

INTRODUCTION

Congratulations on your purchase of the Raptor 30 V2 helicopter. This model was designed and engineered by the World-renowned Mr. Shigetada Taya. It combines elements of his previously successful designs with today's advanced technologies. Since the introduction of the original Raptor 30 in 1998, many have been sold around the world. It is the most popular 30-size helicopter in the world. The Raptor 30 has helped beginners master the art of RC helicopter flying. The Raptor 30 has helped experienced pilots learn new 3-D maneuvers. This is truly a versatile model helicopter for everyone. We did not just sit on our laurel, our team of engineers and test pilots have collected feedbacks from around the world and have now made the Raptor 30 an even better helicopter. We made new molds and tooling for new parts. Many areas have subtle changes to increase strength and durability.

As one of the largest R/C manufacturers in the world, Thunder Tiger has spared no expense to bring you this incredible new machine. All production parts are manufactured by use of the most modern technology available and meets or exceeds the standards as set forth by ISO-9001.

In the last few years we have spent time and resource to develop a new Thunder Tiger PRO-39H(R) ring engine for the Raptor 30 V2 and for other 30-size helicopters. The new PRO-39H(R) has much better transition characteristics than the Pro 36H ABC engine. The needles are easy to set. The ring design eliminates the criticalness of ABC engines. You will find the new 39H engine produce more power than any other available 30-size engines. Together, the new Raptor 30 V2 and the PRO 39H(R) engine will provide you with many hours of enjoyment. Thank you again for purchasing our fine products.

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WARNING

This radio controlled helicopter is not a toy. It is a sophisticated piece of equipment and is designed for hobby use only. If not properly assembled and operated, it is capable of causing property damage and bodily harm to both the operator and/or spectators. Thunder Tiger and its duly authorized distributors assume no liability for damage that could occur from the assembly and/or use/misuse of this product.

AMA INFORMATION

Operating a model helicopter requires a high degree of diligence and skill. If you are a newcomer to the hobby, it is best to seek help and guidance from accomplished model helicopter pilots. This will greatly speed up the learning process and have you flying successfully in a reasonable time. We also would strongly urge you to join the Academy of Model Aeronautics. The AMA is a non-profit organization that provides its members

with a liability insurance plan as well as monthly magazine entitled Model Aviation. All AMA charter aircraft clubs require all pilots to hold a current AMA sporting license prior to operation of their models at club fields. For further information, contact the AMA at:
Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302
(317) 287-1256

FLIGHT SAFETY CHECKLIST

1. Make sure both the transmitter and receiver batteries are fully charged prior to operation the helicopter.
2. Make sure all flight controls operate properly prior to flying.
3. Range check the radio before the first flight. The servos must operate properly with the transmitter antenna collapsed at a range of at least 50 ft.(15 meters).
4. Check to make sure there is no radio interference on your radio channel before operating the helicopter.
5. Use only the recommended engine fuel as specified by the engine manufacturer.
6. Make sure the transmitter and receiver are turned on before starting the engine.
7. The engine throttle must be in the idle position before starting the engine.
8. Model helicopter main and tail rotors operate at high RPM. Make sure nothing can come in contact with the rotor blades during flight.
9. After starting the helicopter, maintain a safe distance during the flight.
10. Never operate the helicopter in rain or excessive wind conditions.
11. Always operate and fly your helicopter in a safe and responsible manner.
12. Never fly a model helicopter over other pilots, spectators or cars.

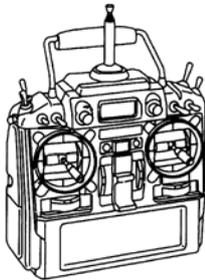
POST FLIGHT INSPECTION

1. Inspect the model thoroughly to insure no parts have come loose or become damaged during the flight and landing. Replace damaged parts and tighten loose screws before flying again.
2. Pump out any remaining fuel from the fuel tank.
3. Wipe off excess oil and fuel from helicopter body and other exposed parts.
4. Lubricate all moving parts ensure smooth operation for the next time you fly.
5. Store model in a cool, dry place. Avoid storage in direct sunlight or near a source of heat.

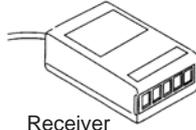
Following these few, simple safety rules will allow you to enjoy the thrill of model helicopter flying for many years to come.

OTHER ITEMS REQUIRED

■ RADIO SET



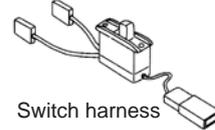
Transmitter
(helicopter type only
6 or more channels)



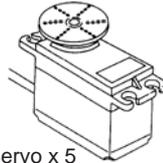
Receiver



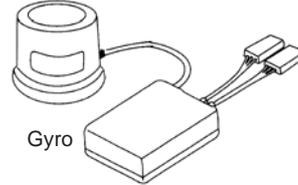
Battery
1000mAh



Switch harness

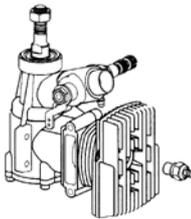


Servo x 5



Gyro

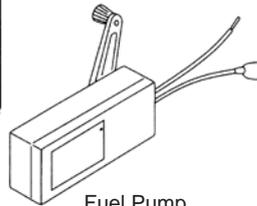
■ ENGINE



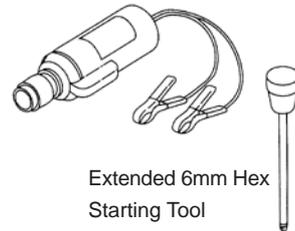
HELI ENGINE(39-size)



Glow Fuel(15%-30%)



Fuel Pump

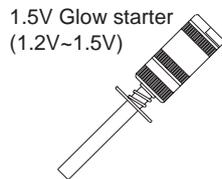
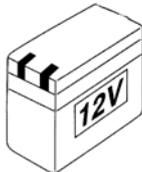


12V Electric starter

Glow Plug

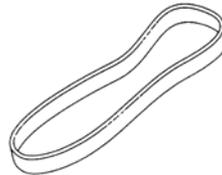
Extended 6mm Hex
Starting Tool

12V Battery

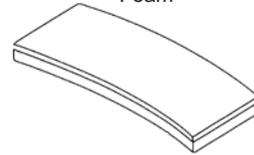


1.5V Glow starter
(1.2V~1.5V)

Rubber Band



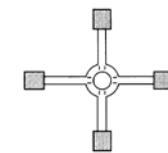
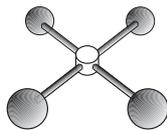
Foam



Remote Glow Plug
Extension



Training Gear
(for beginners only)



Glow Plug Wrench

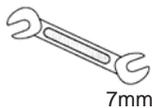
TOOLS REQUIRED FOR ASSEMBLY



Screw Driver



Needle Nose Pliers



5.5mm Wrench



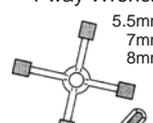
Ball Link Pliers



Nipper



Scissors



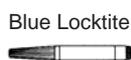
Metric
4-way Wrench
5.5mm
7mm
8mm



Hobby Knife



Instant Glue



Blue Locktite



Grease



Epoxy

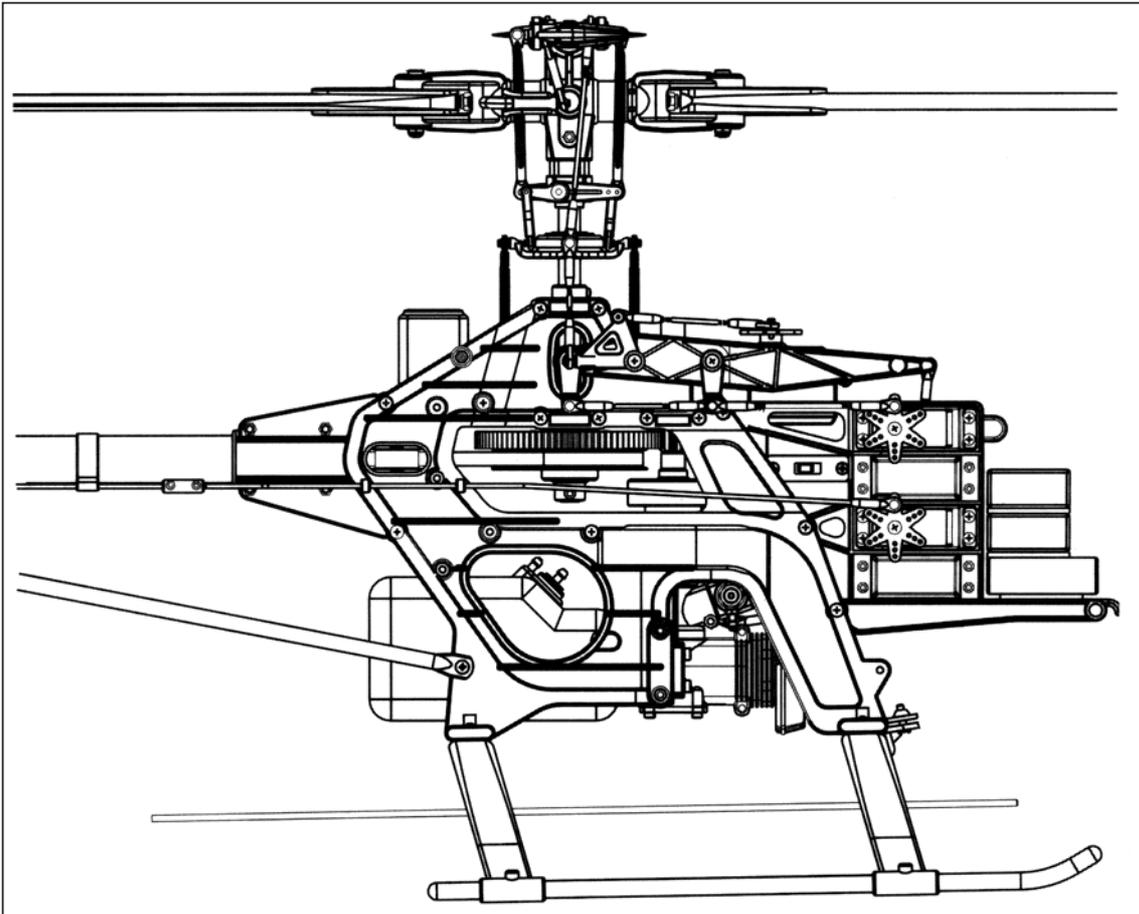


Hex Wrench



5.5mm
7mm
8mm
10mm
Socket Drivers

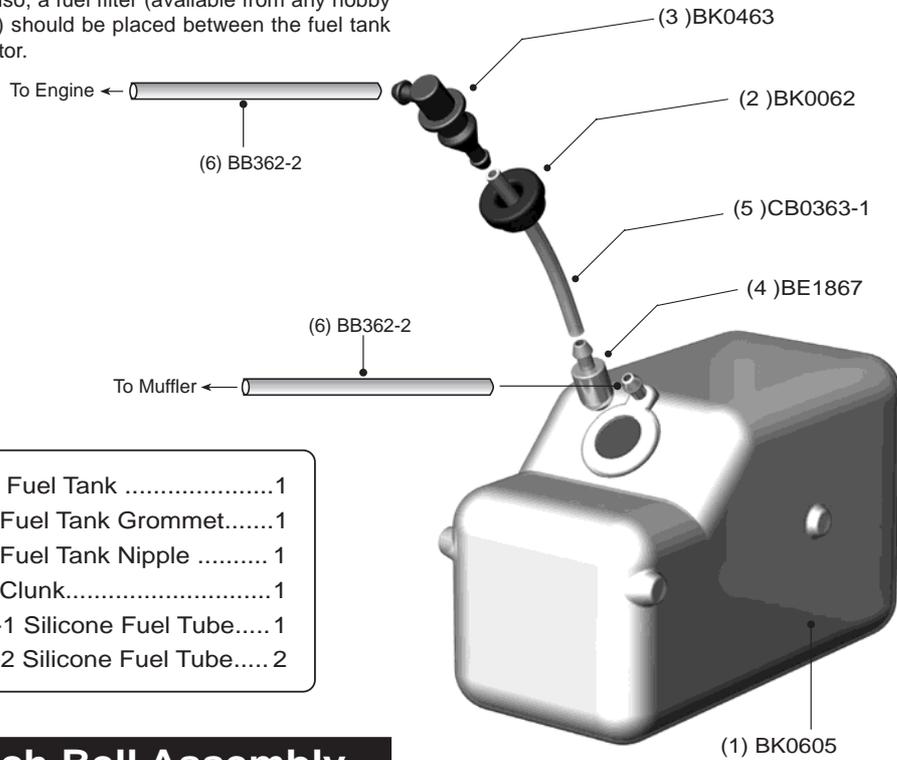
ASSEMBLING SECTION



The parts in the Raptor kit are packed according to the assembly steps. The part number and quantity contained in each are always shown in the square box on each page. Do not open all the bags at once. Open only the bag that is needed for the current assembly step.

① Fuel Tank Assembly

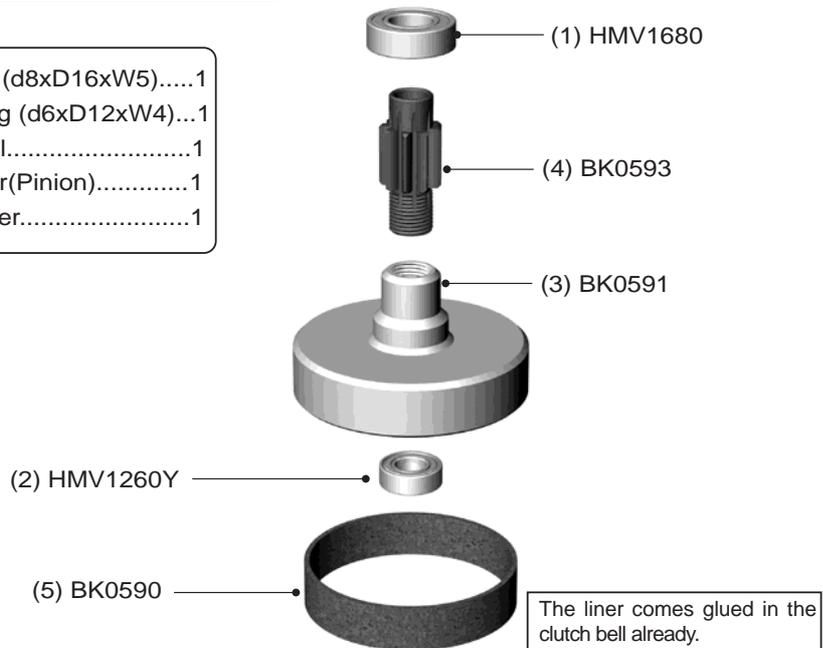
Note: After assembly, check to make sure the Fuel Tank clunk can move from top to bottom without touching the back of tank. Also, a fuel filter (available from any hobby shop, TTR1164) should be placed between the fuel tank and the carburetor.



