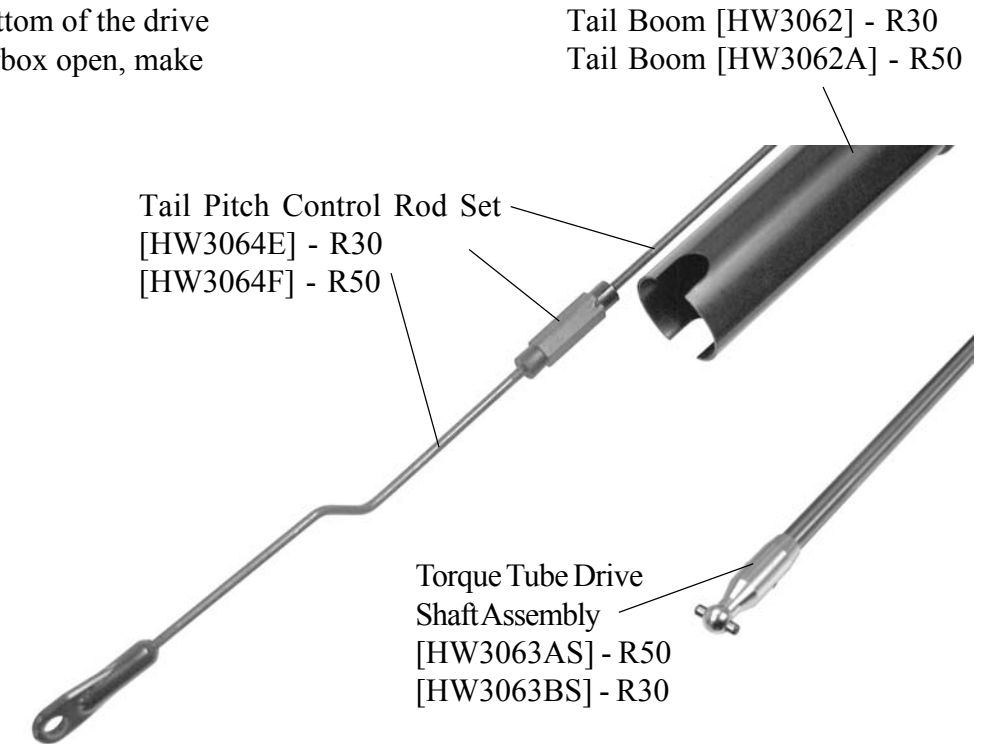
Following assembly, move the swashplate up and down to the endpoints. The swashplate and washout unit should be very smooth throughout the movement range. If not, inspect the fit of the washout guide to the pins in the rotor head, these pins can be bent slightly if binding. Lastly the fit of the ball 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.

Completed Rotor Head Assembly from Step 5



### Step 34B Torque Tube Drive Shaft Assembly & Pushrod Guides

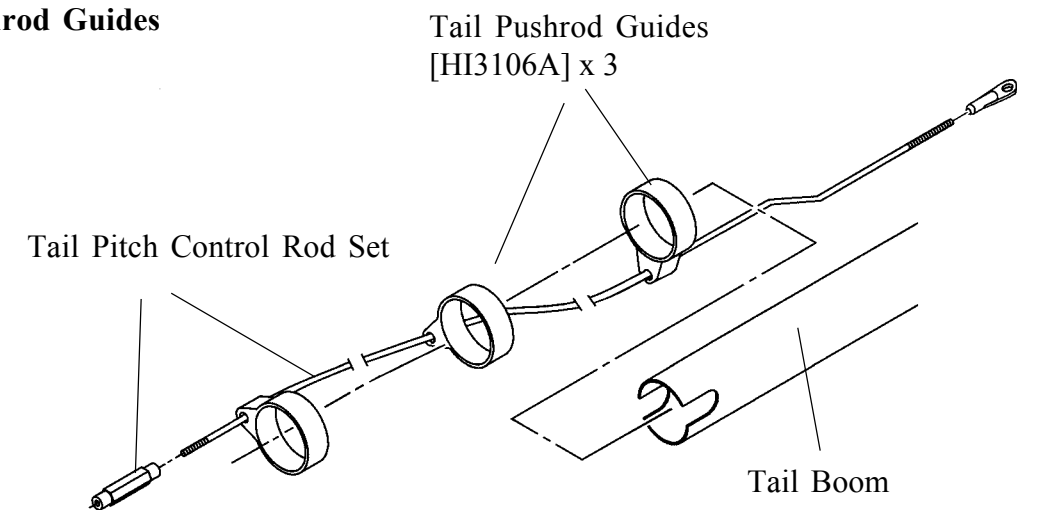
Packaged with the tailboom is the carbon torque tube drive shaft assembly. This is a complete assembly ready to be installed into the helicopter. Using a light oil, apply a few drops to the ball bearing inside the tailboom guide. This should be done every 20 hours of flight or 3 month intervals. Insert the drive shaft assembly into the tailboom from the end with the 2 holes and position the assembly approximately centered in the tailboom (**apply a little liquid hand soap to ease the insertion of the o-ring guides**). Using one half of the tail gearbox assembly with the tail input shaft installed, continue to insert the drive shaft assembly until there is a 1mm gap between the end of the drive shaft and the bottom of the drive coupler. This is simple with the gearbox open, make sure the tailboom is properly keyed into the tail gearbox. Slide the three tail pushrod guides onto the tailboom engaging tail pushrod. Thread the pushrod connector onto the long pushrod, the short 'z' pushrod will be attached in the rudder servo linkage setup page.



