Thunder Tiger

RAPTOR V.2

Version 2.0

30 CLASS RC HELICOPTER

MANUAL

ASSEMBLY & MAINTENANCE

NOTICE

This is an improved electronic duplicate of the Thunder Tiger Manual for the Raptor 30 V2. ACE also has an electronic version this manual available, but it misses the parts list section and could use some improvements.
I would like to thank BimmerM3 at the RunRyder forum (www.runryder.com), for sending me a Raptor 30 V2 manual. This enabled me to reconstruct the manual, partly by scanning in parts and by manually creating the pages, and partly by copying and modifying the ACE manual.
I did a very careful job in duplicating the manual, but of course I can not assume responsibility in case of errors. The duplicate has been kept as close as possible to the original manual, but at numerous places errors and typos were corrected. At many places the English text was improved, as well as the layout. Some part numbers have been corrected. A few sentences where correction would need more than changing a few words were left unchanged.
The front page has been recreated in color, where the original manual is all black and white. A colored front page is so much more inviting!

I hope you enjoy the use of this electronic manual.

January 2004
Wouter Pasman
Netherlands.

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. 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 feedback 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 resources 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.

CONTENTS

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.

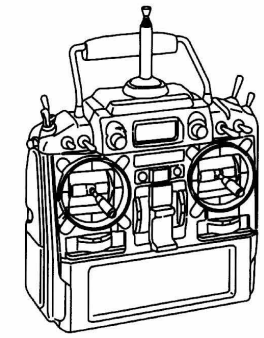
POST FLIGHT INSPECTION

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 ensures 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.

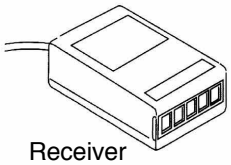
Following these few, simple safety rules will allow you to enjoy the thrill of model helicopter flying for many years to come.

OTHER ITEMS REQUIRED

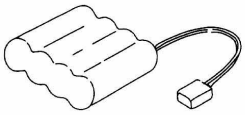
■ RADIO SET



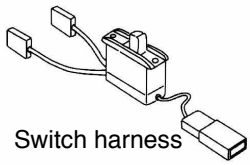
Transmitter
(helicopter type only
6 or more channels)



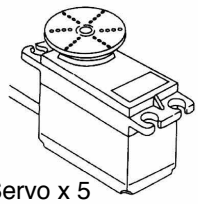
Receiver



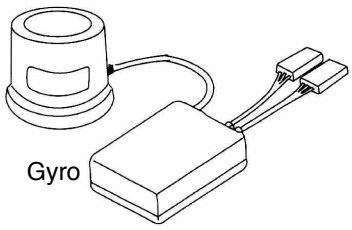
Battery
1000mAh



Switch harness

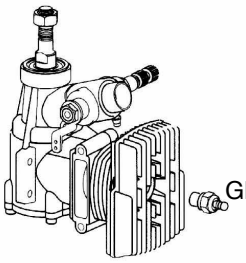


Servo x 5



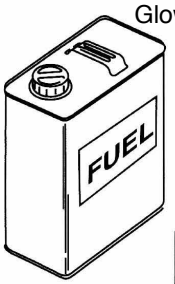
Gyro

■ ENGINE

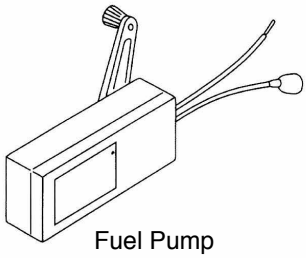


Glow Plug

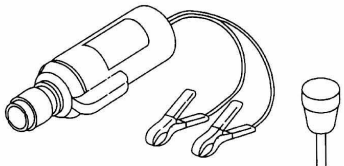
HELI ENGINE(39-size)



Glow Fuel(15%-30%)

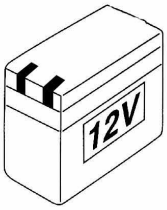


Fuel Pump

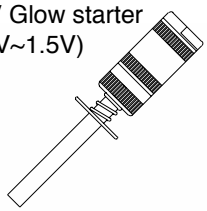


12V Electric starter

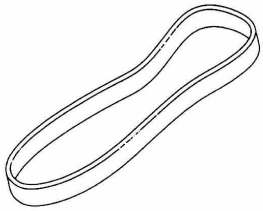
Extended 6mm Hex
Starting Tool



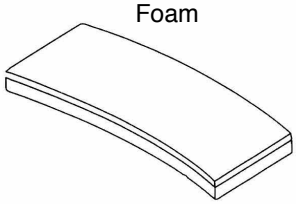
12V Battery



1.5V Glow starter
(1.2V~1.5V)

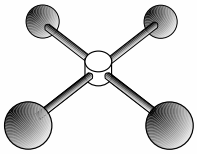


Rubber Band

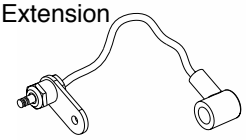


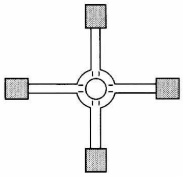
Foam

Training Gear
(for beginners only)