- (1) BK0605 Fuel Tank 1
- (2) BK0062 Fuel Tank Grommet..... 1
- (3) BK0463 Fuel Tank Nipple 1
- (4) BE1867 Clunk..... 1
- (5) CB0363-1 Silicone Fuel Tube..... 1
- (6) BB0362-2 Silicone Fuel Tube..... 2

② Clutch Bell Assembly

- (1) HMV1680 Bearing (d8xD16xW5)..... 1
- (2) HMV1260Y Bearing (d6xD12xW4)... 1
- (3) BK0591 Clutch Bell..... 1
- (4) BK0593 Drive Gear(Pinion)... 1
- (5) BK0590 Clutch Liner..... 1

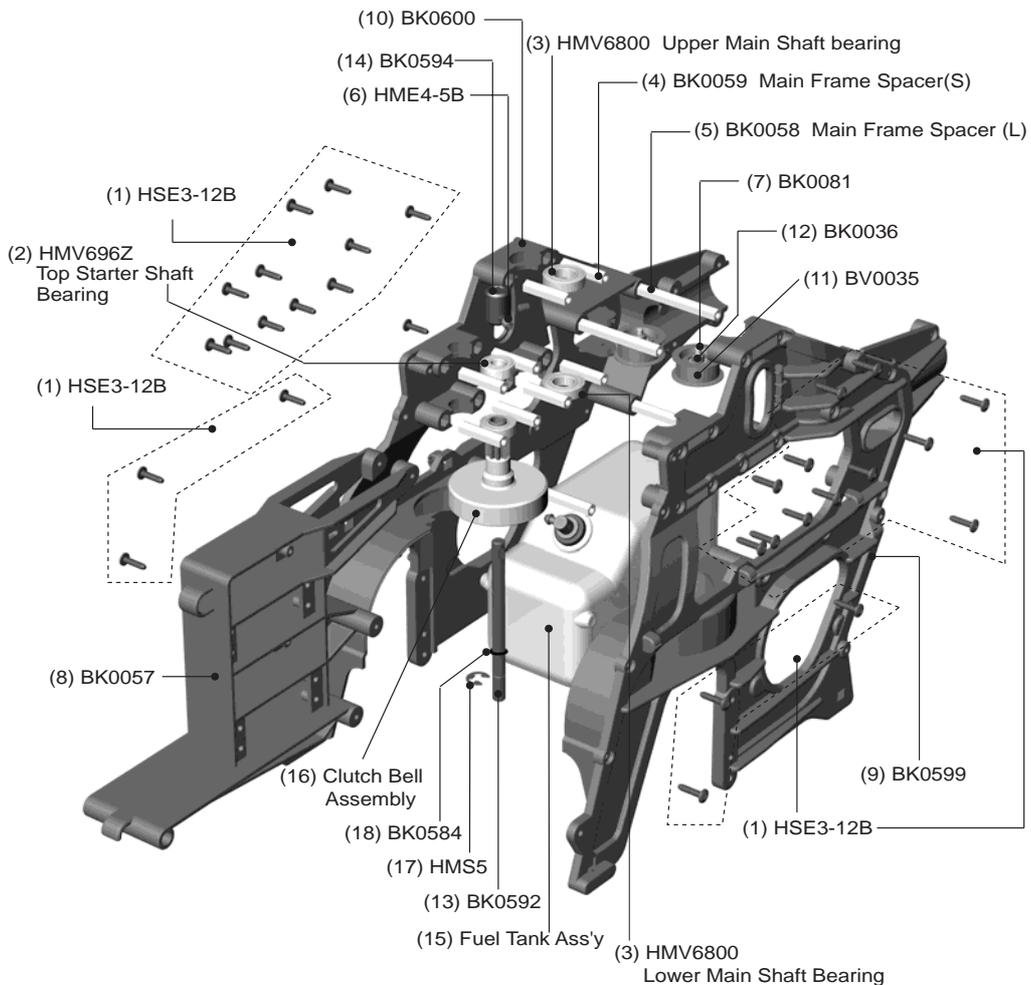


③ Main Frame Assembly-Part1

Please insert the frame spacers, bearings, pulley and parts in the frames according the drawing below. Tighten the screws snugly, but do not over torque them which could strip the plastic.

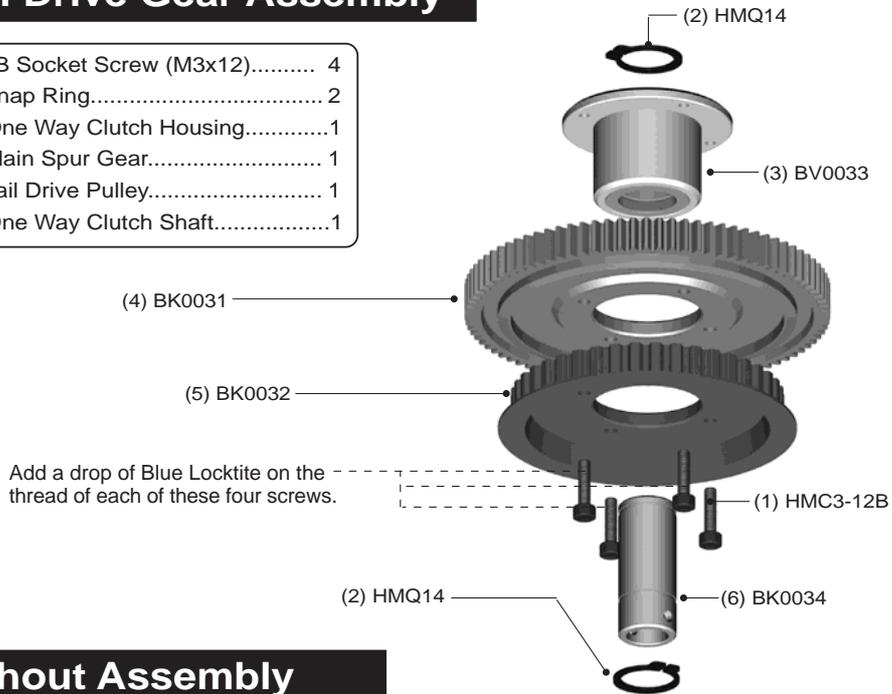
Insert starter shaft through the center of the clutch bell assembly, through the top starter shaft bearing and into the starter coupling. Secure with the two set screws. Make sure this is tightly secured.

(1) HSE3-12B Self Tapping Screw (M3x12)..	30	(10) BK0600 Main Frame Right Side.....	1
(2) HMV696Z Bearing (d6xD15xW5).....	1	(11) BV0035 Guide Pulley.....	2
(3) HMV6800 Bearing (d10xD19xW5).....	2	(12) BK0036 Pulley Collar.....	4
(4) BK0059 Frame Spacer (S).....	8	(13) BK0592 Starter Shaft.....	1
(5) BK0058 Frame Spacer (L).....	4	(14) BK0594 Starter Coupling.....	1
(6) HME4-5B Set Screw (M4x5).....	2	(15) Fuel Tank Assembly	
(7) BK0081 Pin.....	2	(16) Clutch Assembly	
(8) BK0057 Servo Frame.....	1	(17) HMS5 E-CLIP.....	1
(9) BK0599 Main Frame Left Side.....	1	(18) BK0584 Thrust Washer.....	1



④ Main Drive Gear Assembly

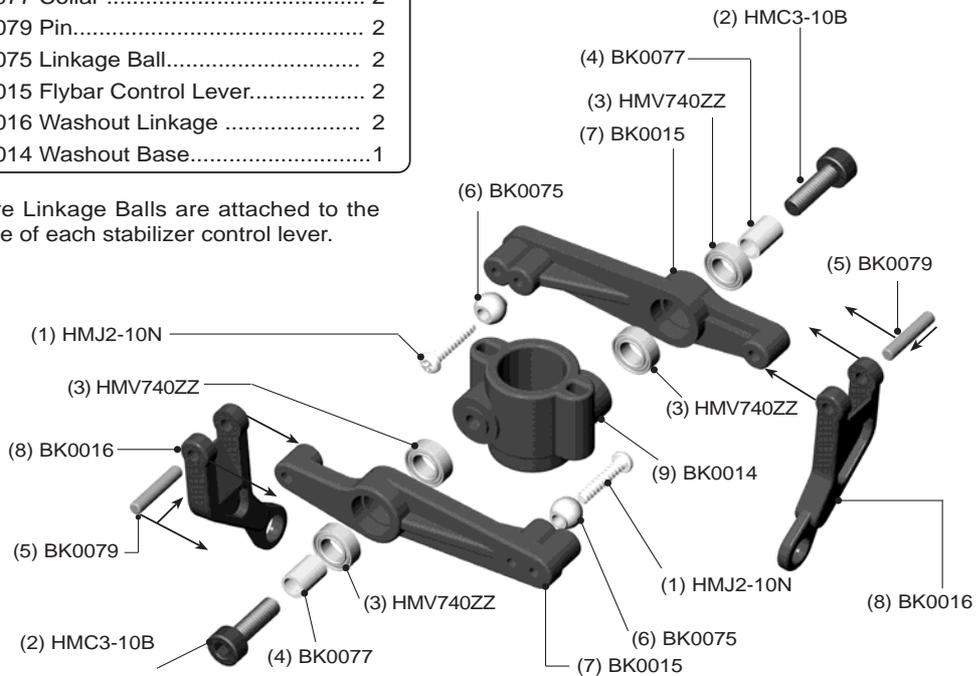
- (1) HMC3-12B Socket Screw (M3x12)..... 4
- (2) HMQ14 Snap Ring..... 2
- (3) BV0033 One Way Clutch Housing.....1
- (4) BK0031 Main Spur Gear..... 1
- (5) BK0032 Tail Drive Pulley..... 1
- (6) BK0034 One Way Clutch Shaft.....1



⑤ Washout Assembly

- (1) HMJ2-10N Self Tapping Screw(M2x10).. 2
- (2) HMC3-10B Socket Screw (M3x10)..... 2
- ※(3) HMV740ZZ Bearing (d4xD7xW2.5)..... 4
- (4) BK0077 Collar 2
- (5) BK0079 Pin..... 2
- (6) BK0075 Linkage Ball..... 2
- (7) BK0015 Flybar Control Lever..... 2
- (8) BK0016 Washout Linkage 2
- (9) BK0014 Washout Base.....1

Make sure Linkage Balls are attached to the inside hole of each stabilizer control lever.



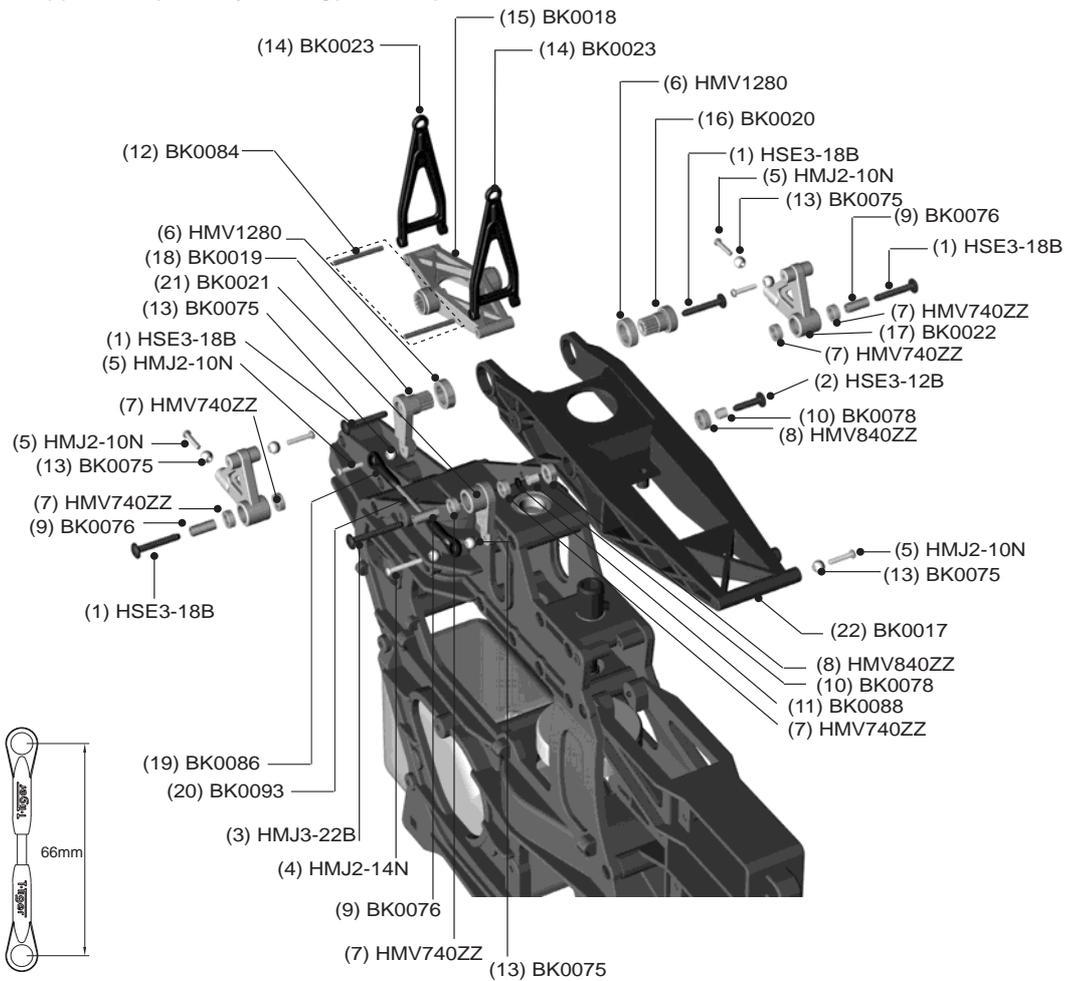
※ For sport kit (29BB) version, (3) will be replaced by Bushing(BK0107x4)

⑥ Main Frame Assembly-Part2

Add a drop of CA to the two screws at the pivoting point of the collective pitch control arm.
Attach the linkage rod to the parallel elevator linkage balls.

(1) HSE3-18B Self Tapping Screw(M3x18)....4	(12) BK0084 Pin 2
(2) HSE3-12B Self Tapping Screw(M3x12)... 1	(13) BK0075 Linkage Ball.....8
(3) HMJ3-22B Self Tapping Screw(M3x22)....1	(14) BK0023 Elevator Control Arm Link..... 2
(4) HMJ2-14N Self Tapping Screw(M2x14)... 1	(15) BK0018 Elevator Control Arm..... 1
(5) HMJ2-10N Self Tapping Screw(M2x10)... 6	(16) BK0020 Elevator Arm Control Shaft..... 1
(6) HMV1280 Bearing (d8xD12xW3.5)..... 2	(17) BK0022 Aileron Control Lever..... 2
* (7) HMV740ZZ Bearing (d4xD7xW2.5)..... 6	(18) BK0019 Elevator Arm Parallel Lever..... 1
* (8) HMV840ZZ Bearing (d4xD8xW3)..... 2	(19) BK0086 Ball Link.....2
(9) BK0076 Collar..... 3	(20) BK0093 Linkage Rod 1
(10) BK0078 Collar 2	(21) BK0021 Elevator Control Lever..... 1
(11) BK0088 Flat Washer 1	(22) BK0017 Collective Pitch Control Arm..... 1

※ For sport kit (29BB) version,
(7) will be replaced by Bushing(BK0107x6)
(8) will be replaced by Bushing(BK0108x2)

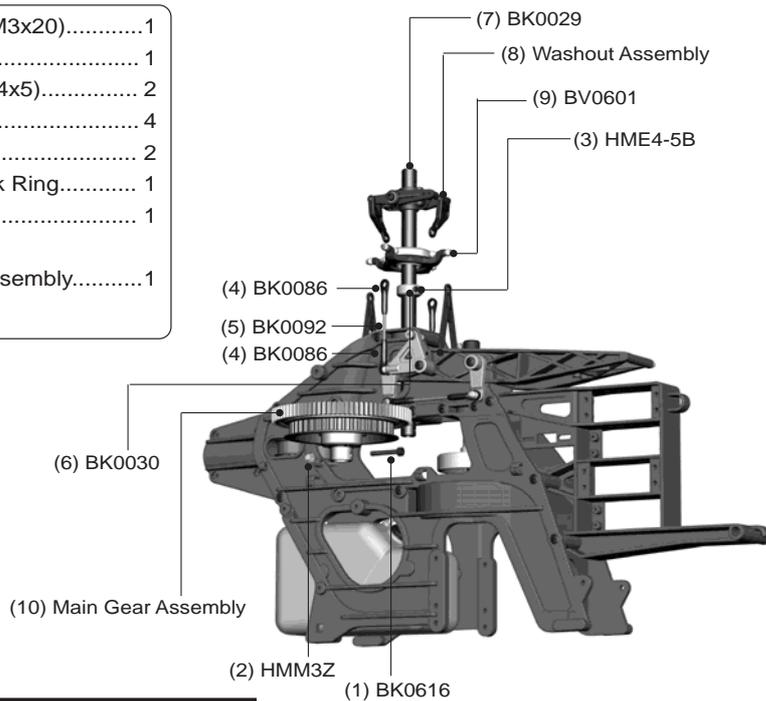
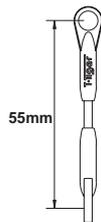


Warning, do not over-torque the self-tapping screws.