**!** Having taken time to properly fit the tail gearbox joint will make the front transmission assembly very simple.

### Step 34C Tail Rudder Pushrod Guides

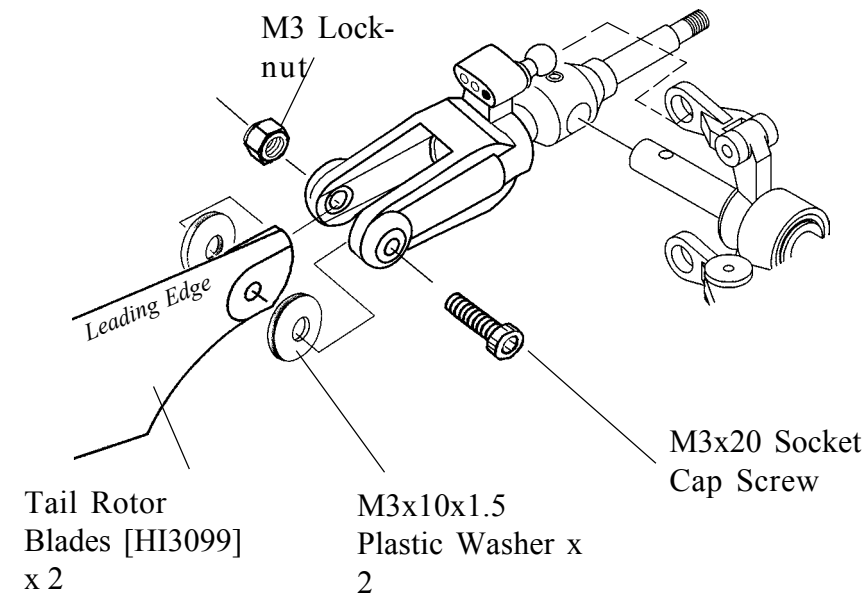
If not already done, slide the three tail pushrod guides onto the tailboom engaging tail pushrod. Attach the pushrod connector and the short "z" pushrod. Align the guides as illustrated in the picture until the pushrod can be moved very smoothly by hand. Once satisfied bond in place with a single drop of Zap Ca. (one drop will allow easy removal later).



**!** Reminder, 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 Blades Assembly

Snap the ball on the tail rotor grip into the adjoining pitch slider link on both sides. Install the Tail Rotor Blades shimmed with 3x10mm plastic washers on both sides using two 3x20mm Socket Cap Screws and M3 locknuts. Note the direction of the blades on the diagram, the straight leading edge of the blade should be on the same side as the ball on the blade grip. To tension the blade bolt, start loose and tighten until the blade holds horizontal but pivots freely when shaken.