Remote Glow Plug
Extension

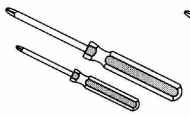




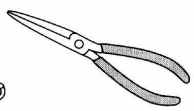
Glow Plug Wrench

TOOLS REQUIRED FOR ASSEMBLY

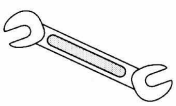
Screw Driver



Needle Nose Pliers

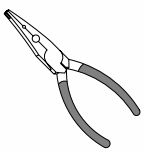


5.5mm Wrench

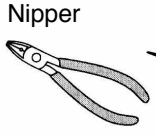


7mm

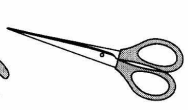
Ball Link Pliers



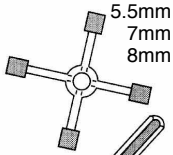
Nipper



Scissors



Metric
4-way Wrench



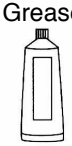
5.5mm
7mm
8mm

Hobby Knife

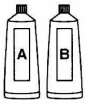
Instant Glue

Blue Locktite

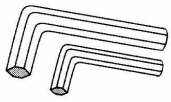
Grease

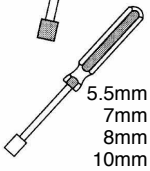


Epoxy



Hex Wrench

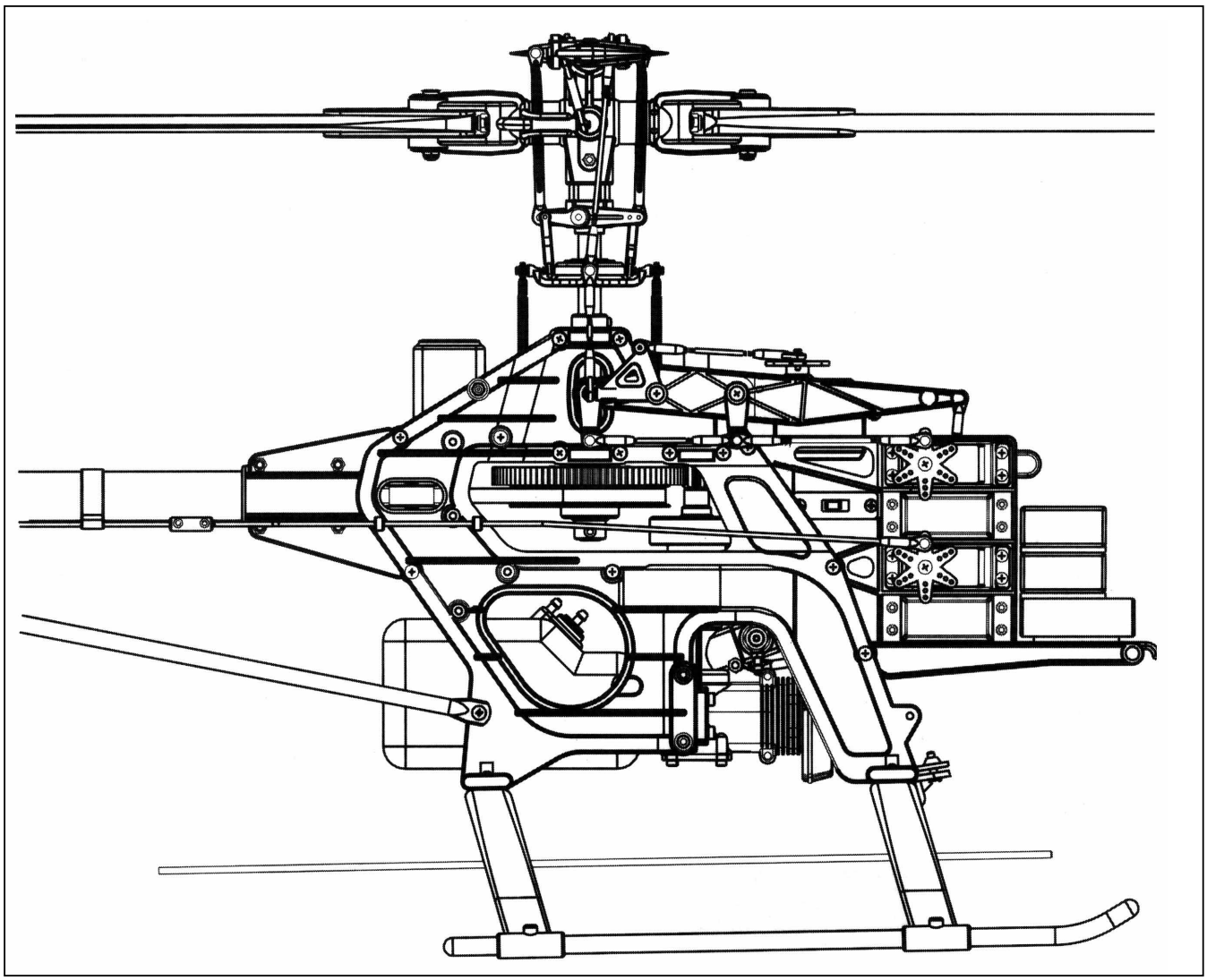




5.5mm
7mm
8mm
10mm

Socket Drivers

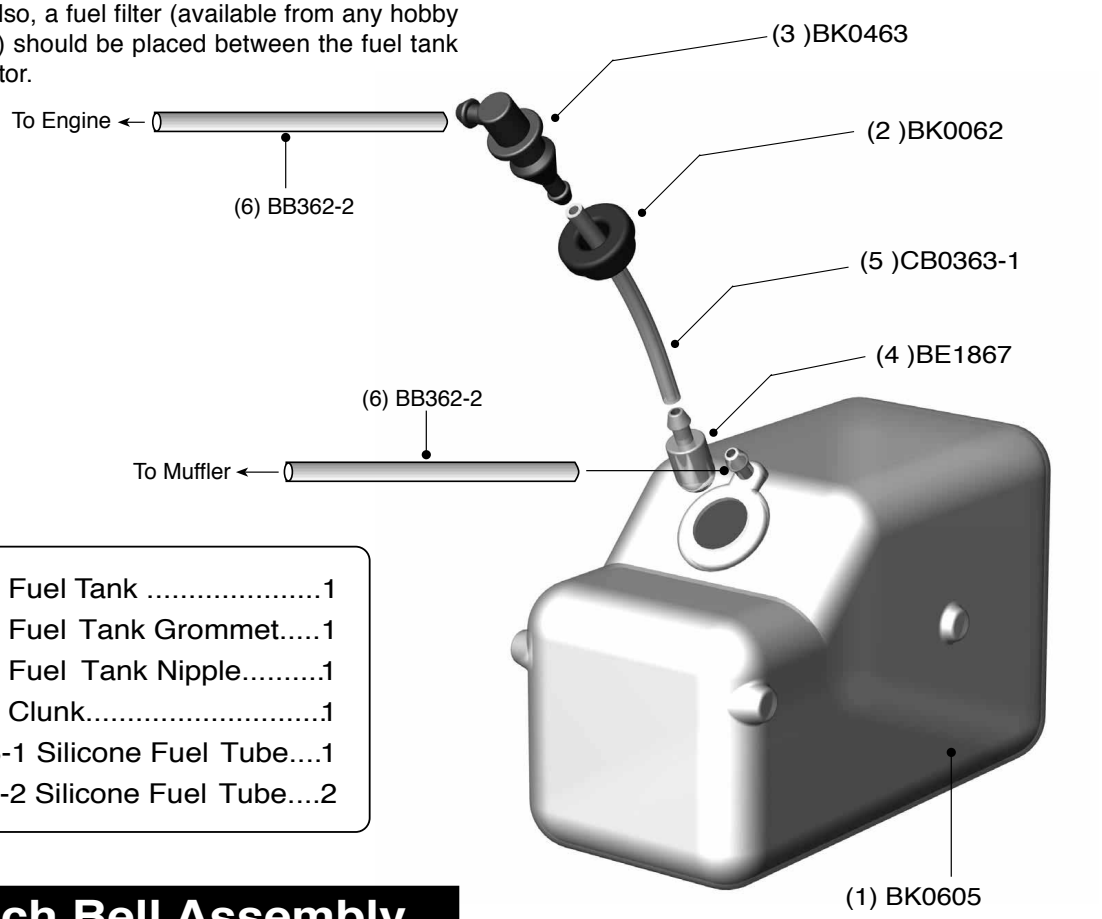
ASSEMBLING SECTION



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

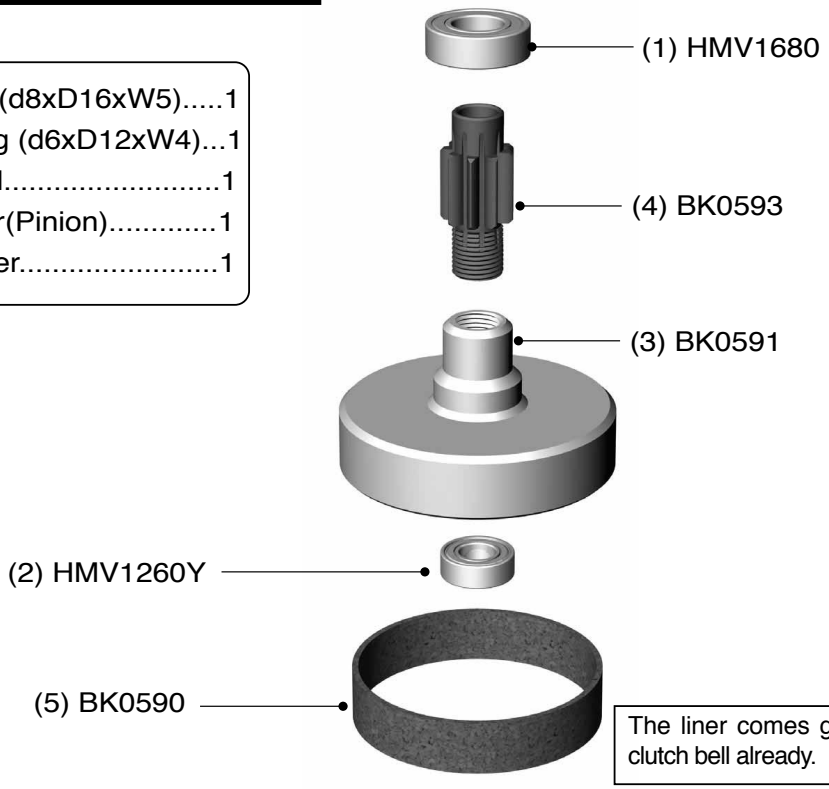
Note: After assembly, check to make sure the Fuel Tank clunk can move from top to bottom without touching the back of tank. Also, a fuel filter (available from any hobby shop, TTR1164) should be placed between the fuel tank and the carburetor.



(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

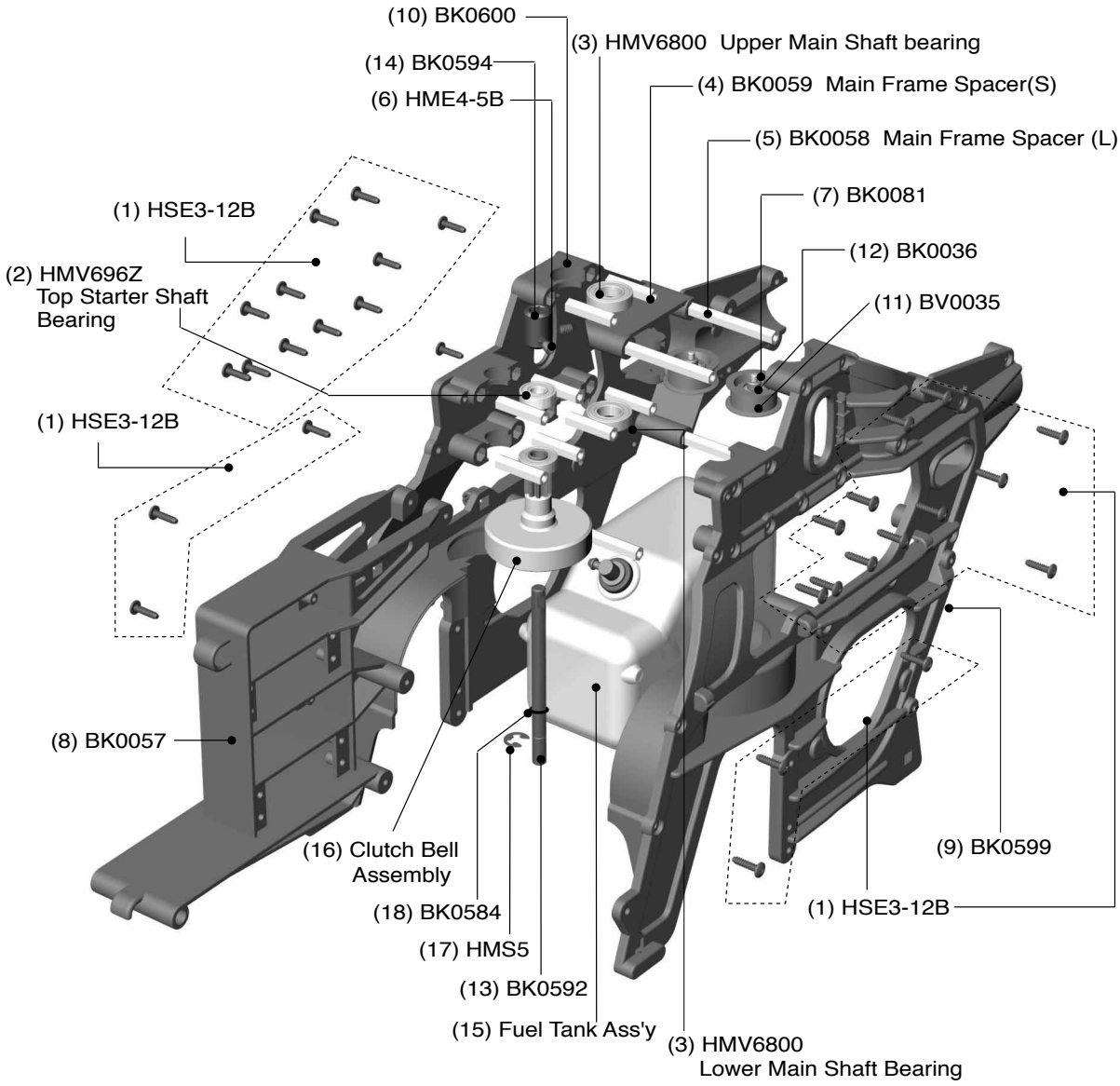


The liner comes glued in the clutch bell already.

③ Main Frame Assembly-Part1

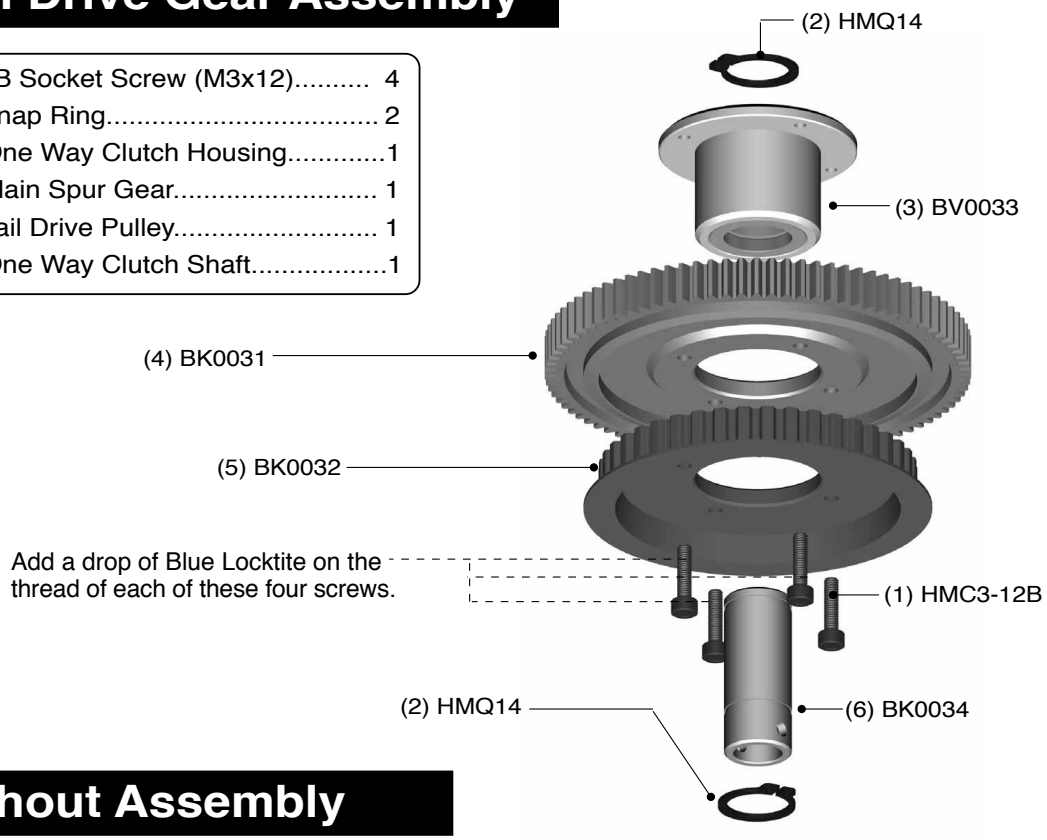
Please insert the frame spacers, bearings, pulley and parts in the frames according the drawing below. Tighten the screws snugly, but do not over torque them which could strip the plastic.
Insert starter shaft through the center of the clutch bell assembly, through the top starter shaft bearing and into the starter coupling. Secure with the two set screws. Make sure this is tightly secured.

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



④ Main Drive Gear Assembly

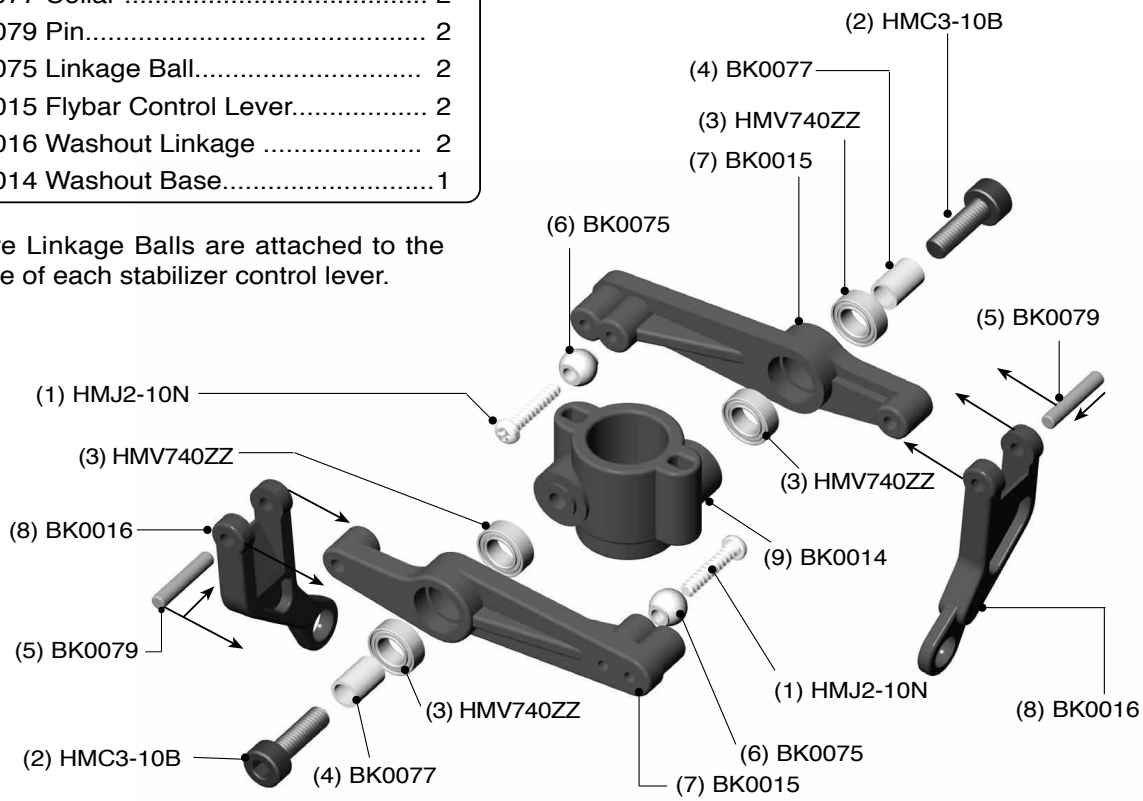
(1) HMC3-12B Socket Screw (M3x12)..... 4
(2) HMQ14 Snap Ring..... 2
(3) BV0033 One Way Clutch Housing.....1
(4) BK0031 Main Spur Gear..... 1
(5) BK0032 Tail Drive Pulley..... 1
(6) BK0034 One Way Clutch Shaft.....1



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.