⑦ Main Frame Assembly-Part3

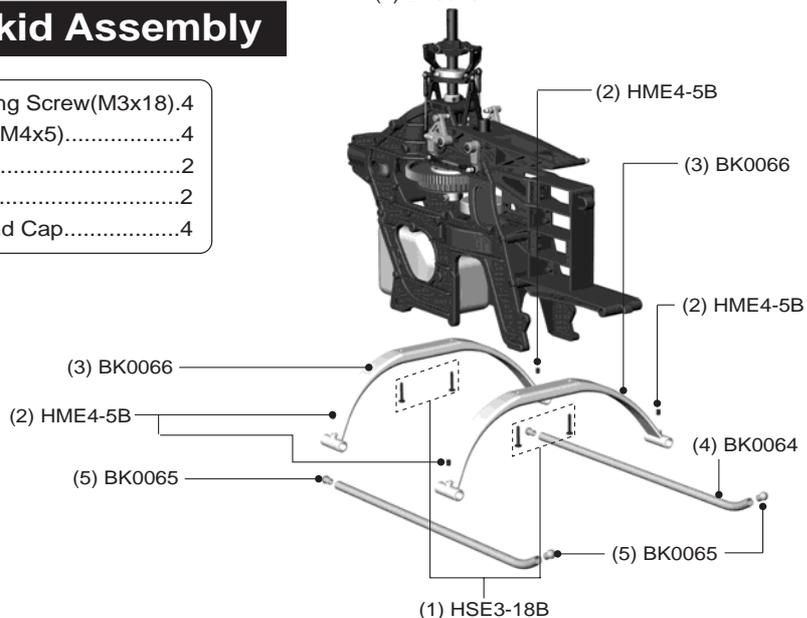
Insert Main Shaft through the shaft bearings making sure that the end with the holes closest to the end is pointed down. Next, slide main gear assembly into position on the shaft and line up the holes in the main shaft with the holes in one way clutch shaft of the main gear assembly. Insert the socket head screw and secure with the lock nut. Next, slide on the mainshaft lock ring on top of the main shaft bearing and secure with the two set screws. Then slide on the swash plate assembly and attach the elevator and aileron control linkages to the outside swash plate linkage balls. Next, slide on washout assembly and attach washout linkage to the inner linkage balls of the swash plate.

- (1) BK0616 Socket Screw(M3x20).....1
- (2) HMM3Z Lock Nut (M3)..... 1
- (3) HME4-5B Set Screw (M4x5)..... 2
- (4) BK0086 Ball Link 4
- (5) BK0092 Linkage Rod 2
- (6) BK0030 Main Shaft Lock Ring..... 1
- (7) BK0029 Main Shaft 1
- (8) Wash Out Assembly
- (9) BV0601 Swash Plate Assembly.....1
- (10) Main Gear Assembly



⑧ Landing Skid Assembly

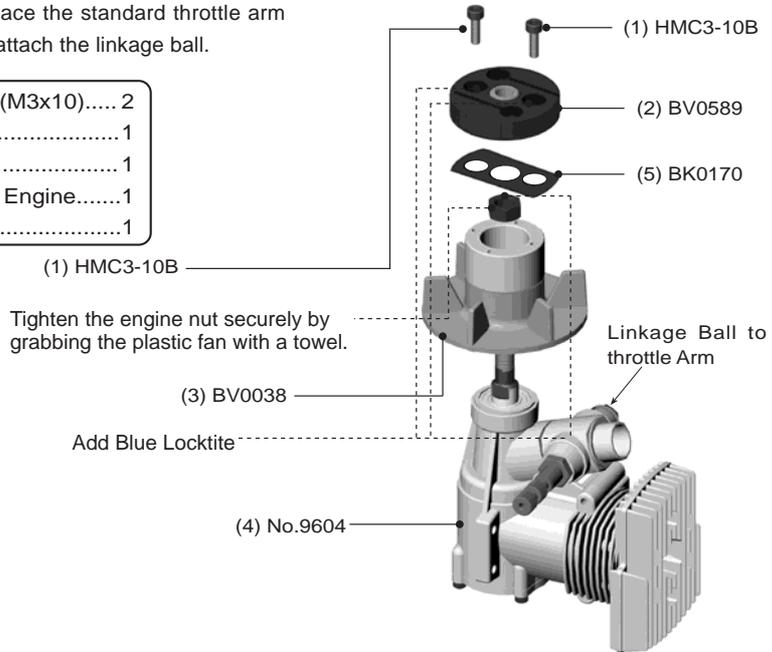
- (1) HSE3-18B Self Tapping Screw(M3x18).4
- (2) HME4-5B Set Screw(M4x5).....4
- (3) BK0066 Skid Brace.....2
- (4) BK0064 Skid Pipe.....2
- (5) BK0065 Skid Pipe End Cap.....4



⑨ Engine Assembly

Note: A piston lock purchased from your dealer will make this a much easier task. You must replace the standard throttle arm w/the extended throttle arm and attach the linkage ball.

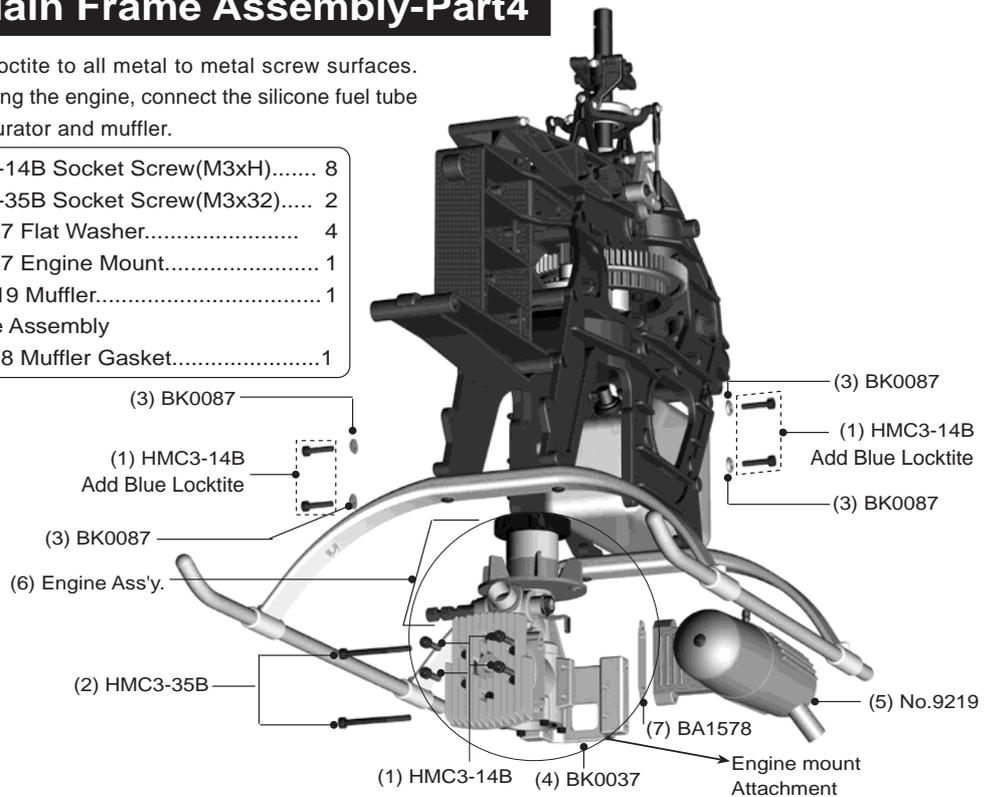
- | | |
|---------------------------------------|---|
| (1) HMC3-10B Socket Screw(M3x10)..... | 2 |
| (2) BV0589 Clutch Shoe..... | 1 |
| (3) BV0038 Cooling Fan..... | 1 |
| (4) No.9604 TT PRO-39H(R) Engine..... | 1 |
| (5) BK0170 Shim..... | 1 |



⑩ Main Frame Assembly-Part4

Add blue Loctite to all metal to metal screw surfaces. After installing the engine, connect the silicone fuel tube to the carburator and muffler.

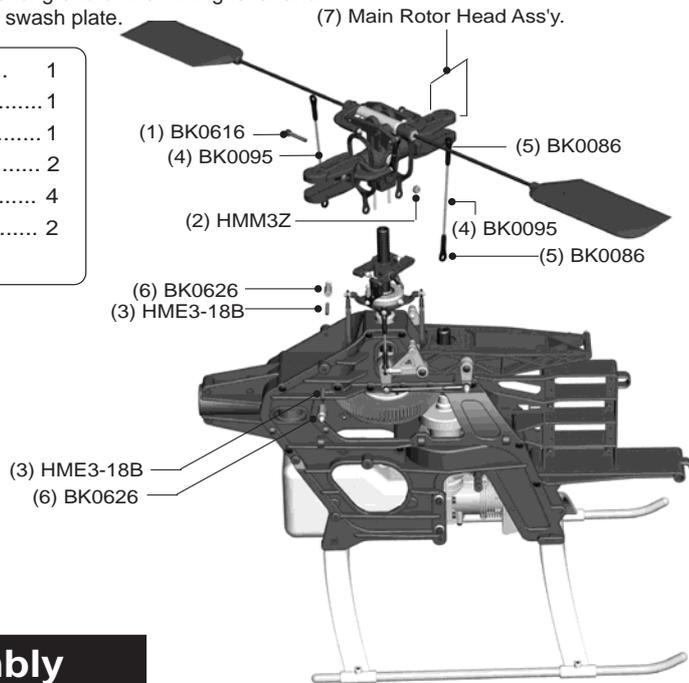
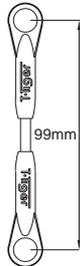
- | | |
|---------------------------------------|---|
| (1) HMC3-14B Socket Screw(M3xH)..... | 8 |
| (2) HMC3-35B Socket Screw(M3x32)..... | 2 |
| (3) BK0087 Flat Washer..... | 4 |
| (4) BK0037 Engine Mount..... | 1 |
| (5) No.9219 Muffler..... | 1 |
| (6) Engine Assembly | |
| (7) BA1578 Muffler Gasket..... | 1 |



12 Main Frame Assembly-Part5

Slide the main Rotor assembly over the main shaft and align the two pins to slide in the washout assembly. Make sure the holes in the main shaft line up with the holes in the main rotor head. Insert the socket screw and secure with locknut. Attach the ball linkage rods to the long end of the mixing lever and to the remaining inside linkage balls of the swash plate.

- | | |
|---------------------------------------|---|
| (1) BK0616 Socket Screw(M3x20)..... | 1 |
| (2) HMM3Z Lock Nut(M3)..... | 1 |
| (3) HME3-18B Set Screw(M3x18)..... | 1 |
| (4) BK0095 Linkage Rod..... | 2 |
| (5) BK0086 Ball Link..... | 4 |
| (6) BK0626 Canopy Retaining Post..... | 2 |
| (7) Main Rotor Head Assembly | |

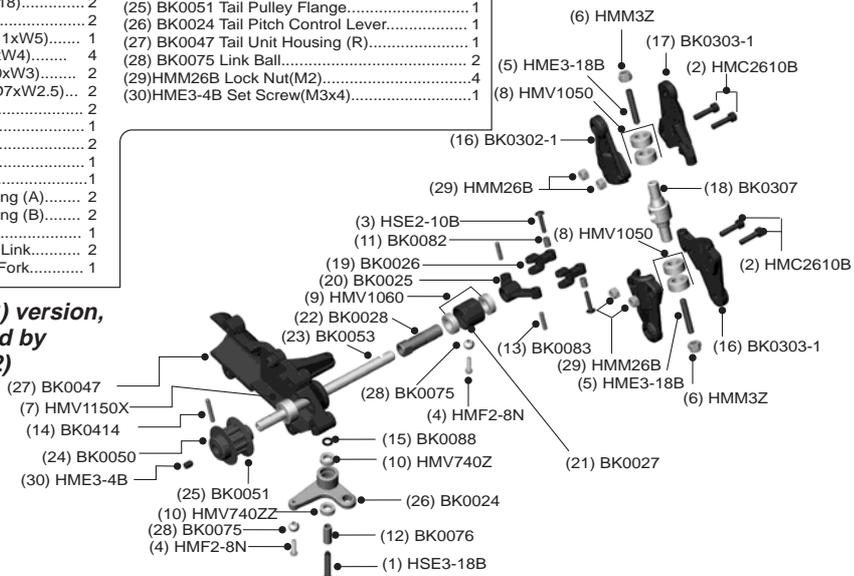


13 Tail Unit Assembly

Assembly Tip: Work from left to right when assembling the parts. The tail pitch control lever screws into the arm extending from the tail unit housing.

- | | |
|--|--|
| (1) HSE3-18B Self Tapping Screw(M3x18).....1 | (21) BK0027 Tail Pitch Control Slider.....1 |
| (2) HMC2610B Self Tapping Screw(M2x10) 4 | (22) BK0028 Tail Pitch Control Slide Bushing.....1 |
| (3) HSE2-10B Self Tapping Screw(M2x10).....2 | (23) BK0053 Tail Rotor Shaft.....1 |
| (4) HMF2-8N Screw(M2x8).....2 | (24) BK0050 Tail Pulley.....1 |
| (5) HME3-18B Set Screw(M3x18).....2 | (25) BK0051 Tail Pulley Flange.....1 |
| (6) HMM3Z Lock Nut(M3).....2 | (26) BK0024 Tail Pitch Control Lever.....1 |
| (7) HMV1150X Bearing (d5xD11xW5).....1 | (27) BK0047 Tail Unit Housing (R).....1 |
| (8) HMV1050 Bearing (d3xD8xW4).....4 | (28) BK0075 Link Ball.....2 |
| (9) HMV1060 Bearing (d6xD10xW3).....2 | (29)HMM26B Lock Nut(M2).....4 |
| ※(10) HMV740ZZ Bearing (d4xD7xW2.5).....2 | (30)HME3-4B Set Screw(M3x4).....1 |
| (11) BK0082 Collar(2x3x4).....2 | |
| (12) BK0076 Collar(3x4x10).....1 | |
| (13) BK0083 Pin(2x9).....2 | |
| (14) BK0414 Pin(2x12).....1 | |
| (15) BK0088 Flat Washer.....1 | |
| (16) BK0302-1 Tail Pitch Housing (A).....2 | |
| (17) BK0303-1 Tail Pitch Housing (B).....2 | |
| (18) BK0307 Tail Rotor Hub.....1 | |
| (19) BK0026 Tail Pitch Control Link.....2 | |
| (20) BK0025 Tail Pitch Control Fork.....1 | |

※For sport kit (29BB) version,
(10) will be replaced by
Bushings(BK0107x2)



16 Servo Installation-Part1

Assembly Tip: Remove all the servo wheels prior to attaching the steel linkage balls. Make sure all linkages are the correct length.