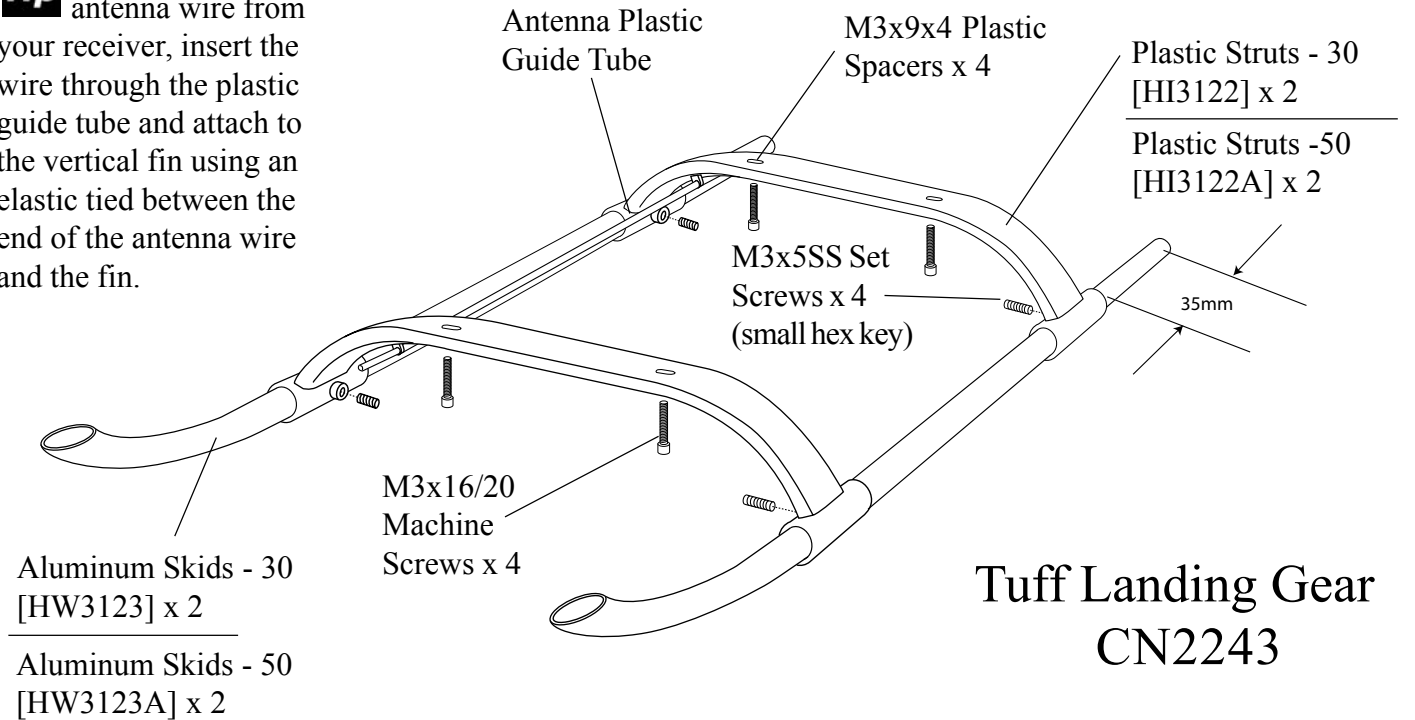


**Tip** After flying the model, if a vibration is noticed on the horizontal fin, you can remove the complete tail rotor assembly with the hub and further balance it using a High Point balancer. Careful sanding of the rotor blades is all that is needed.

### Step 26 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(30) or 3x20mm(50) Machine Screws inserted from the bottom of the struts and through the M3x9 plastic spacers into the lower side frames and secure with four M3 locknuts.

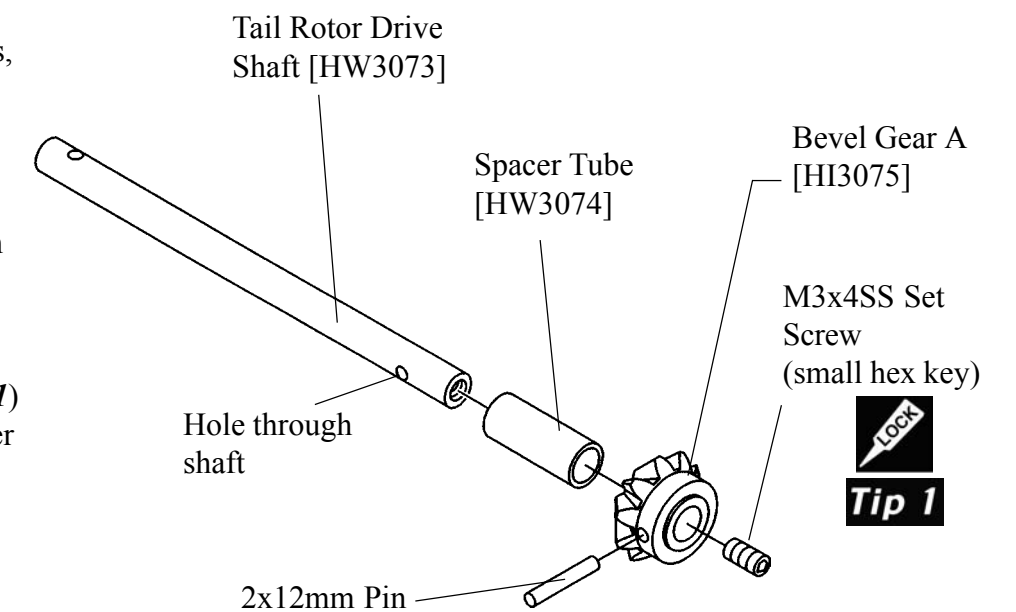
**Tip** When routing the antenna wire from your receiver, insert the wire through the plastic guide tube and attach to the vertical fin using an elastic tied between the end of the antenna wire and the fin.