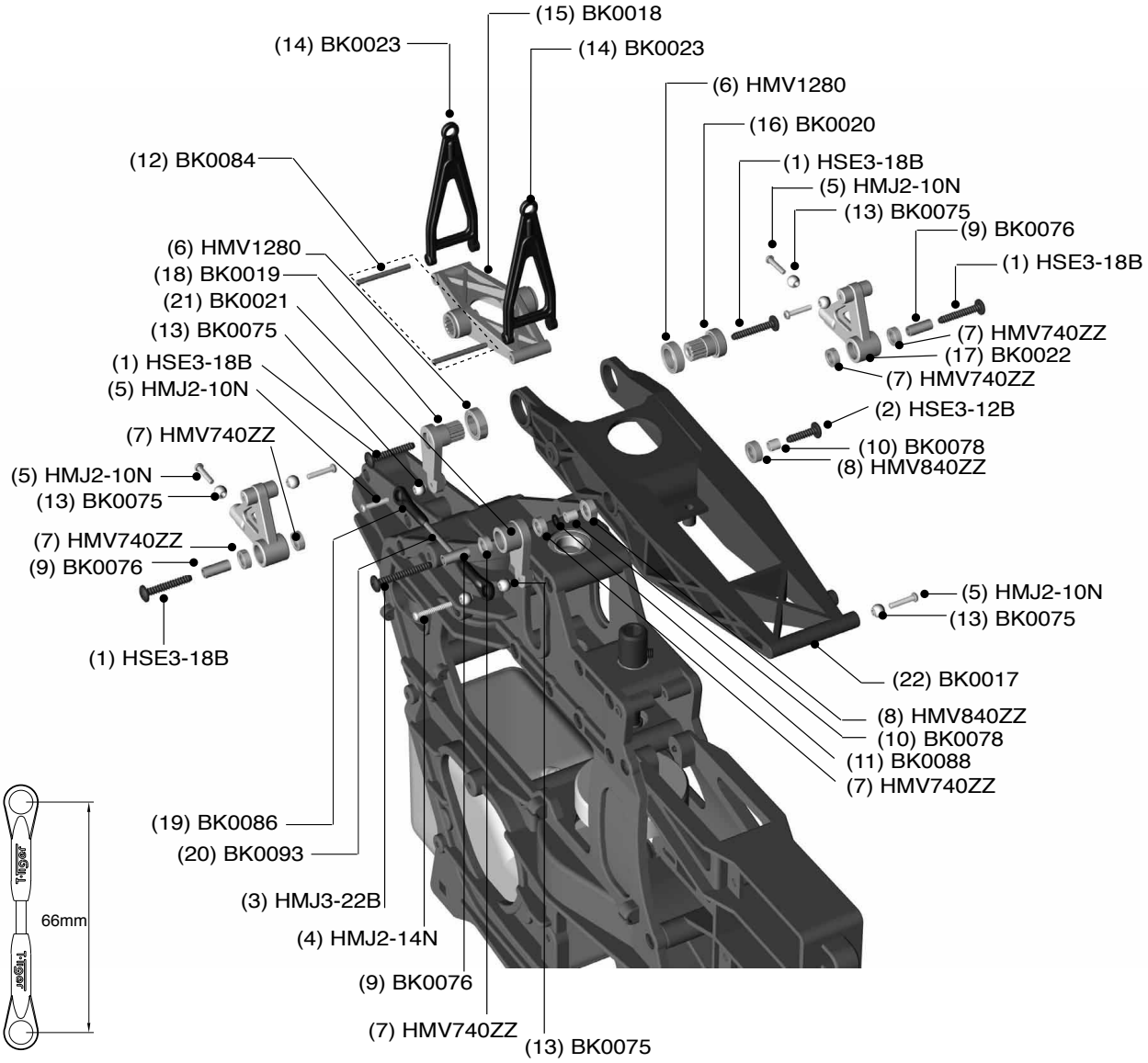
※ ***For sport kit (29BB) version, (3) will be replaced by Bushing(BK0107x4)***

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

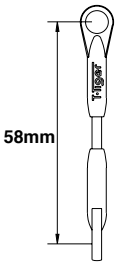


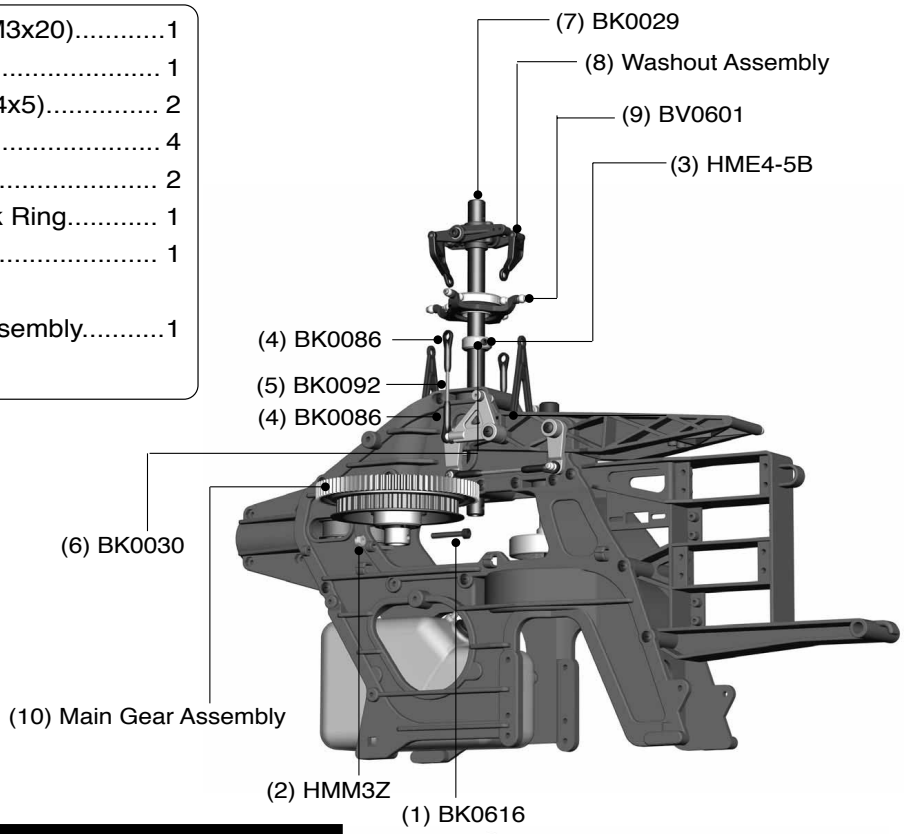
Warning, do not over-torque the self-tapping screws.

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.

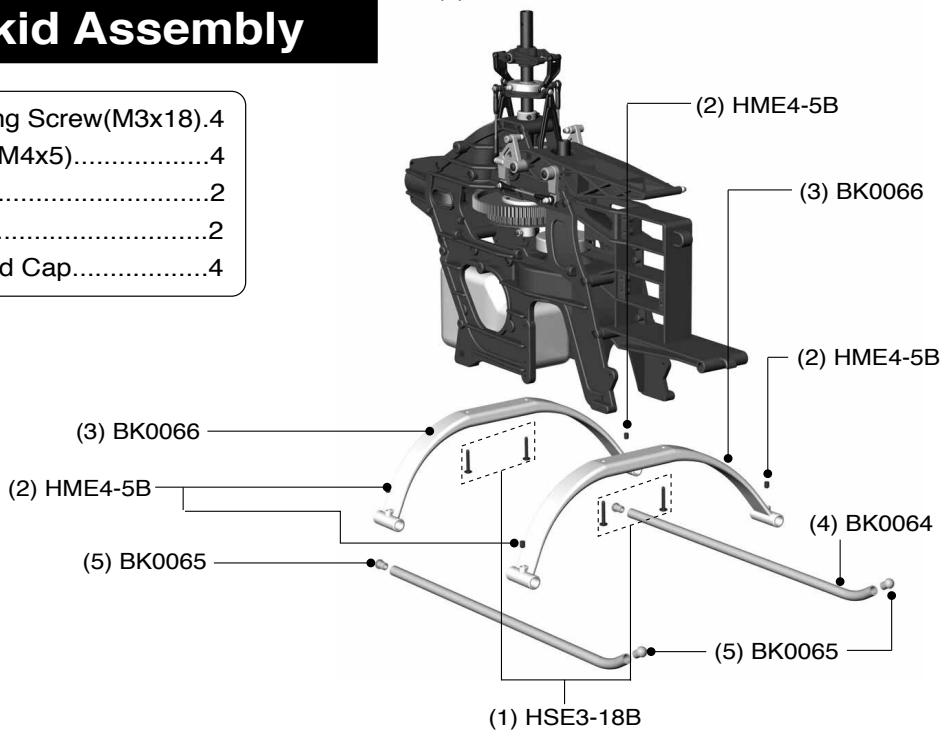
(1) BK0616 Socket Screw(M3x20).....1
(2) HMM3Z Lock Nut (M3)..... 1
(3) HME4-5B Set Screw (M4x5)..... 2
(4) BK0086 Ball Link 4
(5) BK0092 Linkage Rod 2
(6) BK0030 Main Shaft Lock Ring..... 1
(7) BK0029 Main Shaft 1
(8) Wash Out Assembly
(9) BV0601 Swash Plate Assembly.....1
(10) Main Gear Assembly





⑧ Landing Skid Assembly

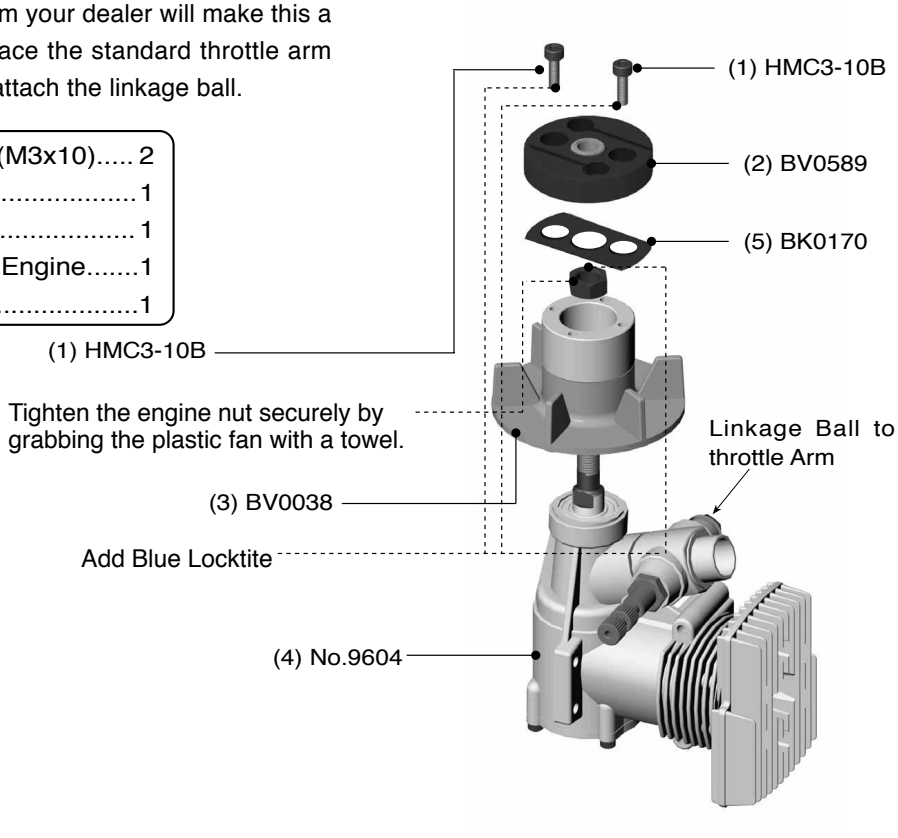
(1) HSE3-18B Self Tapping Screw(M3x18).4
(2) HME4-5B Set Screw(M4x5).....4
(3) BK0066 Skid Brace.....2
(4) BK0064 Skid Pipe.....2
(5) BK0065 Skid Pipe End Cap.....4



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.