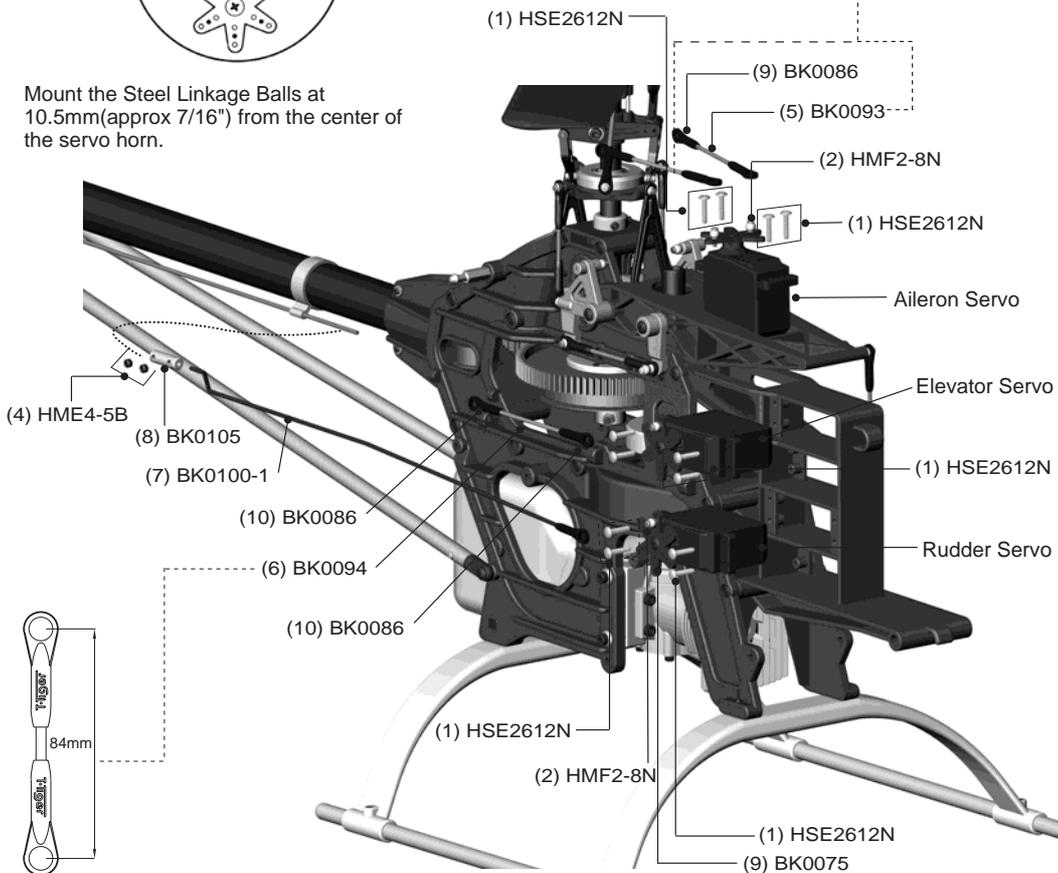
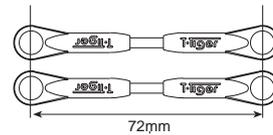
- | | |
|--|----|
| (1) HSE2612N Self Tapping Screw(M2.6x12).... | 12 |
| (2) HMF2-8N Screw(M2x8)..... | 4 |
| (3) HML2 Hex Nut(M2)..... | 4 |
| (4) HME4-5B Set Screw(M4x5)..... | 2 |
| (5) BK0093 Linkage Rod..... | 2 |
| (6) BK0094 Linkage Rod..... | 1 |
| (7) BK0100-1 Linkage Rod..... | 1 |
| (8) BK0105 Tail Control Rod Joint..... | 1 |
| (9) BK0075 Linkage Ball..... | 4 |
| (10) BK0086 Ball Link..... | 7 |



Before installing Aileron Servo, tape the wire as shown.



Mount the Steel Linkage Balls at 10.5mm(approx 7/16") from the center of the servo horn.

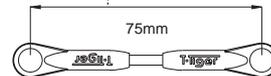
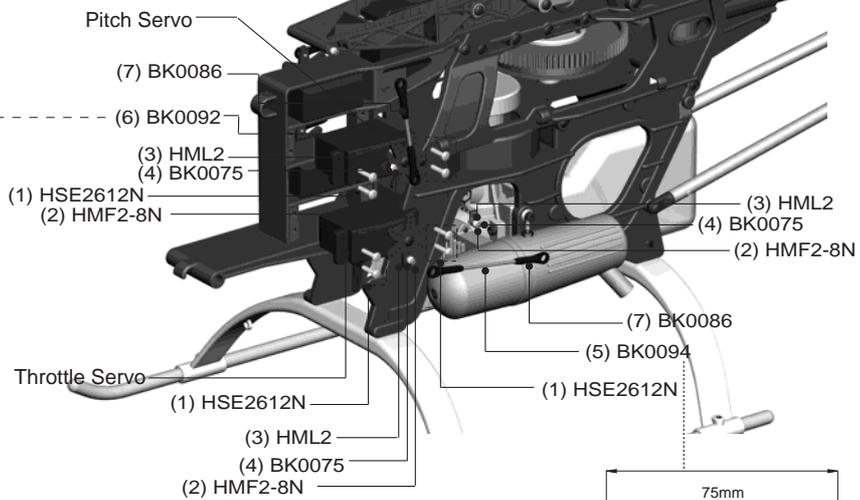
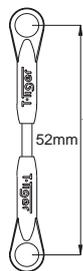
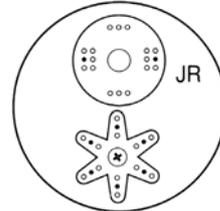


17 Servo Installation-Part2

Assembly Tip: Remove all the servo wheels prior to attaching the steel linkage balls. Make sure all linkages are the correct length.

- (1) HSE2612N Self Tapping Screw(M2.6x12).... 8
- (2) HMF2-8N Screw(M2x8)..... 3
- (3) HML2 Hex Nut(M2)..... 3
- (4) BK0075 Linkage Ball..... 3
- (5) BK0094 Linkage Rod 1
- (6) BK0092 Linkage Rod 1
- (7) BK0086 Ball Link..... 4

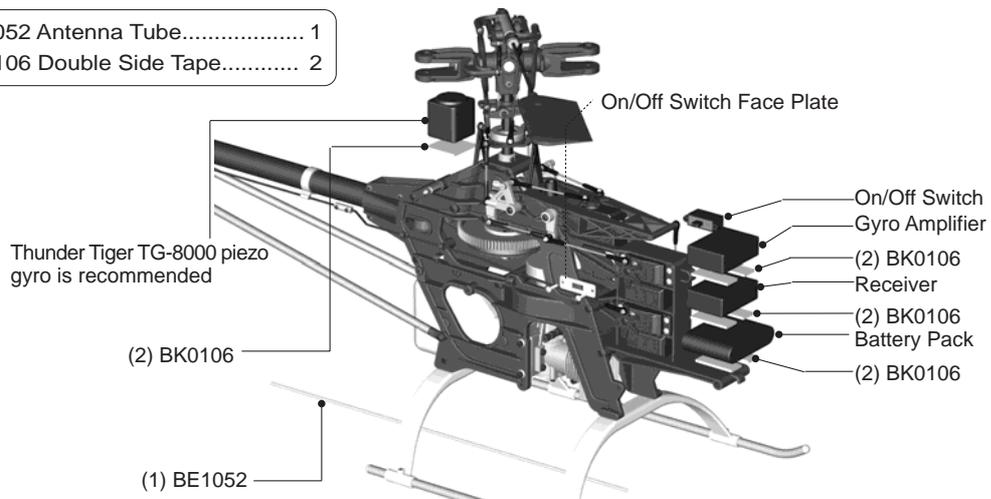
Mount the Steel Link Ball at 10.5mm(approx 7/16") from the center of the servo horn.



18 Receiver/Gyro Installation

Thunder Tiger recognizes that there are many brands of radios and gyros to choose from. You are encouraged to seek the advice of experienced helicopter pilots when making this decision. We do recommend the use of the Thunder Tiger TG-8000 piezo Gyro since it was designed expressly for this machine.

- (1) BE1052 Antenna Tube..... 1
- (2) BK0106 Double Side Tape..... 2

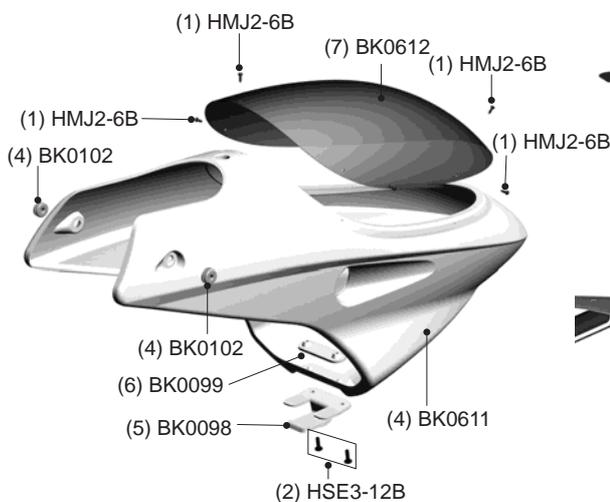


19 Body/Canopy Assembly

Cut off the bubble from the body leaving the lip all the way around. Neatness counts, so take your time. Next trim the flange from the canopy leaving a clean edge. You can lightly sand the edges to get it smooth and even. On the lip of the opening in the body, mark six points for drilling holes to secure canopy: 1-in front, 1-in rear and 2 on each side.

Using double stick tape secure canopy to body. Take a very sharp awl and make pilot holes through the canopy and body lip. Make sure all holes line up. Remove double stick tape and put in the self tapping screws. Install the body clip, decals, and rubber grommets.

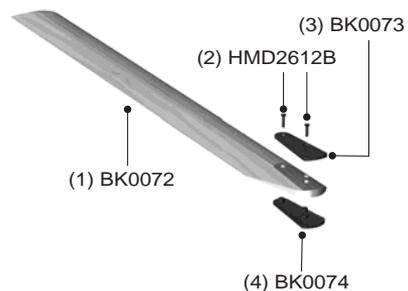
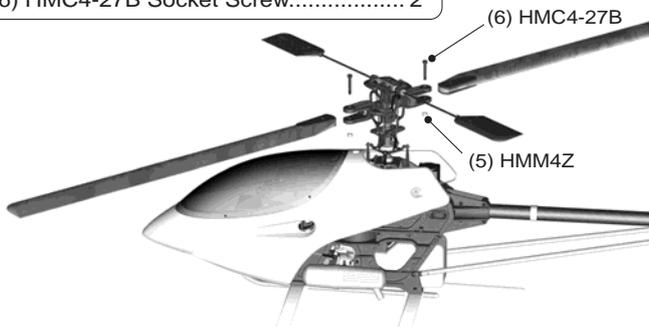
- (1) HMJ2-6B Self Tapping Screw(M2x4).. 6
- (2) HSE3-12B Self Tapping Screw(M3x12).... 2
- (3) BK0611 Body..... 1
- (4) BK0102 Rubber Grommet 2
- (5) BK0098 Body Clip-A..... 1
- (6) BK0099 Body Clip-B..... 1
- (7) BK0612 Canopy..... 1
- (8)JV0093 Decal..... 1



20 Main Rotor Assembly

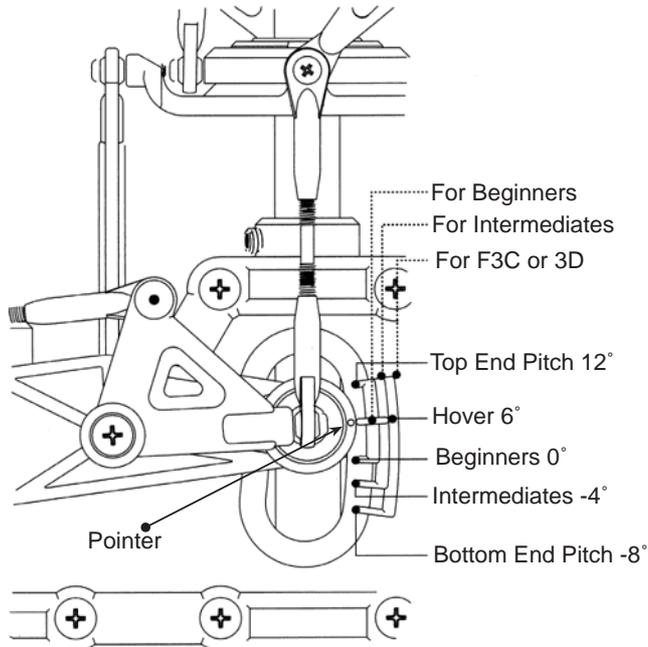
Important-While Thunder Tiger takes great care to manufacture the most balanced blades available, no two rotor blades are exactly the same. It is highly recommended that you purchase a blade balancer from your hobby dealer. Follow the manufacturers instructions for balancing the blades and install on helicopter.

- (1) BK0072 Main Rotor Blade.....2
- (2) HMD2612B Self Tapping Screw (M2.6x12)..... 2
- (3) BK0073 Upper Blade Grip... 2
- (4) BK0074 Lower Blade Grip..... 2
- (5) HMM4Z Lock Nut(M4)..... 2
- (6) HMC4-27B Socket Screw..... 2



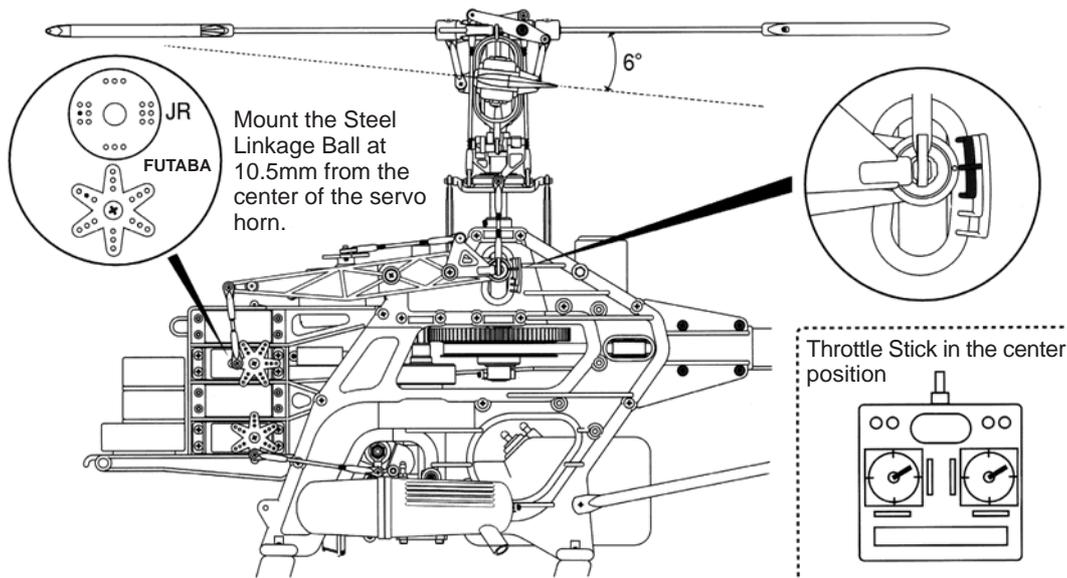
Setting up Main Rotor Blades Pitch Angle

- On the left side frame, there are three pitch scales molded onto the plastic frame. The three different scales are designed for beginner, intermediate or expert F3C and 3D pilots.
- Use the "pointer" on the collective tray and the plastic molded scales to set up the initial collective control.
- The actual blade angle in degrees can be checked using a pitch gauge (sold separately).



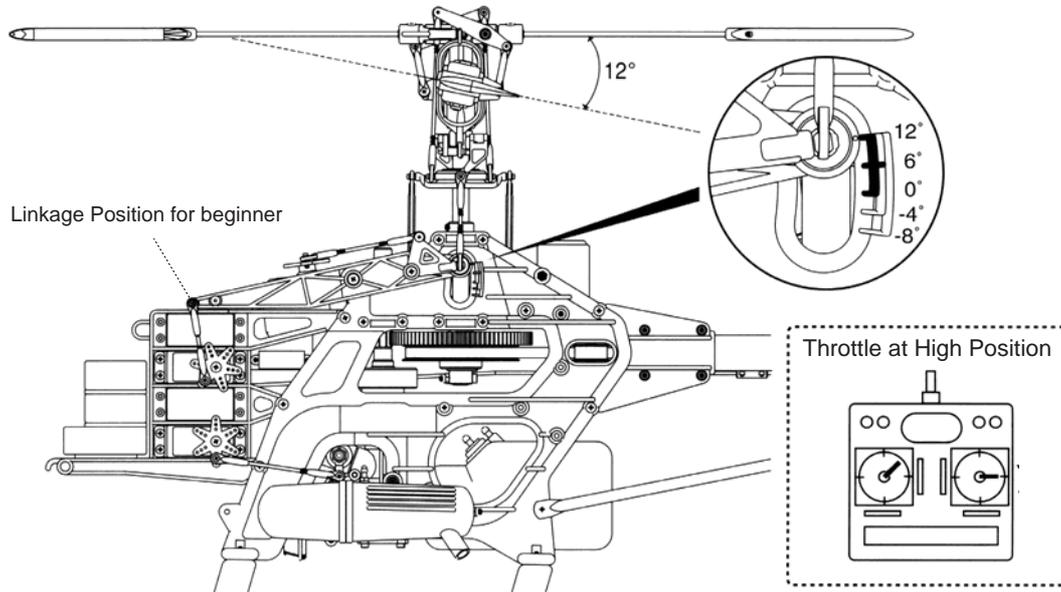
(Hint for beginners)

The hovering pitch angle should be at 6°. To get the 0° to 12° collective range, mount the steel linkage ball at 10.5mm away from the center of the collective servo horn.