Tuff Landing Gear  
CN2243

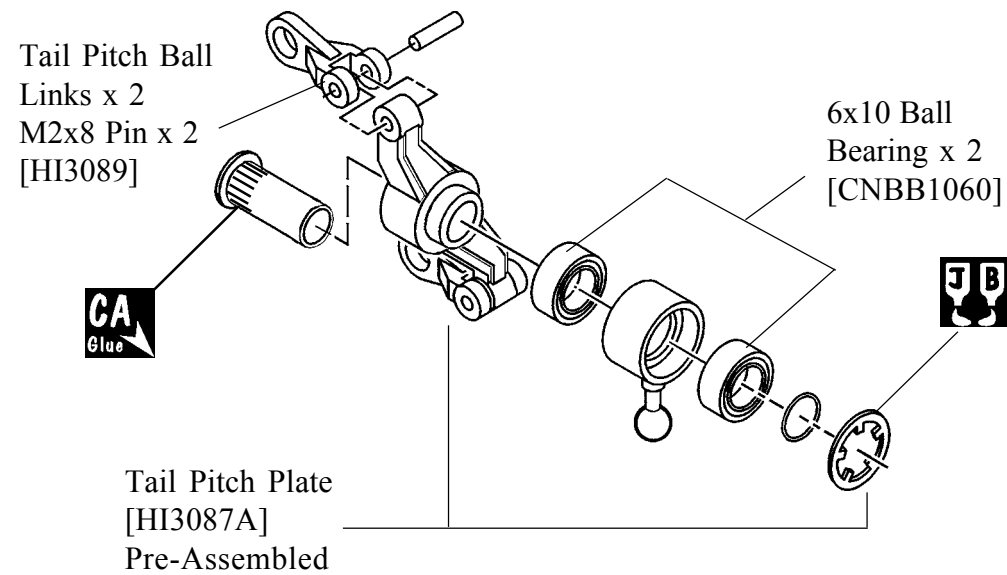
### Step 27 Tail Output Shaft Assembly

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 (**Tip 1**) using threadlock. Slide the Spacer Tube onto the shaft and position against the gear.