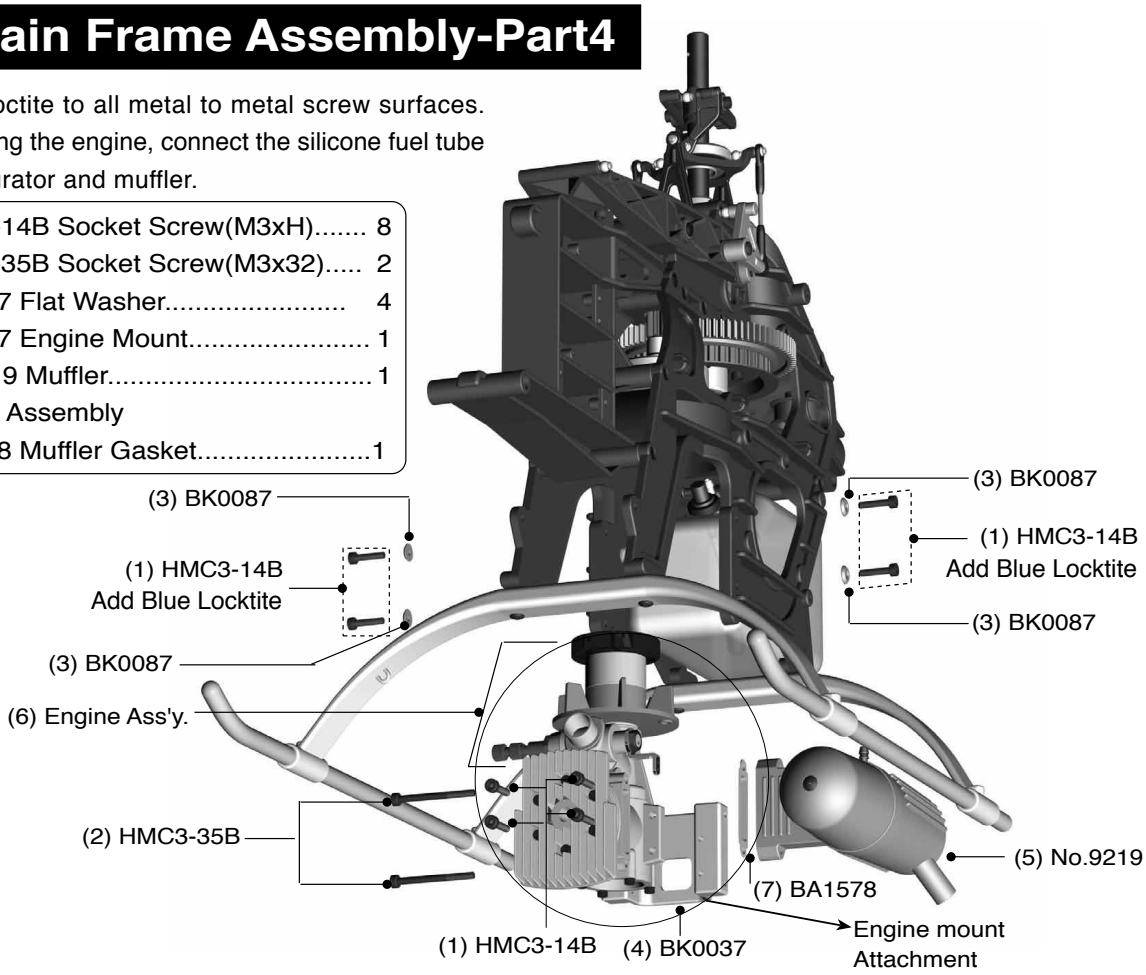
(1) HMC3-10B Socket Screw(M3x10)..... 2
(2) BV0589 Clutch Shoe.....1
(3) BV0038 Cooling Fan.....1
(4) No.9604 TT PRO-39H(R) Engine.....1
(5) BK0170 Shim.....1



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



⑪ Main Rotor Head Assembly

Assembly Hint: Start from the bottom of the main Rotor Hub and work your way up to the flybar assembly. When screwing on the flybar paddles to the flybar, stop when you can see the rod in the window of the paddle. Then, lay the assembly on a flat surface and align the paddles so they are exactly parallel. Insert and tighten the set screws. Attach the flybar control rod to the flybar control arm and use the Double Link to connect the mixing lever (short side) to the Main rotor Pitch Housing.

(1) HMC3-14B Socket Screw(M3x14)..... 2	(12) HMV1360Z Bearing (d6xD13xW5)..... 4	(23) BK0596 Main Rotor Pitch Housing..... 2
(2) HMC3-8B Socket Screw(M3x8)..... 2	(13) BK0076 Collar.....2	(24) BK0583 Feathering Shaft..... 1
(3) HMJ2-10N Self Tapping Screw(M2x10).... 8	(14) BK0078 Collar..... 2	(25) BK0007 Flybar Control Rod.....2
(4) HME4-5B Set Screw(M4x5)..... 2	(15) BK0581 Flap Collar.....2	(26) BV0085 Double Link 2
(5) HME3-10B Set Screw(M3x10)..... 2	(16) BK0088 Flat Washer.....2	(27) BK0582 Flap Damper..... 2
(6) BK0435 Washer (d4xD11xW1.7)..... 2	(17) BK0067 Flybar Paddle..... 2	(28) BK0012 Pin..... 2
(7) HMC4-8B Socket Screw (M4x8)..... 2	(18) BK0010 Flybar Rod.....1	(29) BK0587 Main Rotor Hub Pin.....1
(8) HMV830ZZ Bearing (d3xD8xW4)..... 2	(19) BK0002 Flybar Control Arm..... 2	(30) BK0595 Main Rotor Hub.....1
※(9) HMV740ZZ Bearing (d4xD7xW2.5)..... 4	(20) BK0005 Flybar Arm Bushing..... 2	(31) BK0075 Ball Link..... 8
※(10) HMV840ZZ Bearing (d4xD8xW3)..... 2	(21) BK0004 Flybar Seesaw Hub.....1	(32) BK0584 Thrust Washer.....2
(11) HMX0612 Thrust Bearing..... 2	(22) BK0006 Mixing Lever..... 2	

※ ***For Sport kit (29BB) version,***
(9) will be replaced by Bushing(BK0107x4)
(10) will be replaced by Bushing(BK0108x2)

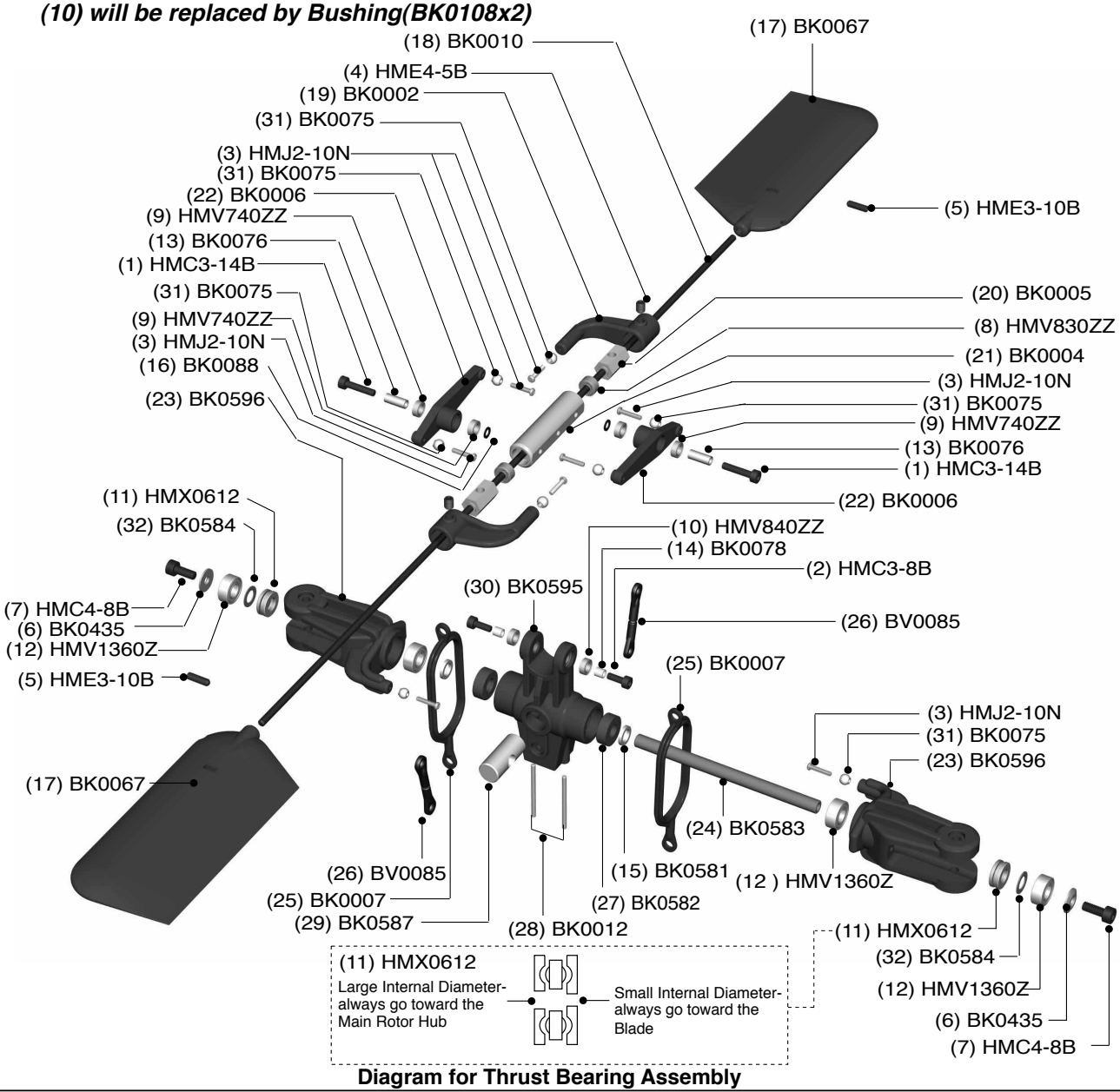
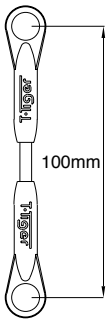


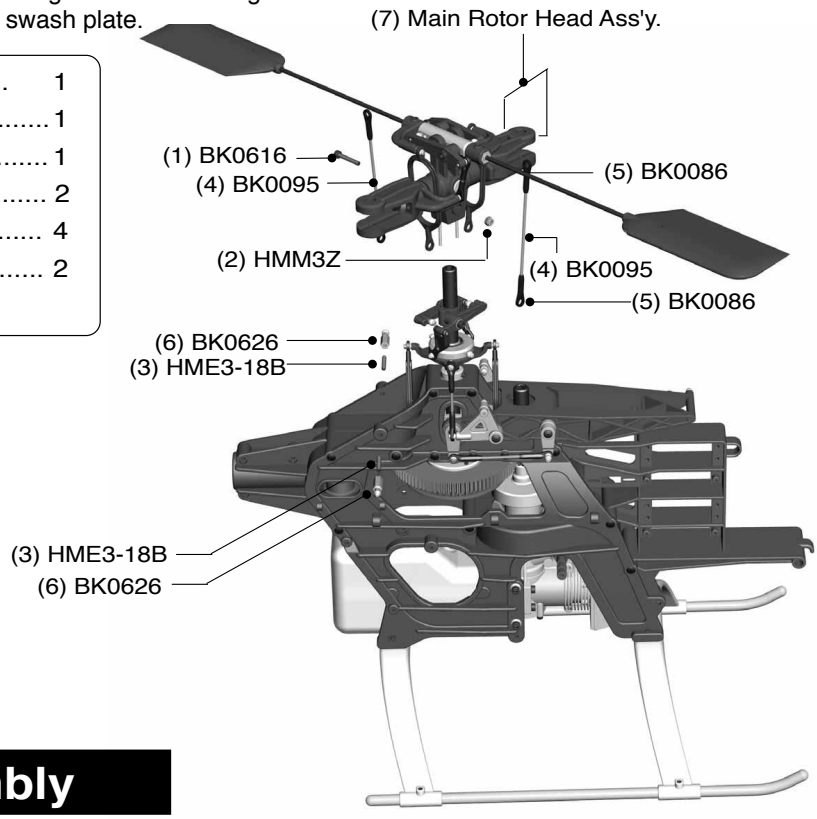
Diagram for Thrust Bearing Assembly

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



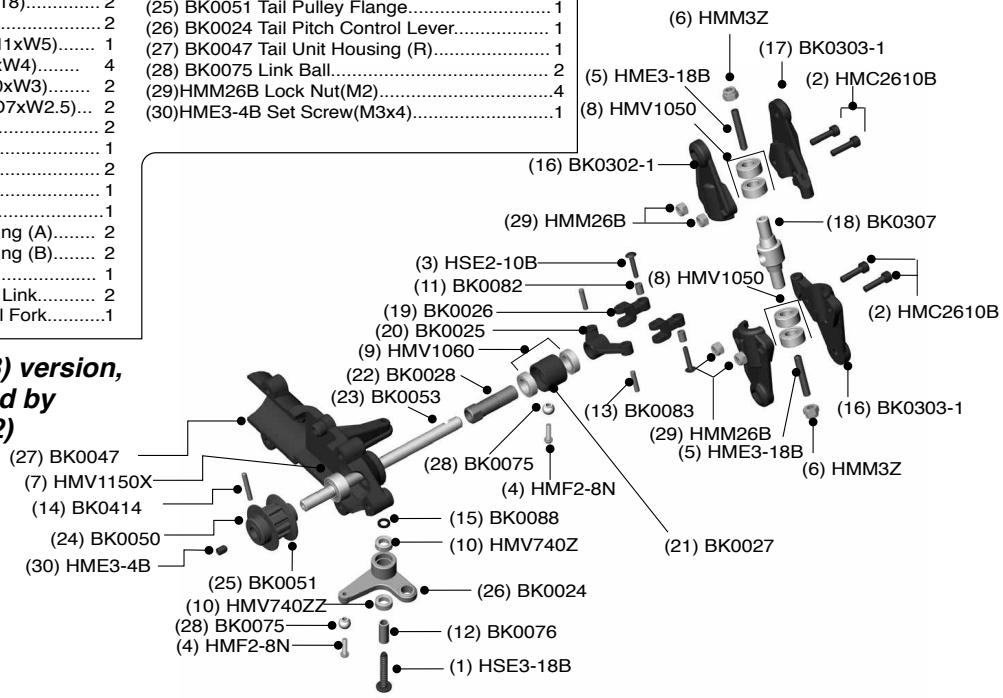


⑬ Tail Unit Assembly

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
(2) HMC2610B Self Tapping Screw(M2.6x10) 4
(3) HSE2-10B Self Tapping Screw(M2x10).2
(4) HMF2-8N Screw(M2x8)..... 2
(5) HME3-18B Set Screw(M3x18)..... 2
(6) HMM3Z Lock Nut(M3)..... 2
(7) HMV1150X Bearing (d5xD11xW5)..... 1
(8) HMV1050 Bearing (d3xD8xW4)..... 4
(9) HMV1060 Bearing (d6xD10xW3)..... 2
※(10) HMV740ZZ Bearing (d4xD7xW2.5)... 2
(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
(21) BK0027 Tail Pitch Control Slider..... 1
(22) BK0028 Tail Pitch Control Slider Bushing.... 1
(23) BK0053 Tail Rotor Shaft..... 1
(24) BK0050 Tail Pulley..... 1
(25) BK0051 Tail Pulley Flange..... 1
(26) BK0024 Tail Pitch Control Lever..... 1
(27) BK0047 Tail Unit Housing (R)..... 1
(28) BK0075 Link Ball..... 2
(29)HMM26B Lock Nut(M2)..... 4
(30)HME3-4B Set Screw(M3x4)..... 1