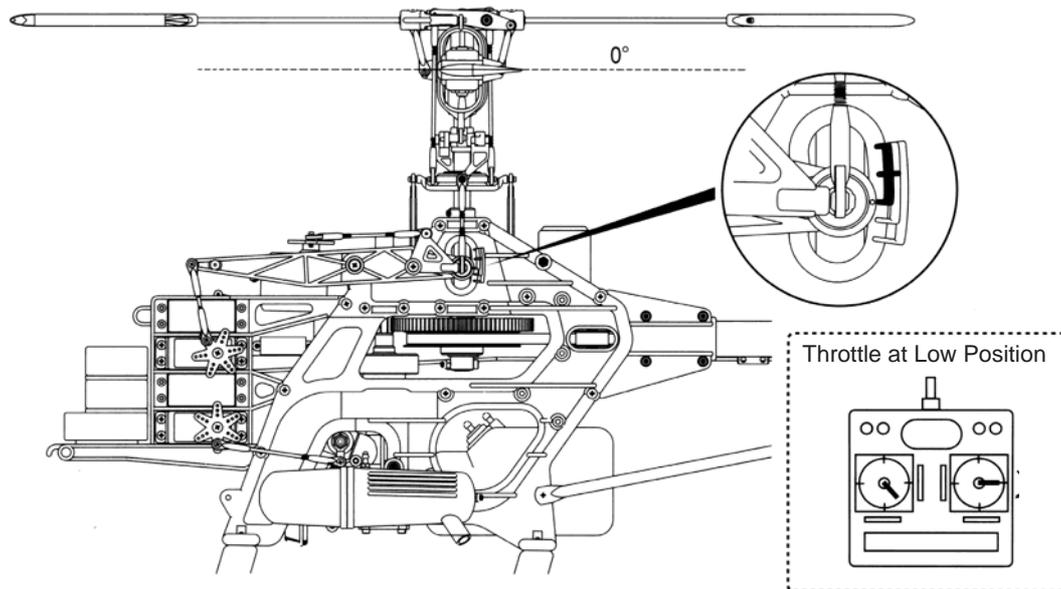
6° hovering pitch angle is used for beginners, intermediates and experts. The throttle/collective must be in the center position when adjusting the collective pushrod length to make the "point" line up with the 6° hover point on the molded scale (see above diagrams).

•High End Blade Pitch Setting



- Move the throttle/collective stick to the full throttle position(see upper right diagram). The molded "pointer" should now line up with the upper limit mark, which should provide about 12° of blade pitch.

•Low End Blade Pitch Setting

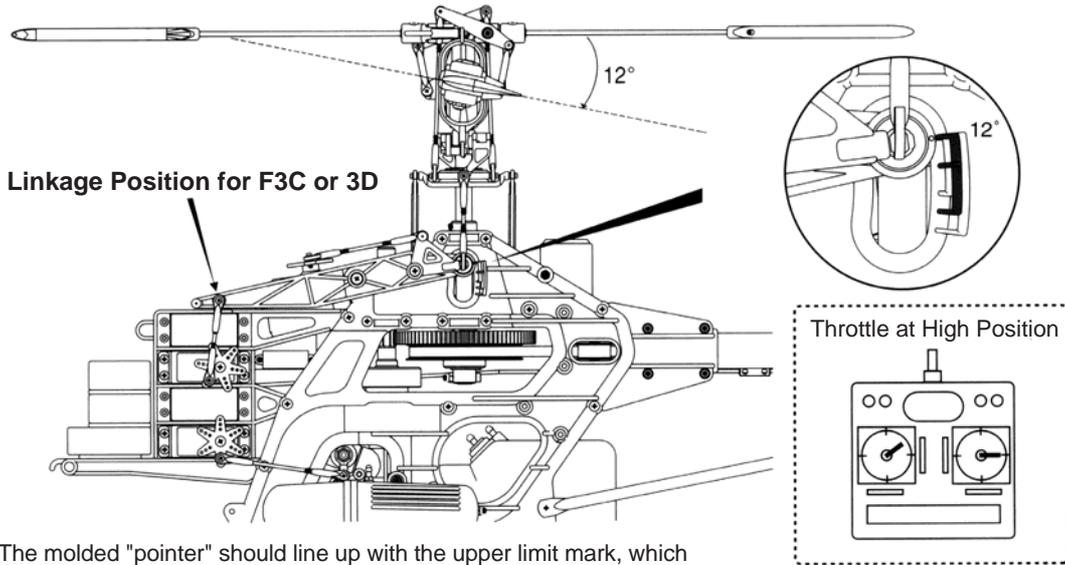


- Move the throttle/collective stick to the low stick position. Use the ATV function of your transmitter to make the "pointer" line up with the 0° mark for beginners (with the -4° mark for intermediates, and -8-degree mark for experts).

Collective Travel for F3C and 3D Flying

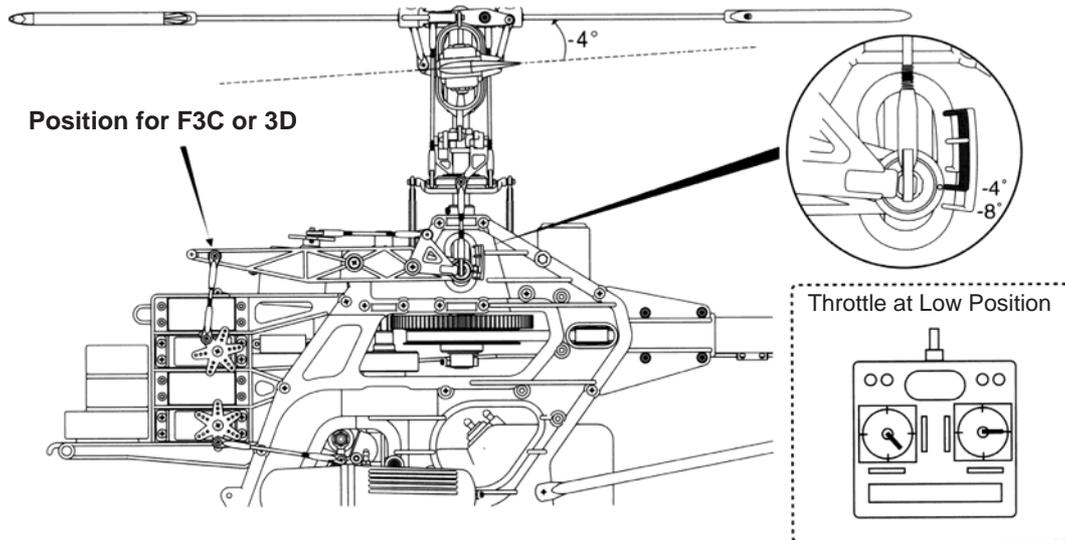
- To achieve +12° to -8° of collective travel range, the steel linkage ball must be moved to the inner location as shown in the figure.
- Use ATV function of the transmitter to get the necessary servo travel.

•High End Blade Pitch Setting



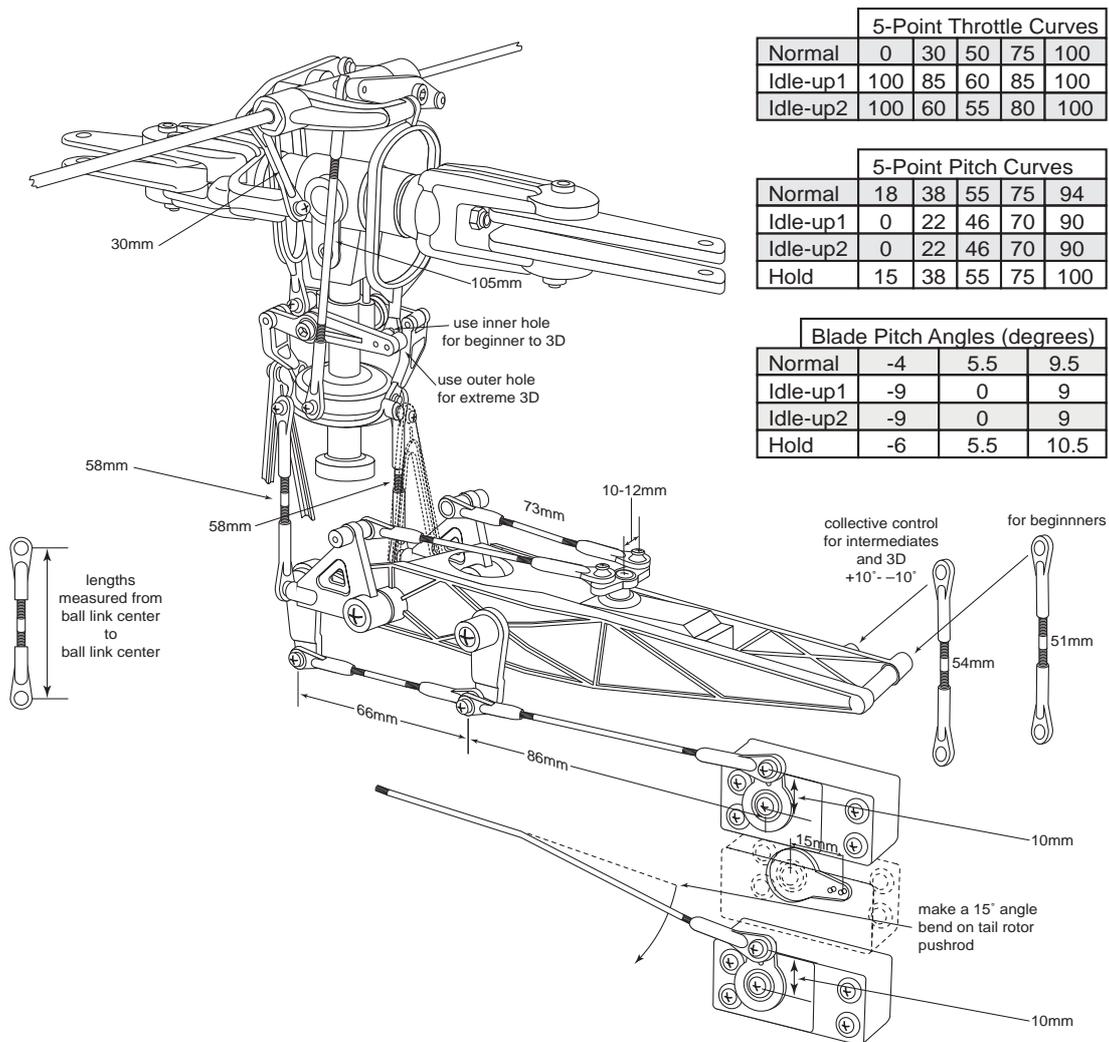
The molded "pointer" should line up with the upper limit mark, which should provide about 12° of blade pitch.

•Low End Blade Pitch Setting



For intermediates set the low end to -4°. For advanced F3C and 3D flying, set the low end to -8°.

CONFIGURING THE RAPTOR FOR 3D



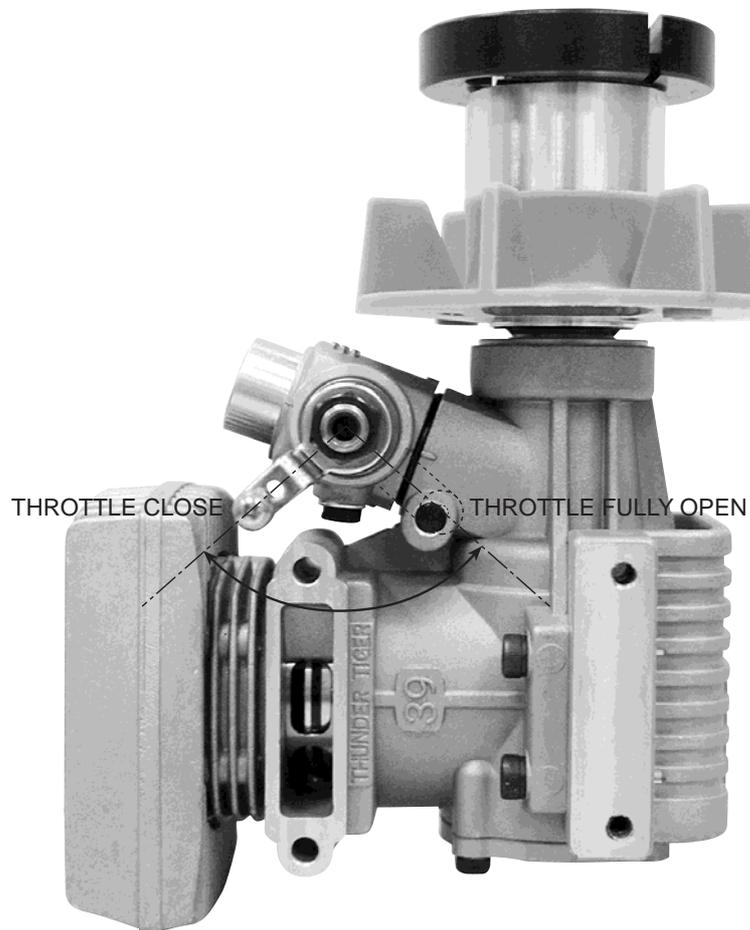
The above pushrod lengths will permit 3D with the Raptor.

Use these lengths as a starting point. Beginners can also use those pushrod lengths, but just connect the collective control to the outside point on the pitch control arm. Pushrod lengths are measured from ball link center to ball link center.