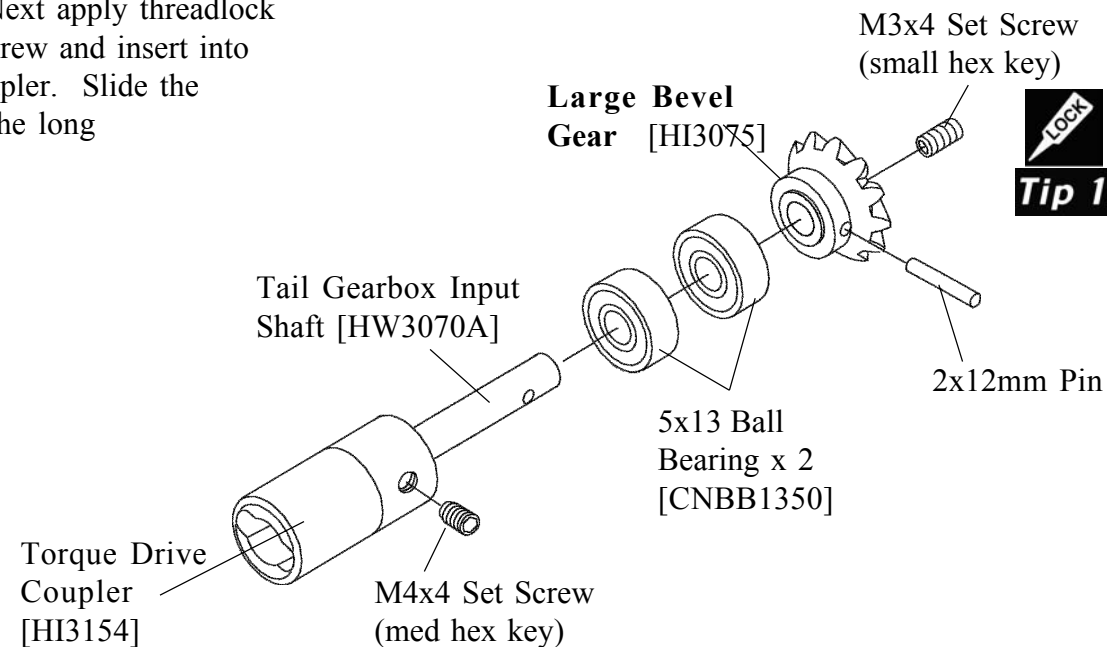
### Step 28 Tail Pitch Plate Assembly

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.**) Apply a drop of CA glue between the edge of the brass tube and the plastic pitch plate. Put this assembly aside for now.



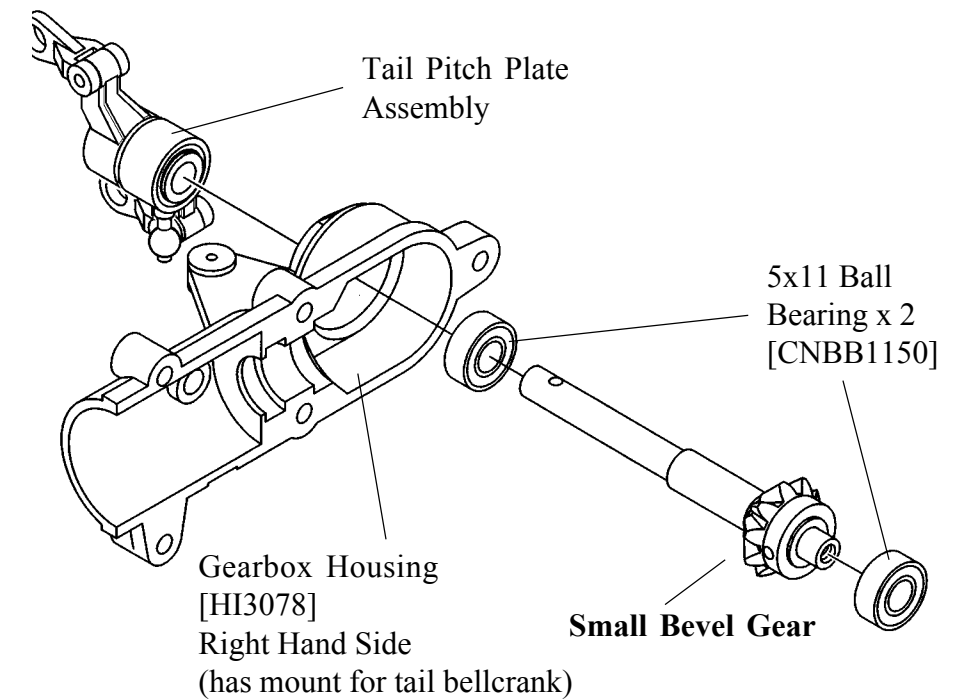
### Step 29B Tail Input Shaft Assembly

From parts bag 7, align the holes on the **large** bevel gear and press in one 2x12mm Pin and secure with one 3x4mm Set Screw inserted into the end of the shaft using threadlock. Slide (**Tip 1**) two Ball Bearings onto the shaft and install into one half of the tail gear box. Next apply threadlock to the 4x4mm set screw and insert into the torque drive coupler. Slide the drive coupler over the long flat spot until there is no end play in the shaft and tighten the set screw in place.