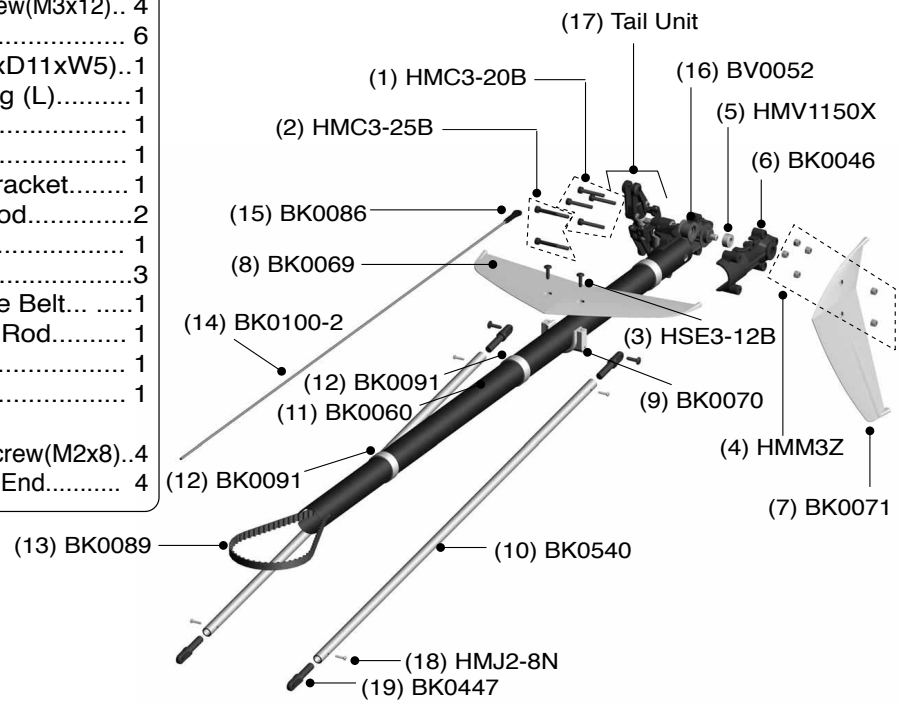
※***For sport kit (29BB) version, (10) will be replaced by Bushing(BK0107x2)***



⑭ Tail Boom Assembly

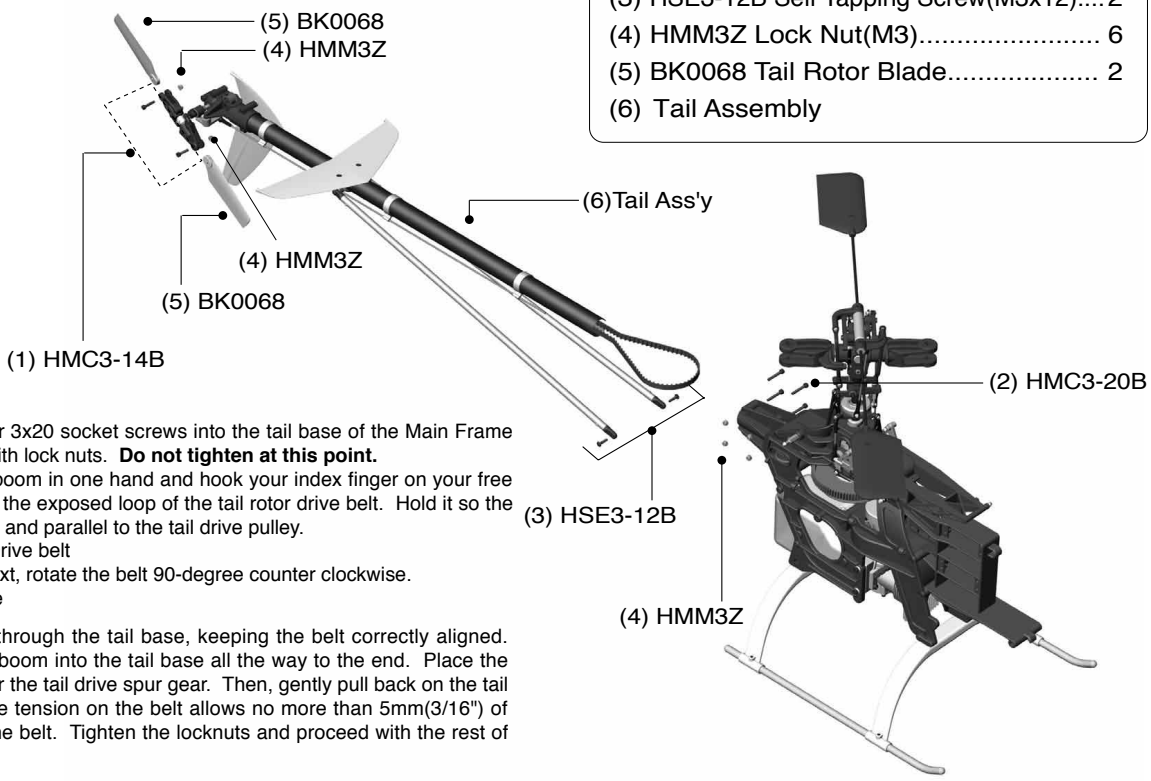
Assembly Tip: Slide the 3 rod guides onto the boom and space them out evenly as shown. Then slide the tail linkage rod into the rod guides. Next, insert the tail rotor drive belt into the boom so that it comes out of both ends. Place drive belt over tail drive pulley and complete balance of tail boom assembly. Remember to connect the tail linkage rod to the tail control lever.

(1) HMC3-20B Socket Screw(M3x20)..4
(2) HMC3-25B Socket Screw(M3x25)..2
(3) HSE3-12B Self Tapping Screw(M3x12).. 4
(4) HMM3Z Lock Nut(M3)..... 6
(5) HMV1150X Bearing (d5xD11xW5)..1
(6) BK0046 Tail Unit Housing (L).....1
(7) BK0071 Vertical Fin..... 1
(8) BK0069 Stabilizer Fin..... 1
(9) BK0070 Stabilizer Fin Bracket..... 1
(10) BK0540 Tail Support Rod.....2
(11) BK0060 Tail Boom..... 1
(12) BK0091 Rod Guide.....3
(13) BK0089 Tail Rotor Drive Belt... 1
(14) BK0100-2 Tail Linkage Rod..... 1
(15) BK0086 Ball Link..... 1
(16) BV0052 Tail Idle Pulley..... 1
(17) Tail Unit
(18) HMJ2-8N Self Tapping Screw(M2x8)..4
(19) BK0447 Tail Support Rod End..... 4



⑮ Main Frame Assembly-Part6

(1) HMC3-14B Socket Screw(M3x14).....2
(2) HMC3-20B Socket Screw(M3x20).....4
(3) HSE3-12B Self Tapping Screw(M3x12)....2
(4) HMM3Z Lock Nut(M3)..... 6
(5) BK0068 Tail Rotor Blade..... 2
(6) Tail Assembly



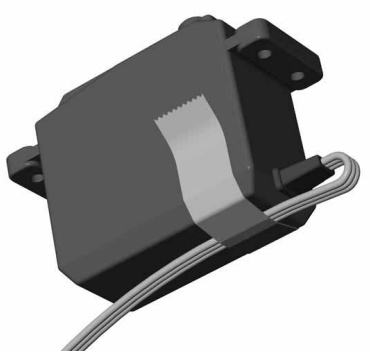
Insert the four 3x20 socket screws into the tail base of the Main Frame and secure with lock nuts. **Do not tighten at this point.**
Hold the tail boom in one hand and hook your index finger on your free hand through the exposed loop of the tail rotor drive belt. Hold it so the belt is vertical and parallel to the tail drive pulley.
Ⓘ Boom Drive belt
Important: Next, rotate the belt 90-degree counter clockwise.
⊖ 90-degree

Pull the belt through the tail base, keeping the belt correctly aligned. Push the tail boom into the tail base all the way to the end. Place the drive belt over the tail drive spur gear. Then, gently pull back on the tail boom until the tension on the belt allows no more than 5mm(3/16") of free play in the belt. Tighten the locknuts and proceed with the rest of the assembly.

⑯ Servo Installation-Part1

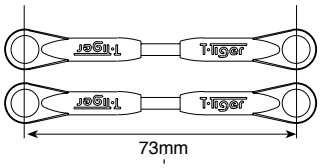
Assembly Tip: Remove all the servo wheels prior to attaching the steel linkage balls. Make sure all linkages are the correct length.

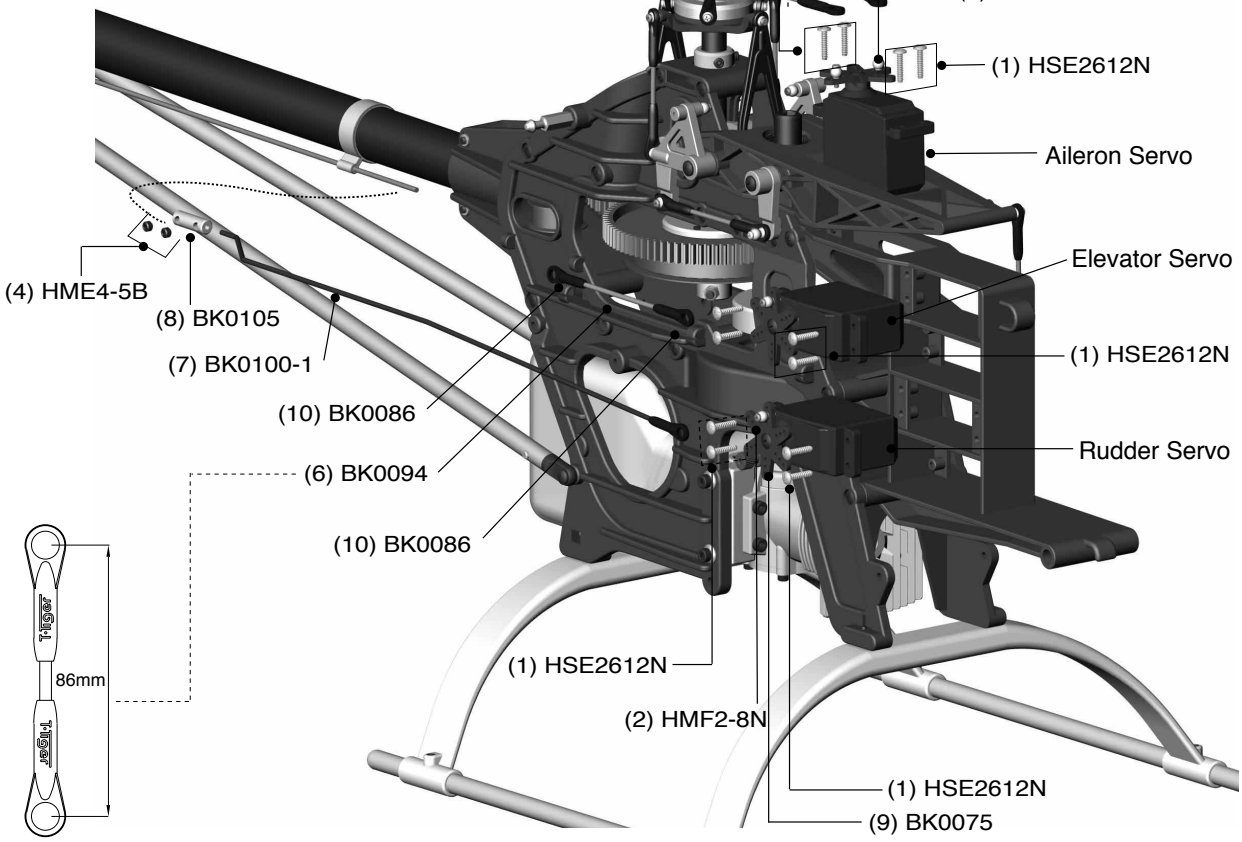
(1) HSE2612N Self Tapping Screw(M2.6x12)....12
(2) HMF2-8N Screw(M2x8)..... 4
(3) HML2 Hex Nut(M2)..... 4
(4) HME4-5B Set Screw(M4x5)..... 2
(5) BK0093 Linkage Rod..... 2
(6) BK0094 Linkage Rod..... 1
(7) BK0100-1 Linkage Rod..... 1
(8) BK0105 Tail Control Rod Joint..... 1
(9) BK0075 Linkage Ball.....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