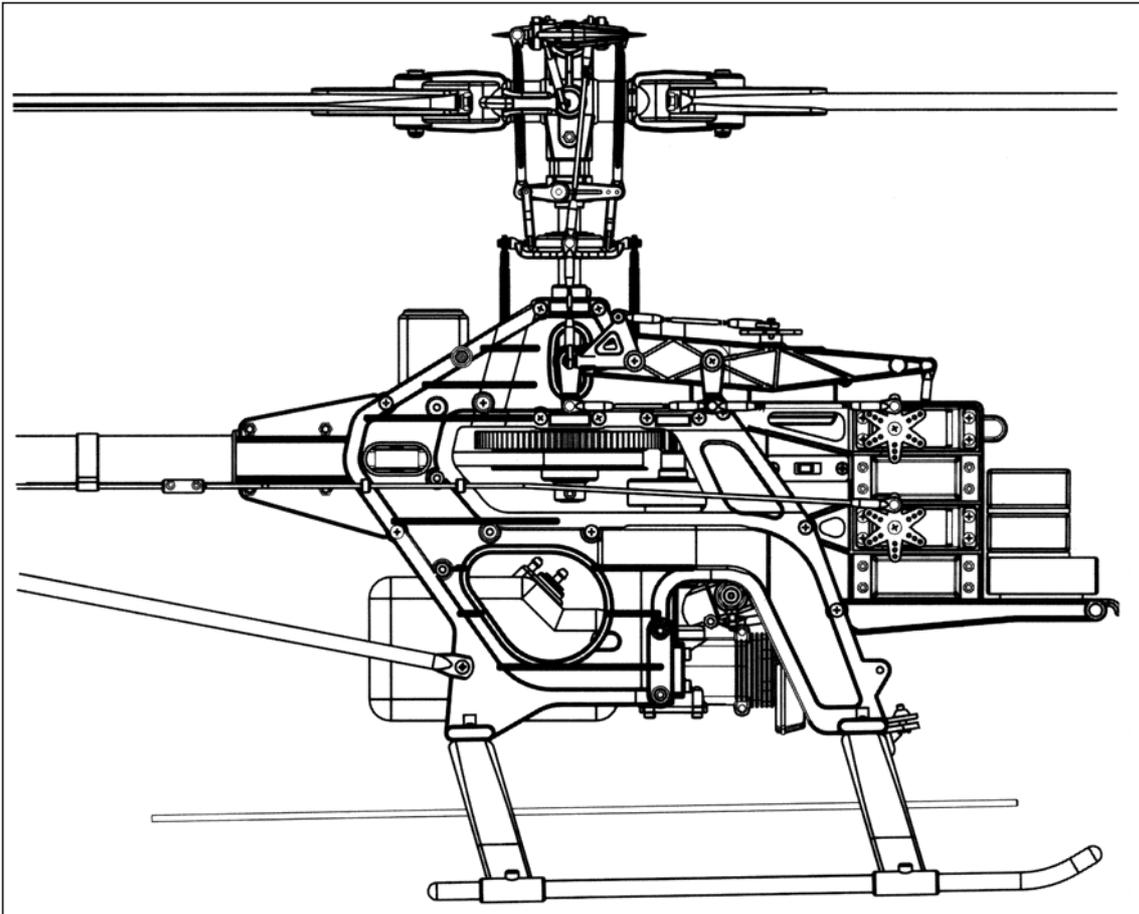
Suggested throttle and collective pitch set up: Idle-up1 is used for continuous 3-D flips and aerobatics. Idle-up2 is used for switchless inverted hover. Use a pitch gauge to check blade angles. It is easier to start setting up idle-up2 blade pitch angles first. Beginners should inhibit idle-up1, idle-up2 and throttle hold. Beginners should only use the Normal mode values. The model should hover at around 1550 rpm in Normal mode, and flies at 1800 in idle-up1. Rotorspeed can be checked using TTR2000 MTF-301 helicopter tachometer.

Engine Throttle Control Linkage

Mount the steel linkage ball to the outer hole on the metal throttle arm. At full throttle stick, the carburetor hole should open completely. At low throttle and with the throttle trim all the way down, the carburetor hole should close completely. Adjust the ATV function in your transmitter to achieve the above requirement. Listen to the servo, it should not make any binding noise. Try keep the throttle ATV between 90% and 110%. If your radio does not have ATV, then adjust the location of the steel link ball on the throttle servo horn to get the correct throttle travel.

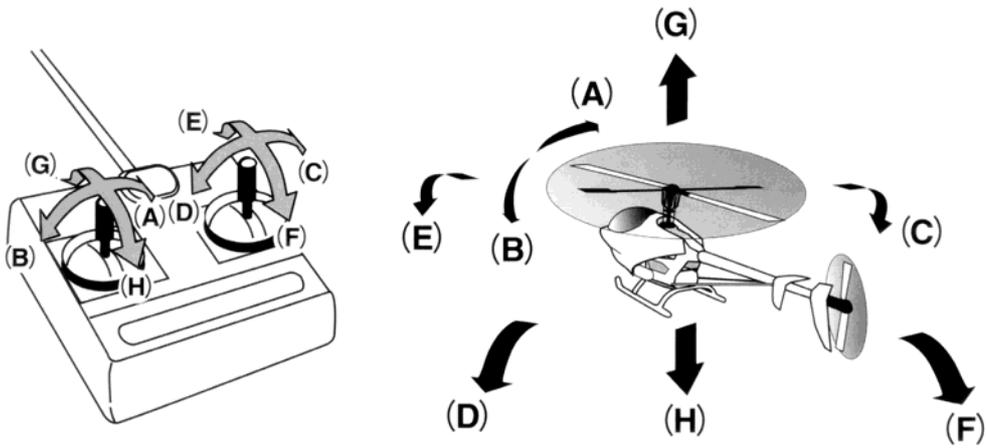


FLIGHT TRAINING SECTION

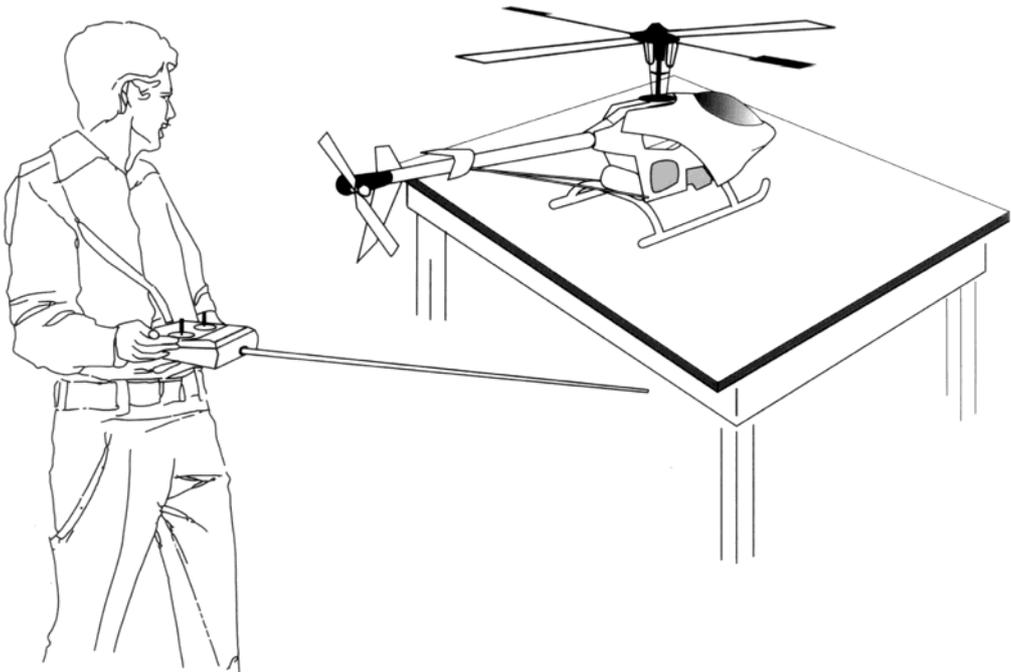


Preflight Adjustments

Relationship between the control motion and radio transmitter.

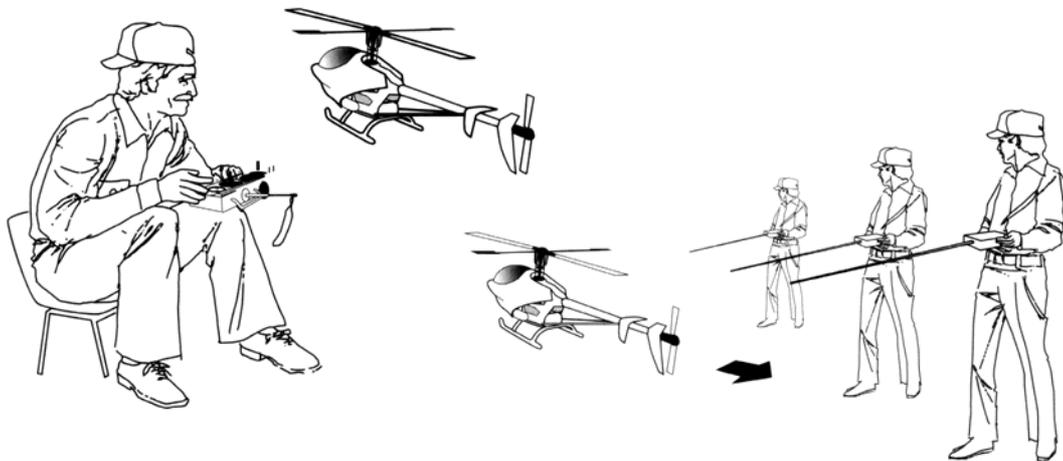


Always check all the controls to make sure they move in the correct direction and there is no mechanical binding or noise from the servos.

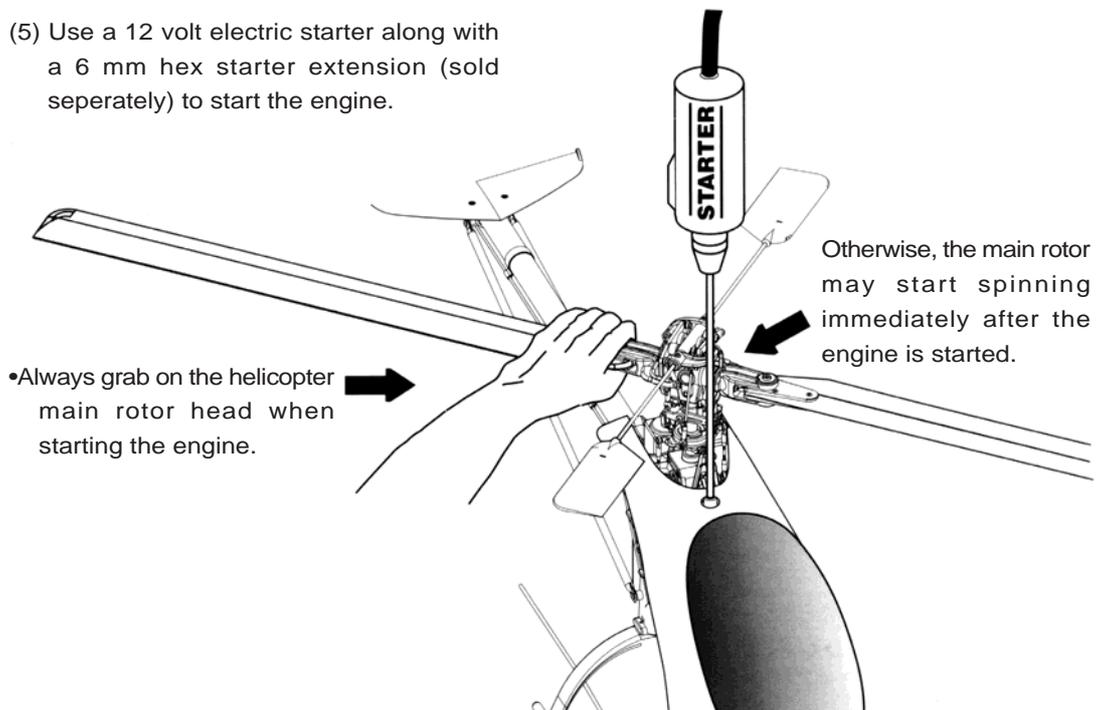


Preflight Checklist and Starting Procedure

- (1) Check to make sure there is no radio interference before operating the model helicopter.
- (2) Make sure the transmitter and receiver are on and all controls operate properly before flight. Range check the radio.
- (3) The engine carburetor must be in the idle position before starting the engine. Please read the engine instruction manual on how to properly adjust the engine. Set the carburetor main needle according to the engine instruction. Depending on the fuel and glow plug used, the carburetor idle screw may require fine adjustment of 1/4 to 1/2 turn away from the factory setting.
- (4) Fill the fuel tank, move the throttle stick to idle, and connect the glow plug battery to the glow plug.



- (5) Use a 12 volt electric starter along with a 6 mm hex starter extension (sold separately) to start the engine.



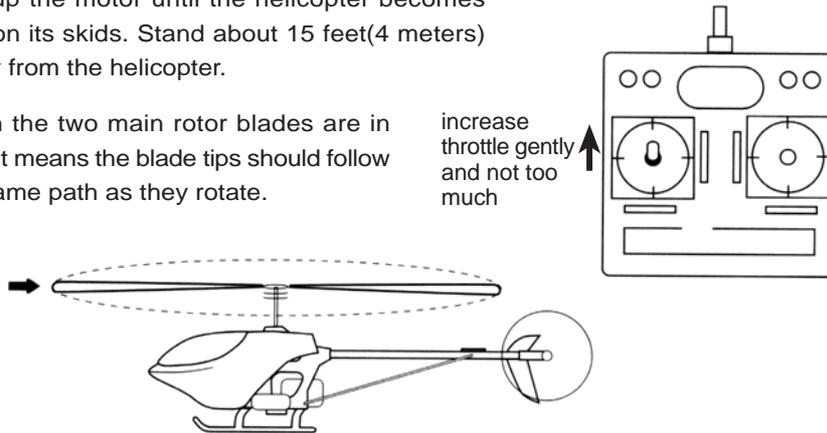
Flying Adjustments (1)

Tracking adjustment ... When the two main rotor blades are in track it means their blade tips follow the same path as they rotate.

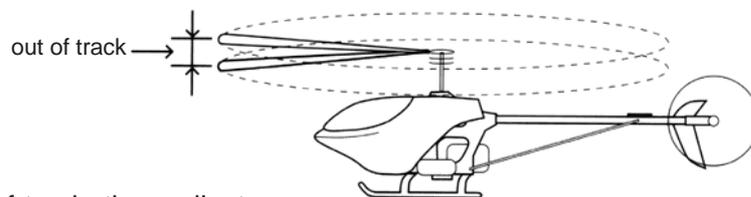
(1) Rev up the motor until the helicopter becomes light on its skids. Stand about 15 feet (4 meters) away from the helicopter.

(2) When the two main rotor blades are in track it means the blade tips should follow the same path as they rotate.

increase throttle gently and not too much

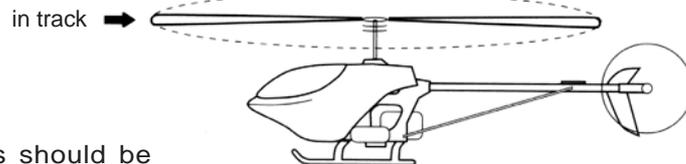


(3) When both blades are in track, the blade tips will appear to overlap as seen from the edge of the rotor plane.



If the blades are out of track, then adjust one of the pushrods that connects to the main rotor blade pitch arm.

Redo steps (1) to (3) until the blades are tracking properly.

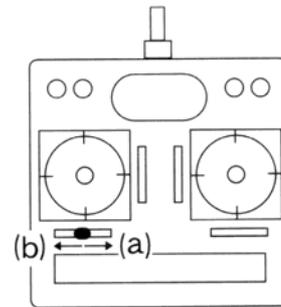
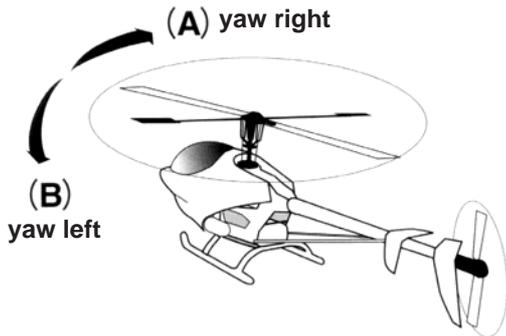


In hover, the main blades should be around 5.5 to 6 degrees in pitch.

Flying Adjustments (2)

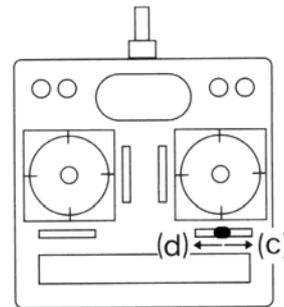
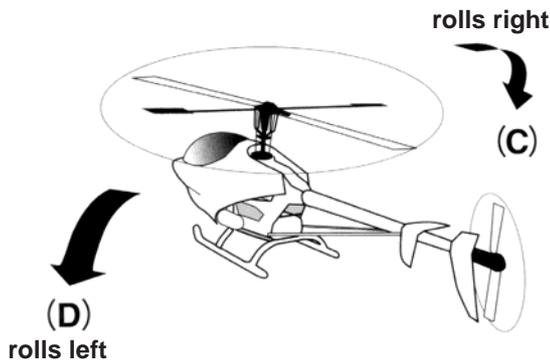
Trimming All helicopters are inherently unstable. But when a helicopter is properly trimmed, it will not drift away or yaw by itself quickly. Use the following procedure to trim your helicopter.