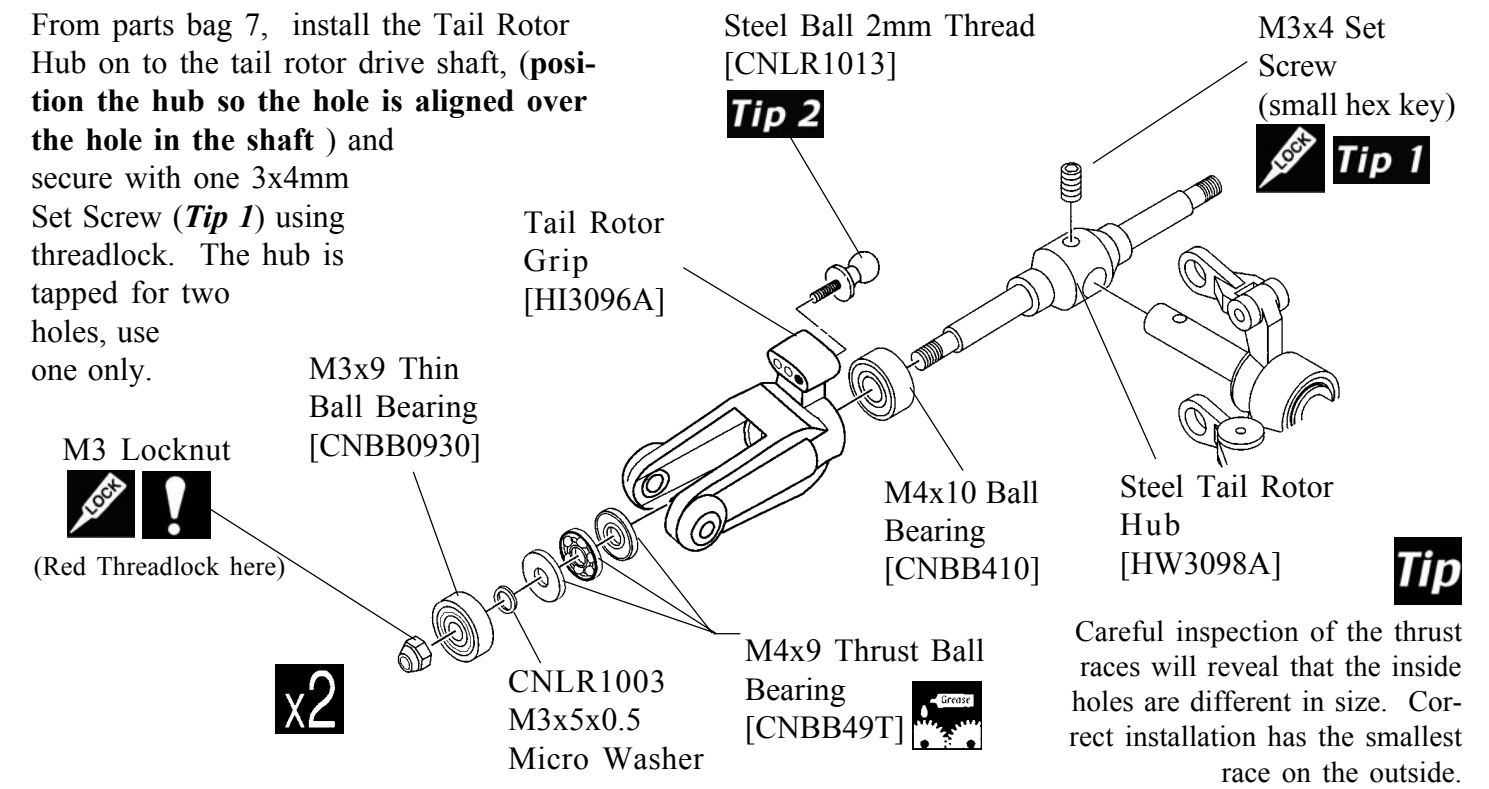
### Step 30 Tail Gearbox Assembly

From parts bag 7, slide two Ball Bearings on each side of the Tail Rotor Output 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 31 Tail Rotor Grip 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 3x4mm Set Screw (**Tip 1**) using threadlock. The hub is tapped for two holes, use one only.



Install one short steel ball into the upper right hole in the tail rotor grip (**Tip 2**). Insert one M4x10 Ball Bearing into the blade grip on the ball side (make sure the bearing is fully seated flush into the grip). Slide the grip onto the tail hub and slide one M4x9 Thrust Ball Bearing (**install the first steel washer (larger inside diameter) followed by the ball race, remember to grease the ball race, followed by the second steel washer (smaller inside diameter)**) followed by one M3x5x0.5 micro washer and one M3x9 Thin Ball Bearing. Important, apply red threadlock to the threads in the M3 locknut (**to avoid getting threadlock into the bearings**) before threading onto the hub. Tighten the locknut slowly until there is no end play and the grip rotates smoothly.