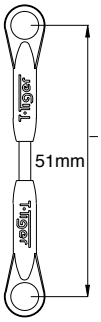


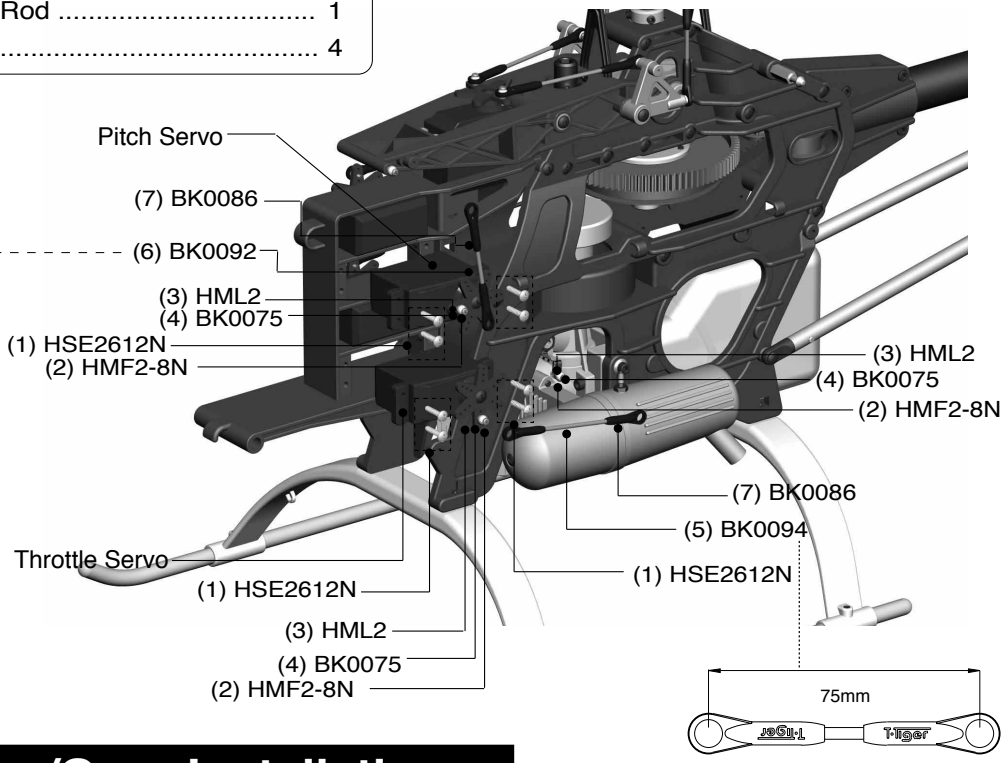
⑰ Servo Installation-Part2

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.

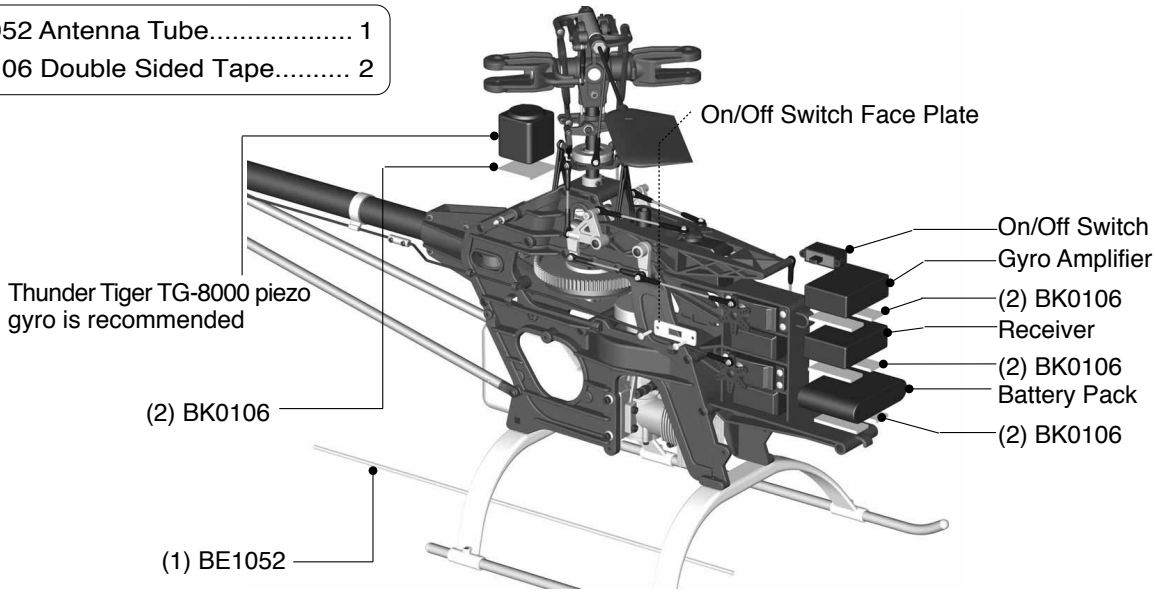




⑱ Receiver/Gyro Installation

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.

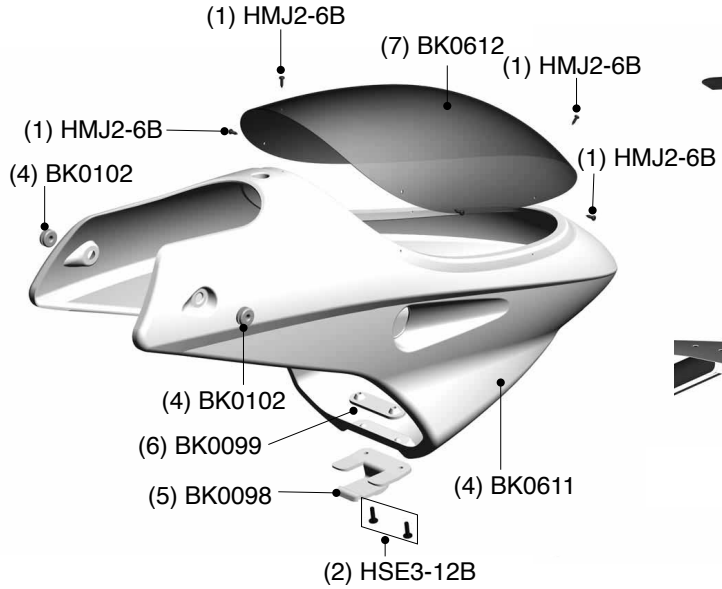
(1) BE1052 Antenna Tube..... 1
(2) BK0106 Double Sided Tape..... 2



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.

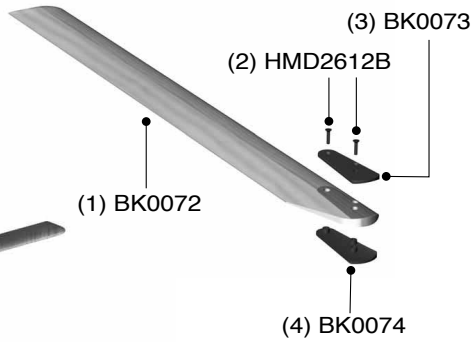
(1) HMJ2-6B Self Tapping Screw(M2x4).. 6
(2) HSE3-12B Self Tapping Screw(M3x12).... 2
(3) BK0611 Body..... 1
(4) BK0102 Rubber Grommet 2
(5) BK0098 Body Clip-A..... 1
(6) BK0099 Body Clip-B..... 1
(7) BK0612 Canopy..... 1
(8) JV0093 Decal.....1

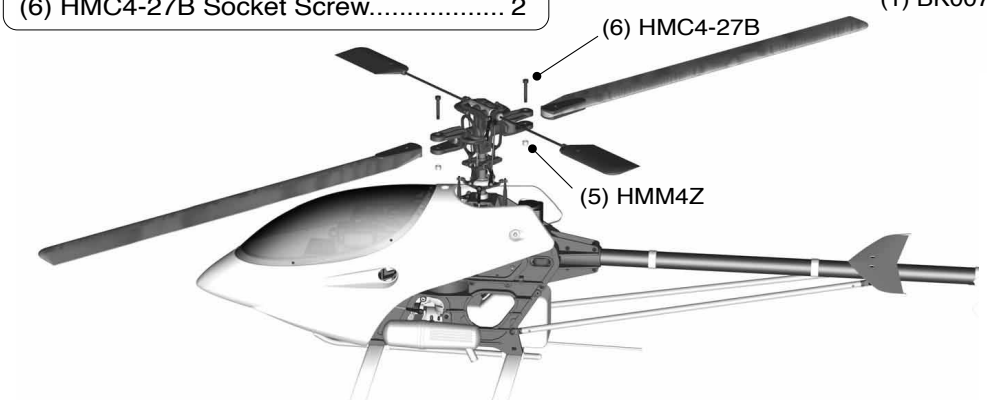


⑳ Main Rotor Assembly

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 .

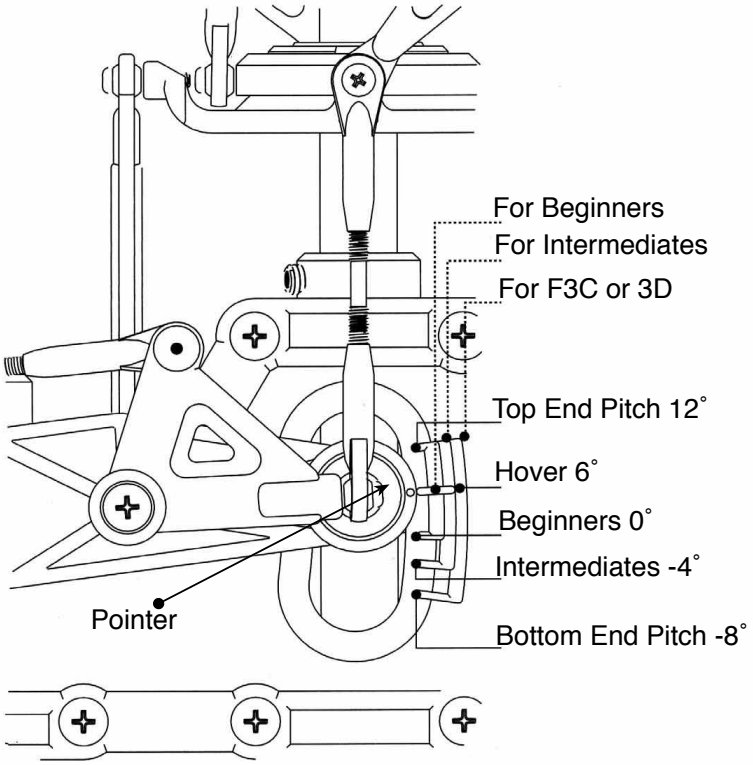
(1) BK0072 Main Rotor Blade..... 2
(2) HMD2612B Self Tapping Screw (M2.6x12)..... 2
(3) BK0073 Upper Blade Grip... 2
(4) BK0074 Lower Blade Grip..... 2
(5) HMM4Z Lock Nut(M4)..... 2
(6) HMC4-27B Socket Screw..... 2





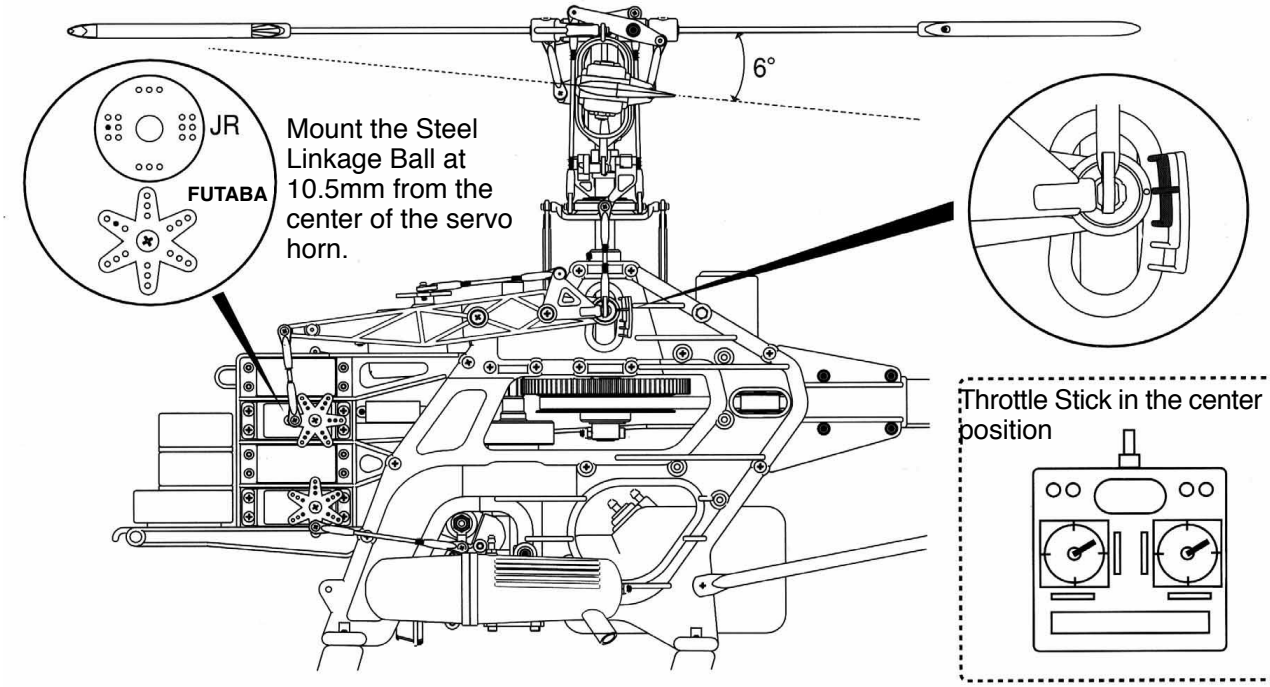
Setting up Main Rotor Blades Pitch Angle

- 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 seperately).