- (1) If the helicopter nose starts to yaw left or right, then use the transmitter trim to compensate:



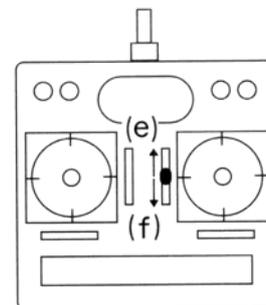
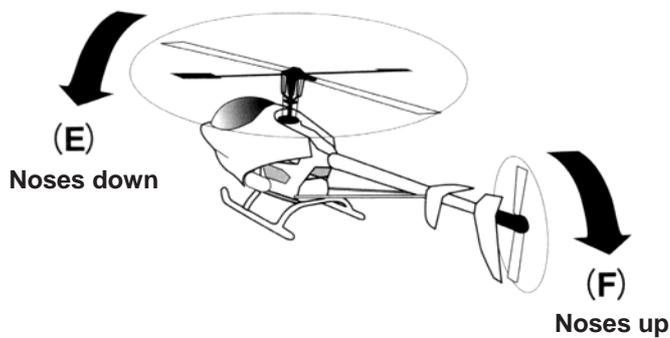
(A) situation: move to (b)
(B) situation: move to (a)

- (2) If the helicopter rolls to left or right, then:



(C) situation: move to (d)
(D) situation: move to (c)

- (3) If the helicopter noses down or up, then:

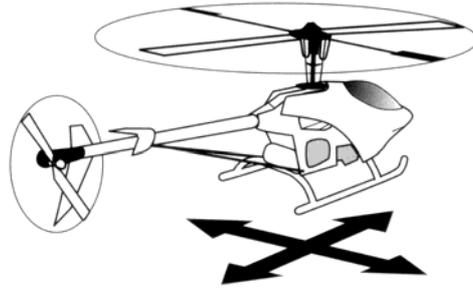


(E) situation: move to (f)
(F) situation: move to (e)

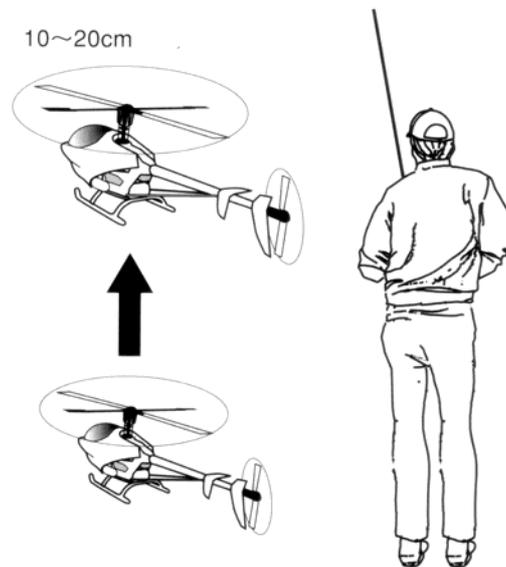
Hover Training (1)

Hovering is when the helicopter is floating in a stationary position in the air. Hovering is the fundamental maneuver to learn first. Here is the procedure to practice hovering:

- (1) Make sure there are no spectators anywhere near the model helicopter. You, the pilot, should stand at least 10 meters (30 feet) behind and slightly to the side of the model helicopter.



- (2) Prior to lifting off, while the main rotor is spinning and the helicopter is on the ground, check the main rotor fore/aft and left/right cyclic to make sure the main rotor is tilting in the correct direction according to your cyclic command. Move the tail rotor control stick to make sure the helicopter nose will swing in the desired direction.

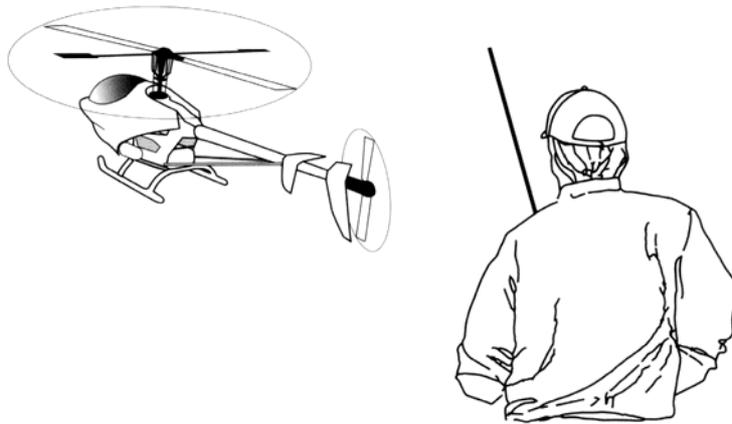


- (3) Increase the throttle/collective to lift the model helicopter skids off the ground to no more than 10 cm (4 inches). Initially, it will be very difficult to control the model to prevent it from moving. For a beginner it will also be difficult to determine whether the helicopter is in trim or not. But with repeated practice close to the ground you will develop a feel for the controls. It is recommended to let a more experienced model helicopter pilot trim out your new model before you attempt to learn to hover.

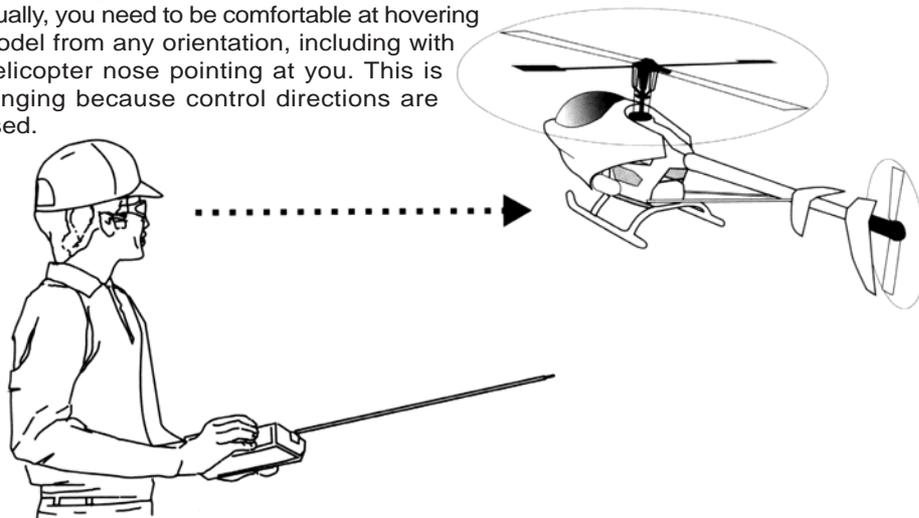
Hover Training (2)

- (1) It will take a few hours of hover practice with the helicopter skids at 10 to 20 cm (4-8 inches) off the ground in order to comfortably control the model.

Do not try to lift the model to more than 10 to 20 cm(4-8 inches) in the beginning because then the model may tip over readily when the beginner panics and an incorrect command is given. Once you can keep the model in one place, then it is time to slowly increase the height by a few centimeters (inches) each flight. Soon, you will be able to hover the helicopter confidently a few feet high. Beginners should always practice hovering close to the ground because in an emergency, throttle and collective can be reduced rapidly without causing a large drop or damage to the model. If the model is hovering beyond one meter(3 feet) altitude, always descend slowly. A panic drop can damage the helicopter.



- (2) Always stand behind the model helicopter when learning how to hover. Then you can watch the nose of the helicopter. A left tail rotor command will yaw the helicopter nose to the left, and a right command will yaw to the right. Similarly, a left cyclic command will cause the helicopter to translate left. After you can comfortably hover the model at one meter high without drifting, then start practice hovering while standing to either side of the model. Eventually, you need to be comfortable at hovering the model from any orientation, including with the helicopter nose pointing at you. This is challenging because control directions are reversed.

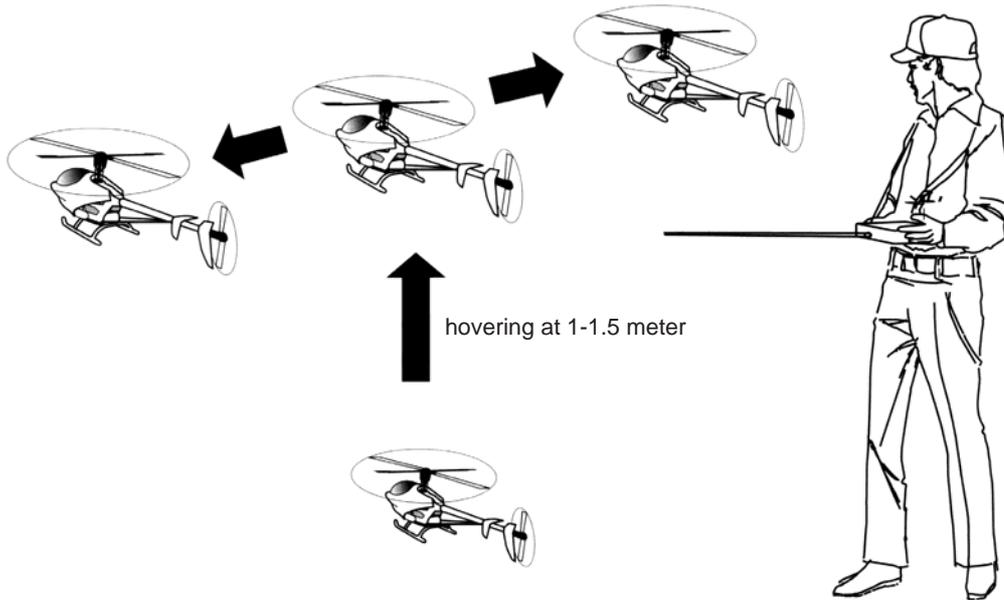


- (3) Once you can confidently hover a model helicopter at any altitude and at any orientation, then congratulate yourself because you have mastered 80% of the fundamental control movements of a helicopter.

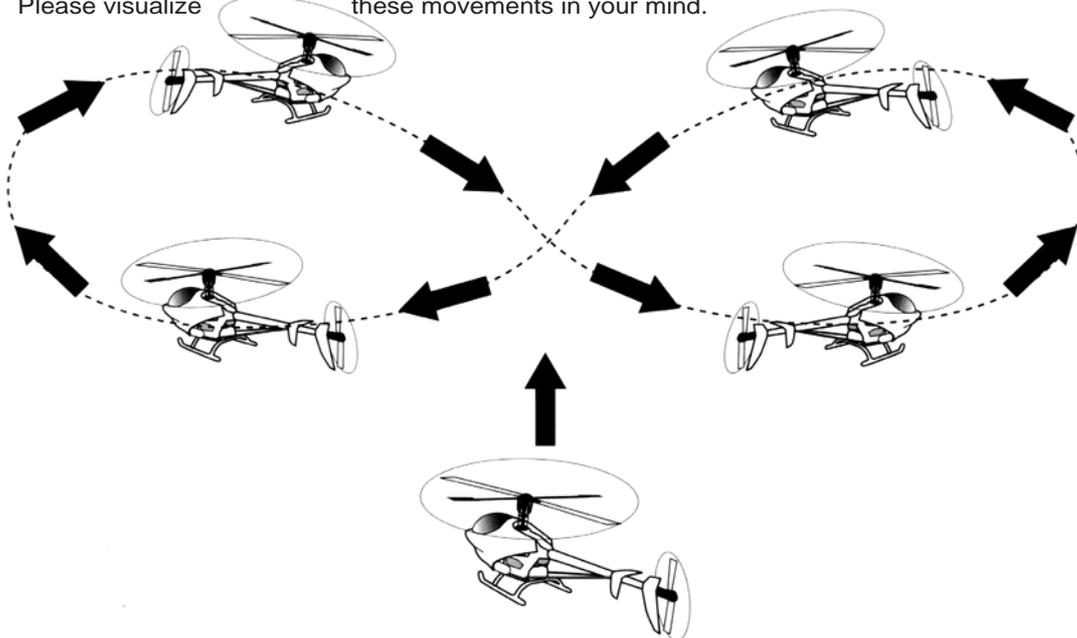
Forward Flight Training

After mastering hovering flight:

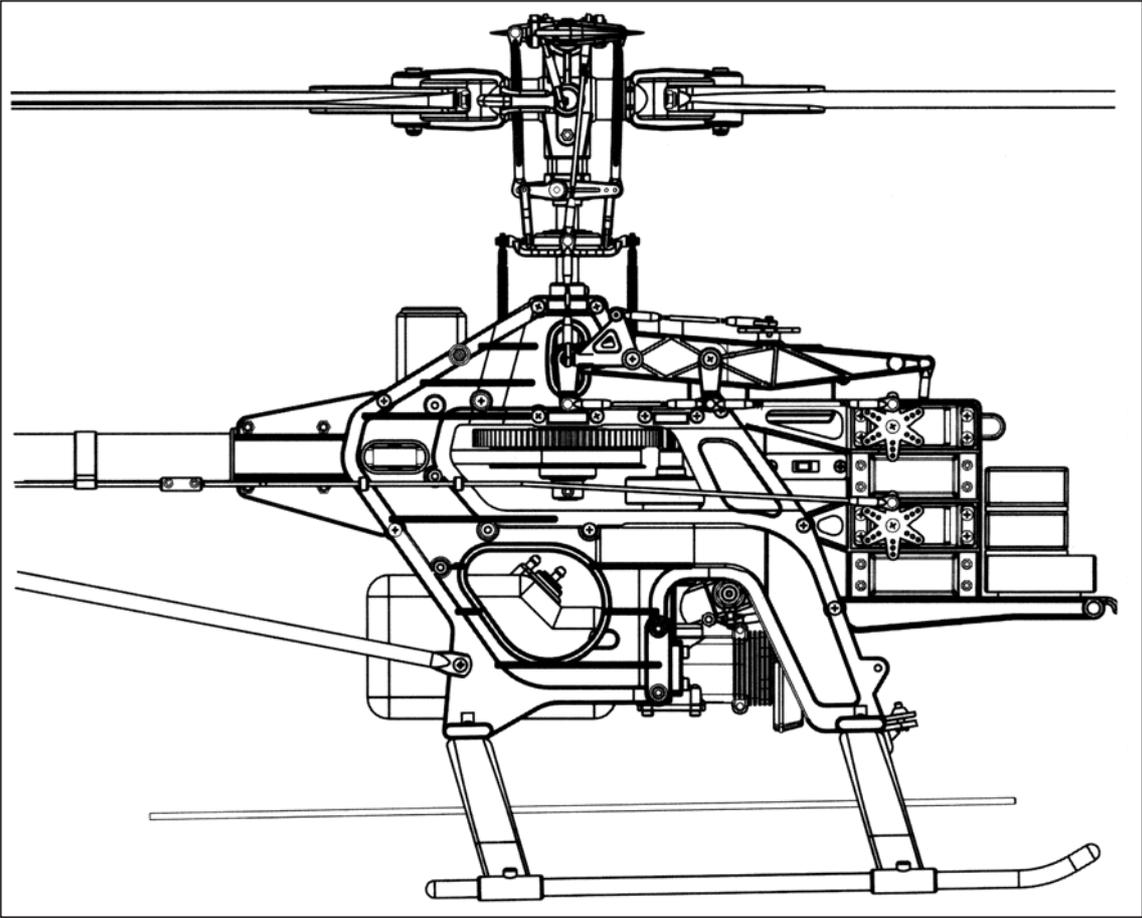
- (1) Start practicing moving the helicopter laterally to the left or right slowly from a 1.5 meter (60 inches) high hover. This is the beginning exercise of translational flight.



- (2) After a few hours of practicing step (1) and you are comfortable with translational movement, start using some tail rotor control so the helicopter nose will point slightly to the left or right as you fly it to the left or right. Eventually, this pattern will become a figure-eight in front of you. Please visualize these movements in your mind.



MAINTENANCE SECTION



After Flight Checklist

- (1) Check every screw and bolt to make sure none has loosened due to vibration.
- (2) Check every rotating and movable part to ensure they still move smoothly and normally.
- (3) Clean off the exhaust residue from the muffler, engine, and helicopter.
- (4) Check all movable parts, such as gears, ball links, belt, etc. for unusual wear.

Trouble Shooting

[1]The engine will not start.

* The engine starting shaft will not turn:

The engine may be flooded with too much fuel. Please remove the glow plug first, then turn the engine with the electric starter until the excess fuel spits out of the glow plug hole.

* The engine turns when the electric starter is applied, but the engine will not start:

- (1) Is the glow plug working? Remove the glow plug and does the platinum coil glow red when a 1.5 volt battery is applied to the plug? If not, then the glow plug battery may be weak and old.
- (2) Is the carburetor needle properly set? Please refer to the engine instruction manual for the proper needle setting.
- (3) Does the throttle control arm move properly and in the correct direction according your transmitter command?

* Engine will start, but quits immediately.

- (1) Use the transmitter to increase the carburetor opening slightly. The throttle stick should never exceed the 1/3 position when starting the engine.
- (2) Try a new or different type of glow plug. There are different types of glow plugs on the market for different types of fuel and operating conditions. Seek the advice of experienced fliers and also experiment with different types of glow plugs until you find the one that suits your operating condition the best.

*Engine runs, but the helicopter will not lift off.

- (1) Check the main rotor blade pitch angle, they should be set at 5.5 to 6 degrees when the transmitter throttle/collective stick is at the center position.
- (2) Does the engine throttle arm move properly? The carburetor opening should be fully open when the transmitter throttle/collective stick is moved up. The carburetor opening should be nearly closed when the transmitter throttle/collective stick is moved down. And the opening should be completely closed when the transmitter throttle/collective stick is moved down and the throttle trim is also moved down.
- (3) The carburetor needle is not set properly. Close the needle (turn it clockwise) all the way, then open the needle (turn it counter clockwise) 1 and 1/2 turns and try again. If the model still will not lift, then the engine maybe running too rich. If the symptom is the engine exhaust has a lot of smoke and the engine coughs and wants to quit when the transmitter throttle/collective stick is moved up, then close the needle 1/8 turn at a time, until the model will lift off. Do not turn the needle too far inward, that will make the engine run too lean and over-heat and damage the engine.

[2] Helicopter problems.

* The helicopter shakes.

- (1) Is the blade spindle bent?
- (2) Is the flybar bent?
- (3) Is the main rotor shaft bent?
- (4) Are the two control paddles mounted at the same distance from the rotor shaft, and the paddles are parallel to each other, and in the proper direction?
- (5) Is the tail rotor shaft bent? The tail rotor blades mounted properly or damaged?
- (6) Are the main rotor blades damaged or mounted in the proper orientation? The blades may require additional balancing. The blade balance can be checked by removing both blades and then use one of the 4mm blade bolt and nut to hold the two blades together like a teeter totter. Then, hold the blade bolt with your thumb and index finger. The two blades should teeter and remain in a level position. If not, then add some tape to the lighter blade near the blade tip until the two blades teeter in a level position. Hobby shops also sell blade balancers that are designed solely for balancing model helicopter blades.

In the event the model has crashed.

Inspect the flybar, rotor shaft and the blade spindle to make sure they are not bent at all. If any item is damaged, it must be replaced with a new part to ensure safe operation. Do not glue any broken or damaged plastic part. Do not repair broken rotor blades. Always inspect the following items immediately:

Engine starting shaft.

All the gears.

Main shaft, flybar and blade spindle.

Tail boom and support.

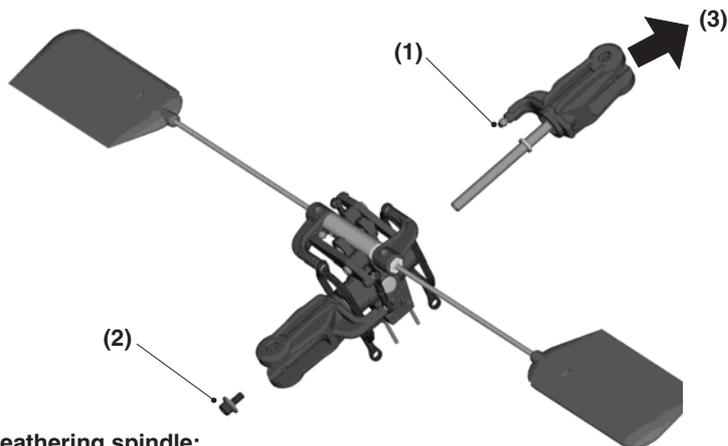
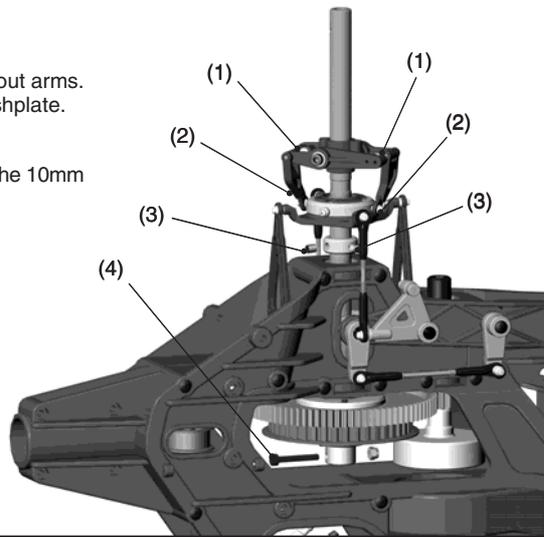
Vertical and horizontal fins.

Tail rotor shaft and control system.

Main and tail rotor blades.

Changing the main rotor shaft:

- (1) Disconnect the control rods to the washout arms.
- (2) Disconnect the washout link to the washplate.
- (3) Loosen the set screws on the collar.
- (4) Remove the 3mm x 20 bolt.
- (5) Hold on to the plastic main gear and pull the 10mm main rotor shaft upward.

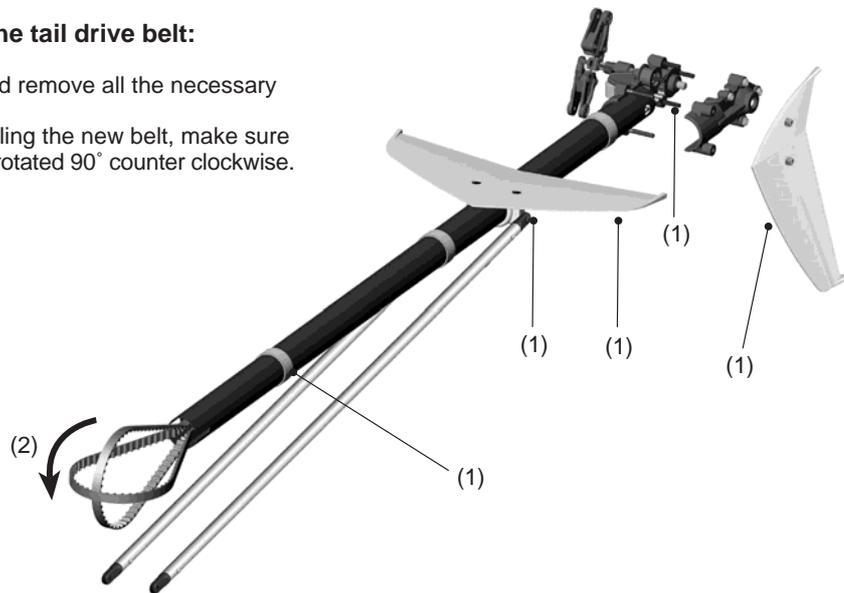


Changing the blade feathering spindle:

- (1) Disconnect the linkage rods to the blade grips.
- (2) Remove the 4mmx8 bolt.
- (3) Pull out the blade grips gently.

Changing the tail drive belt:

- (1) Loosen and remove all the necessary screws.
- (2) After installing the new belt, make sure the belt is rotated 90° counter clockwise.



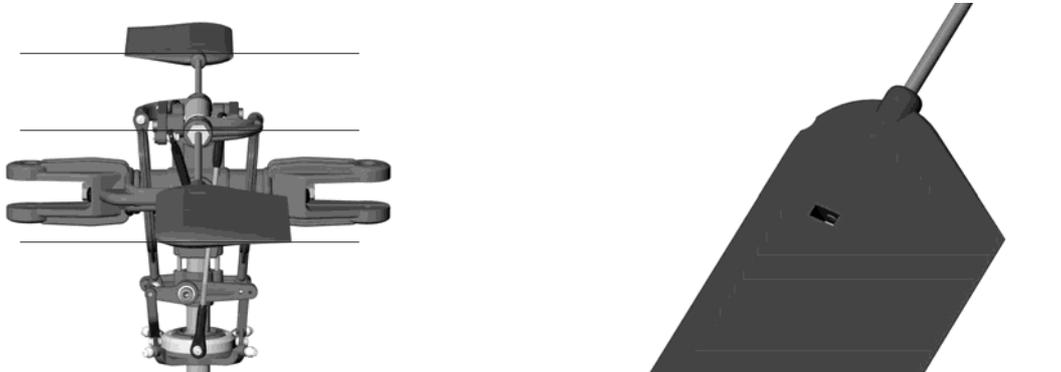
Changing the flybar:

- (1) Loosen or remove the M3x10 set screws.
- (2) Unscrew the control paddles.

* After reinstalling the flybar and paddles, make sure the paddles are level and flat.

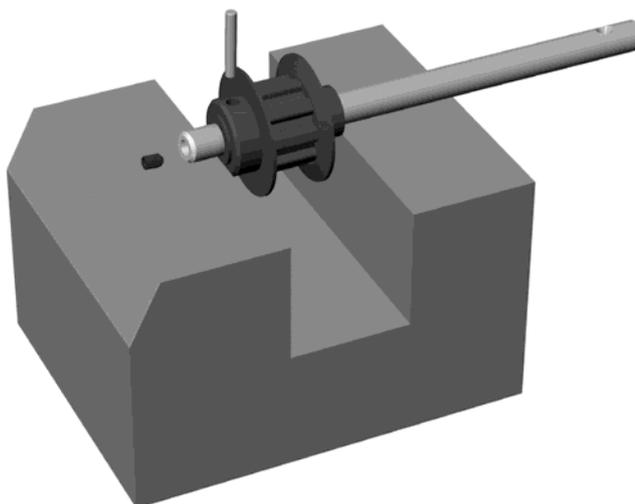
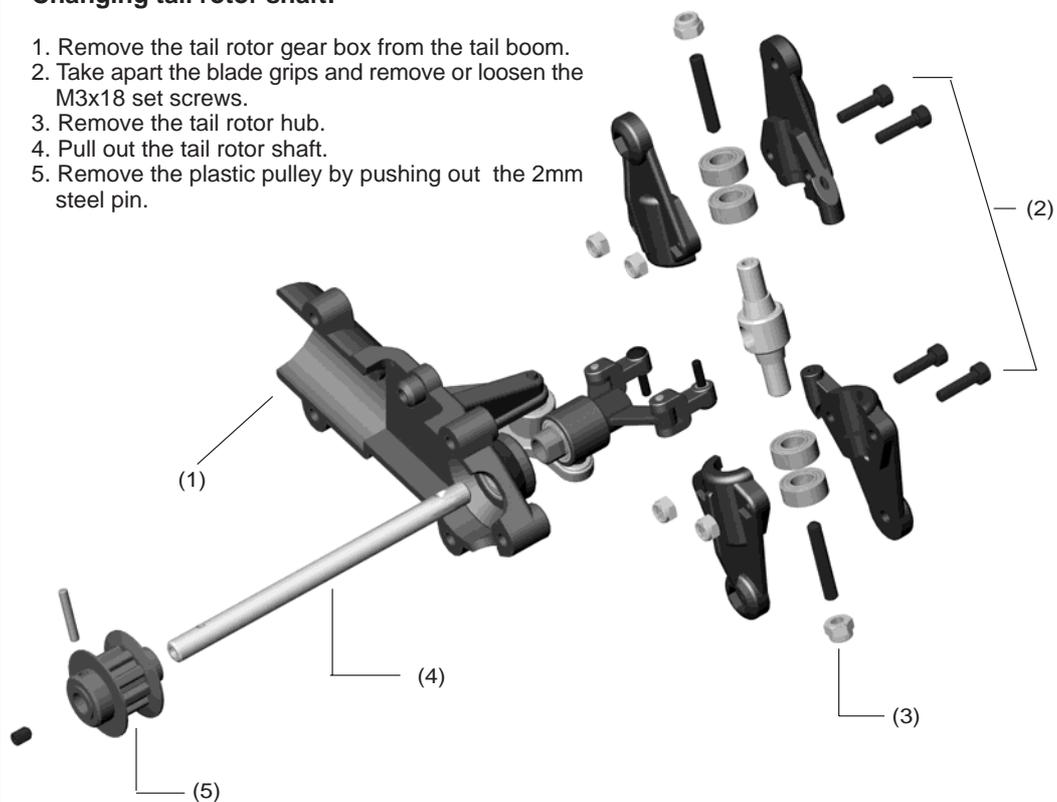
* Make sure the distance from the rotor shaft to both paddles are the same.

* If the flybar is not perfectly straight or smooth, it can be lightly sanded.



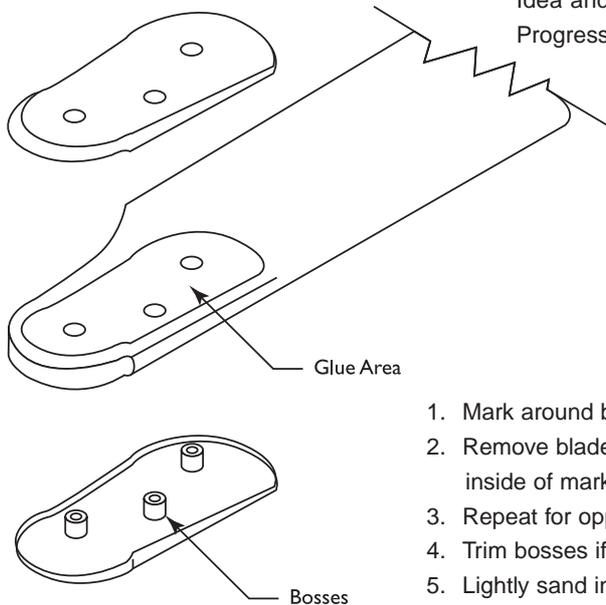
Changing tail rotor shaft:

1. Remove the tail rotor gear box from the tail boom.
2. Take apart the blade grips and remove or loosen the M3x18 set screws.
3. Remove the tail rotor hub.
4. Pull out the tail rotor shaft.
5. Remove the plastic pulley by pushing out the 2mm steel pin.



Blade Modification

Idea and original art submitted by Randy Wishon,
Progressive Technologies, inc.



1. Mark around blade grips with a felt-tip marker.
2. Remove blade grips and cut covering lightly .125" inside of mark, being careful not to cut into the blade.
3. Repeat for opposite side.
4. Trim bosses if necessary to allow tight fit to the blades.
5. Lightly sand inside of grips for better adhesion.
Apply Epoxy to blades in area shown top and bottom.
6. Attach blade grips and tighten screws.
7. Wipe off the excess Epoxy.

Dear Raptor Customers:

The stock wood blades should be operated with a main rotor speed of no more than 1700 RPM. If the blades are going to be operated at more than 1700 RPM, such as for aerobatics, then it is recommended reinforcing the blade root section with epoxy. The enclosed drawing illustrates how to remove the plastic blade grips and then carefully slice away some of the covering material, and add the "thin" type CA glue to further strengthen the wood. After installing the plastic blade grips, apply epoxy around the seam of the plastic grip and the wood to seal it off. This adds more strength and prevents oil from seeping through. For beginners, the best rotor speed is around 1550 RPM. For advanced fliers, a good hovering RPM is around 1550, and a constant 1800 RPM in idle-up for 3-D aerobatics. We recommend using the Thunder Tiger TR-2000 optical tachometer to help you check the rotor speed and to help you set the engine mixture. This tachometer is especially helpful for the beginners and we highly recommend it.