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.

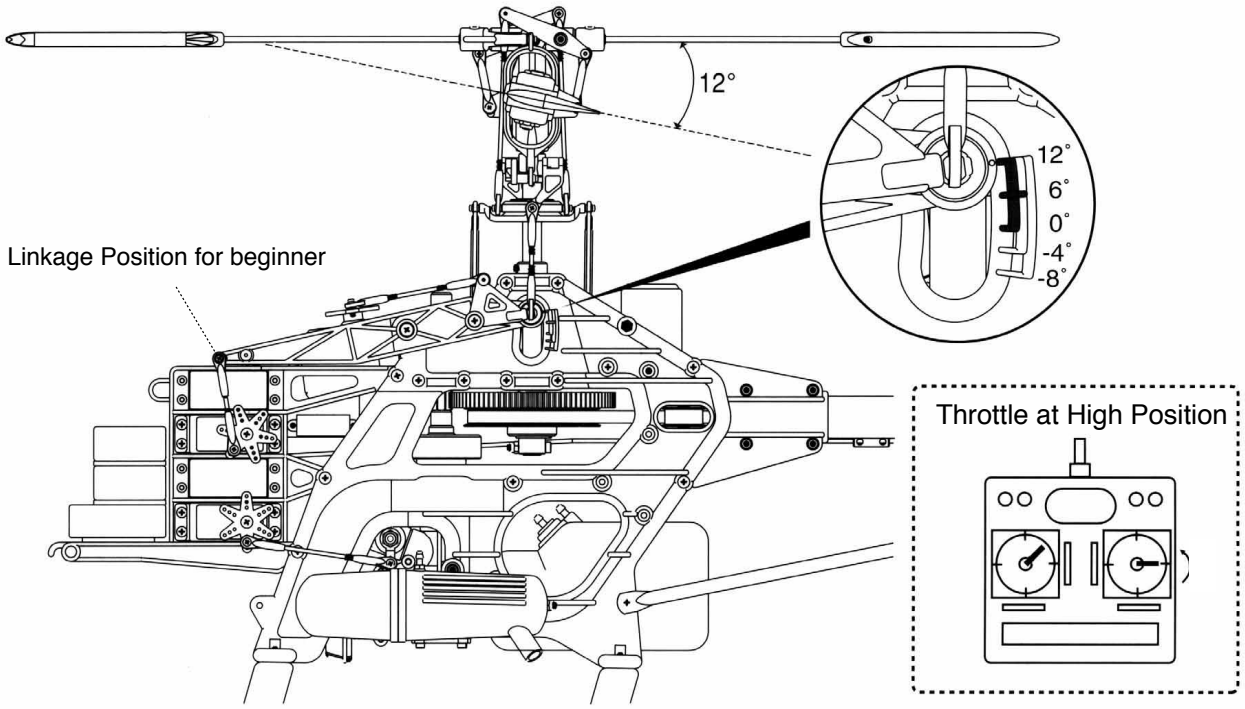
(Hint for beginners)



Throttle Stick in the center position

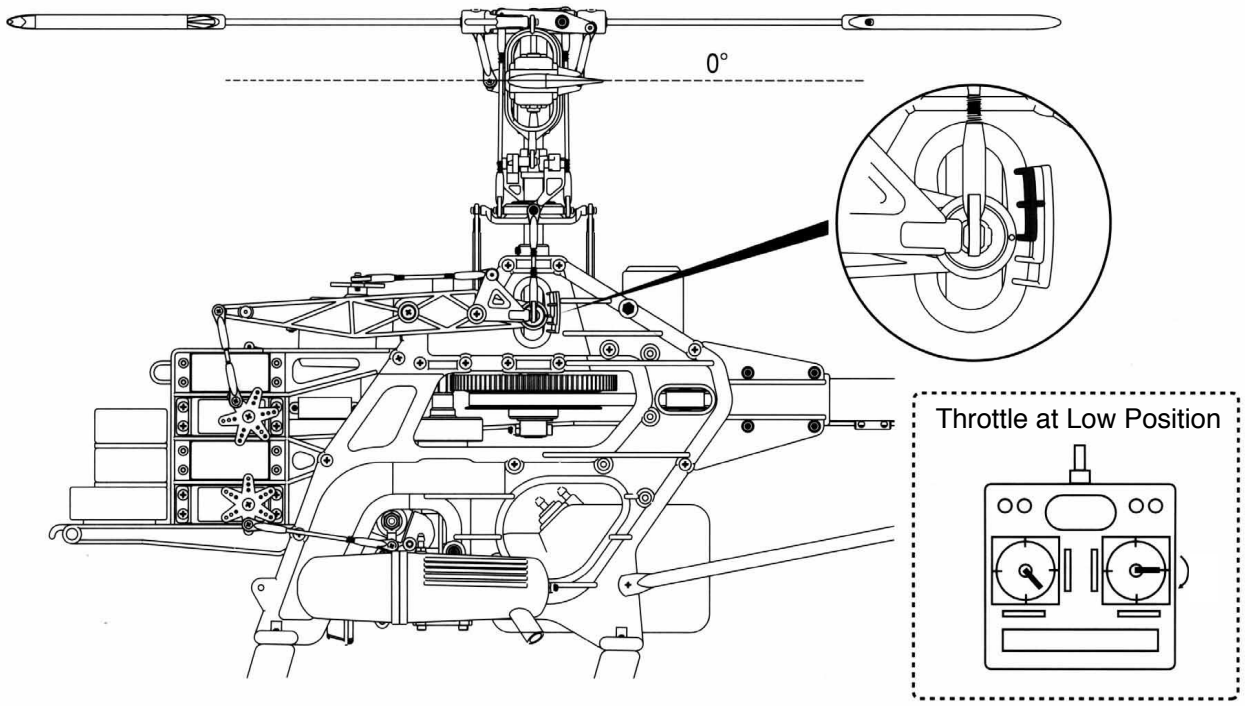
6˚ hovering pitch angle is used for beginners, intermediates and experts. The throttle/collective must be in the center position when adjusting the collective pushrod length to make the "point" line up with the 6˚ hover point on the molded scale (see above diagrams).

■ 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

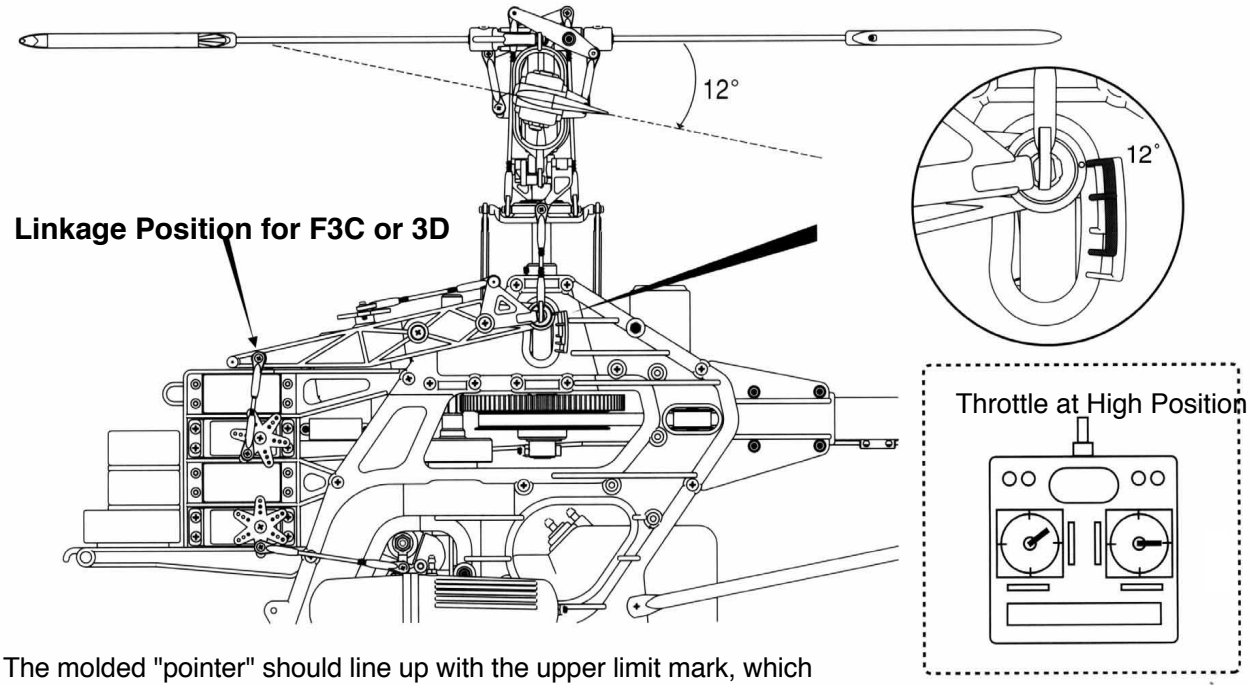


● Move the throttle/collective stick to the low stick position. Use the ATV function of your transmitter to make the "pointer" line up with the 0˚ mark for beginners (with the -4˚ mark for intermediates, and -8-degree mark for experts).

Collective Travel for F3C and 3D Flying

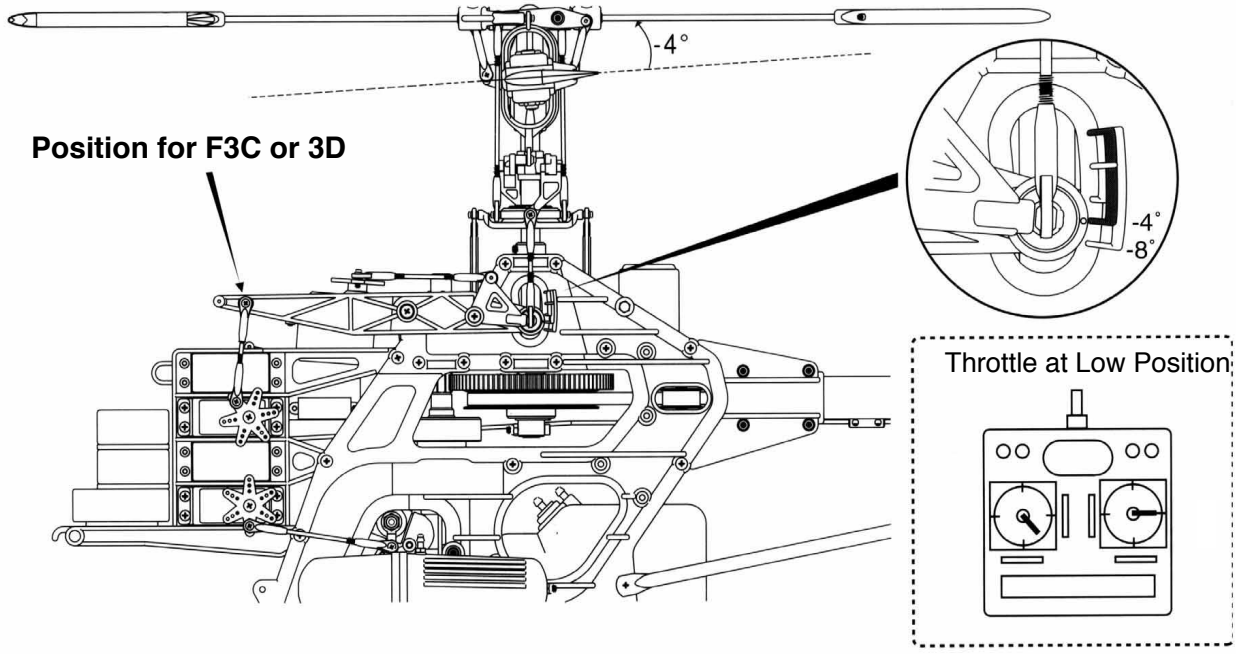
- To achieve +12˚ to -8˚ of collective travel range, the steel linkage ball must be moved to the inner location as shown in the figure.
- Use ATV function of the transmittler to get the necessary servo travel.

■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



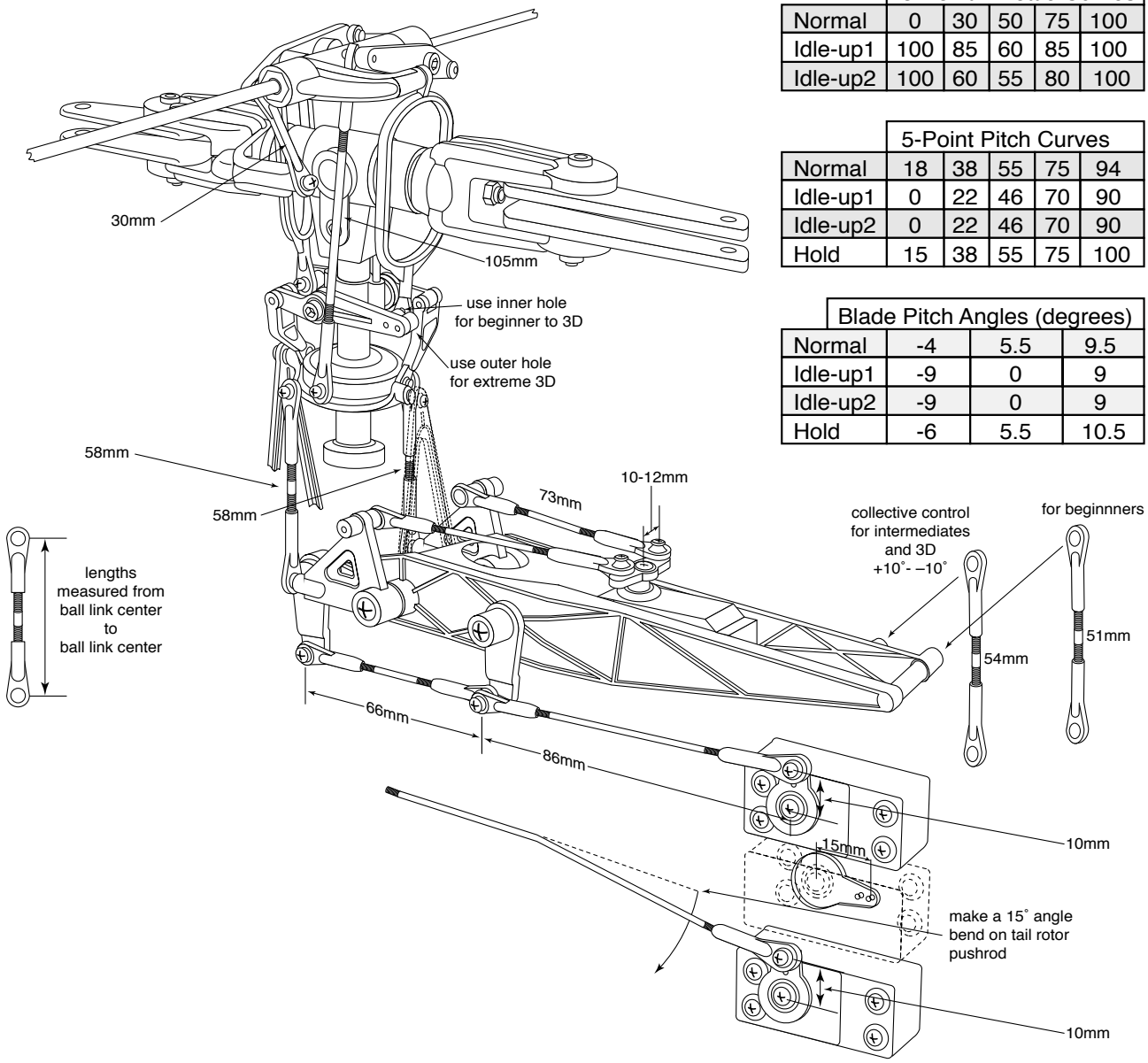
For intermediates set the low end to -4˚. For advanced F3C and 3D flying, set the low end to -8˚.

CONFIGURING THE RAPTOR FOR 3D

	5-Point Throttle Curves				
Normal	0	30	50	75	100
Idle-up1	100	85	60	85	100
Idle-up2	100	60	55	80	100

	5-Point Pitch Curves				
Normal	18	38	55	75	94
Idle-up1	0	22	46	70	90
Idle-up2	0	22	46	70	90
Hold	15	38	55	75	100

	Blade Pitch Angles (degrees)		
Normal	-4	5.5	9.5
Idle-up1	-9	0	9
Idle-up2	-9	0	9
Hold	-6	5.5	10.5



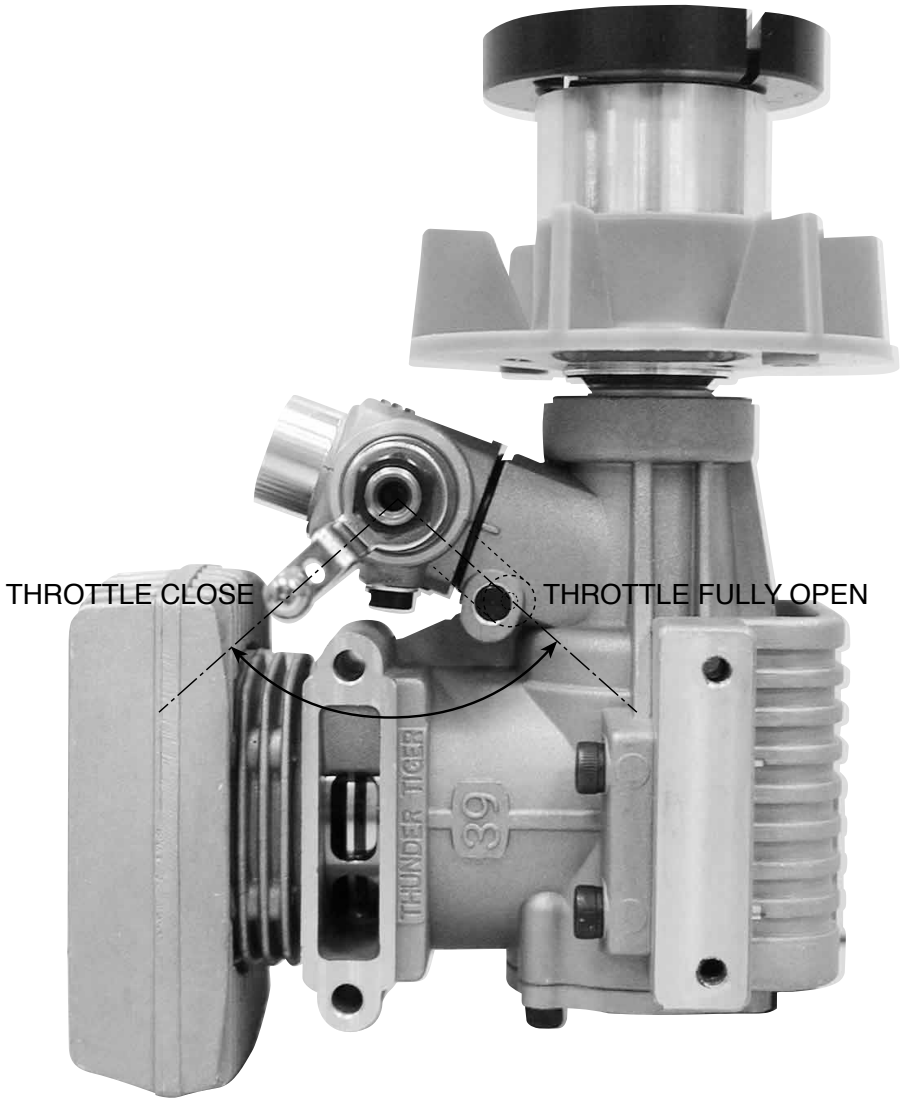
The above pushrod lengths will permit 3D with the Raptor.

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.

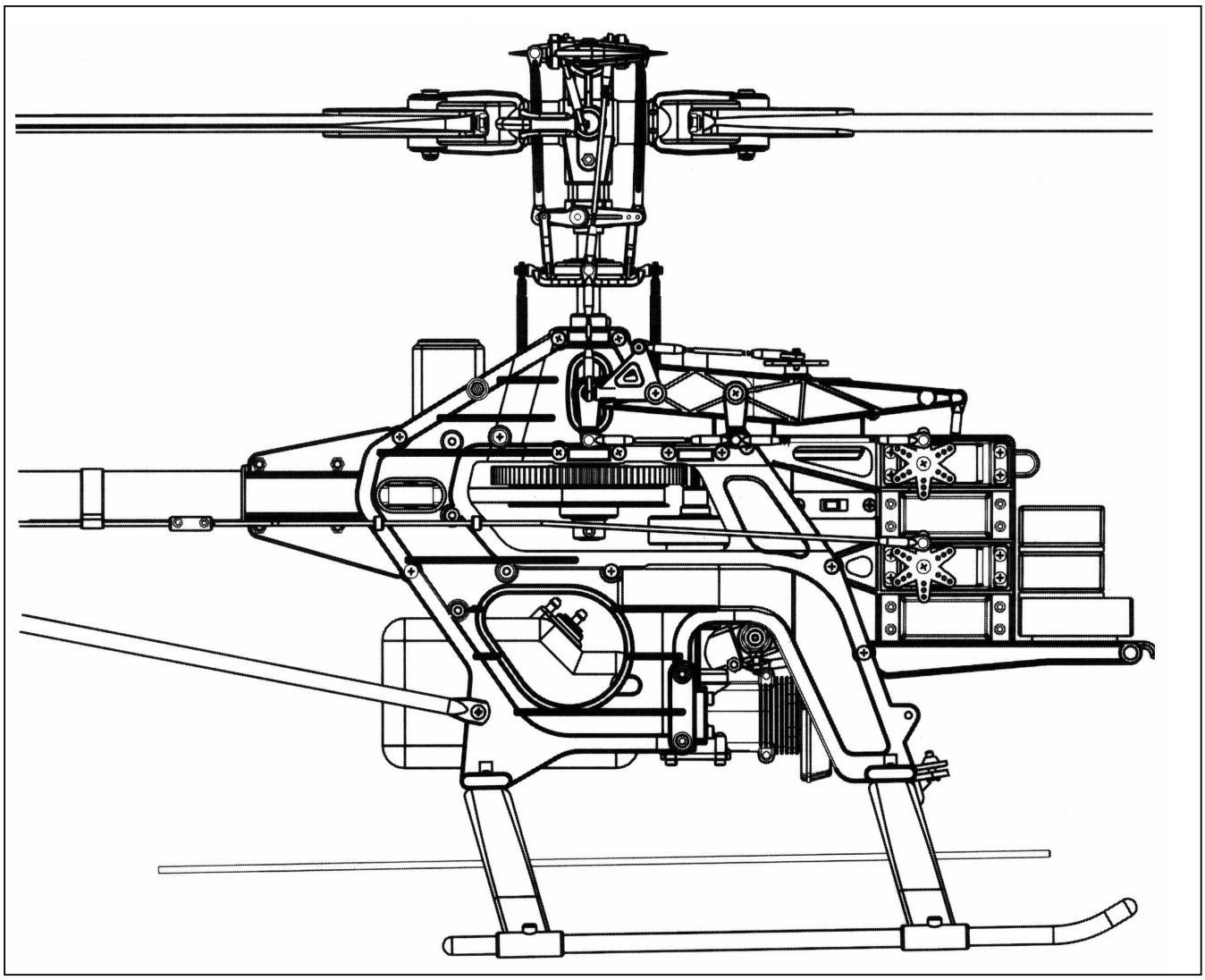
Suggested throttle and collective pitch set up: Idle-up1 is used for continuous 3-D flips and aerobatics. Idle-up2 is used for switchless inverted hover. Use a pitch gauge to check blade angles. It is easier to start setting up idle-up2 blade pitch angles first. Beginners should inhibit idle-up1, idle-up2 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.

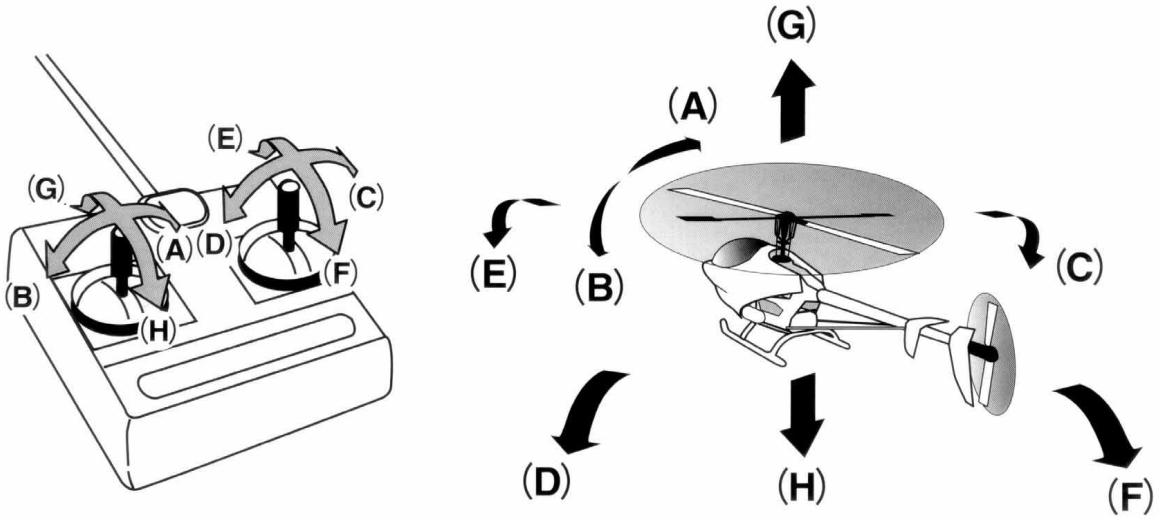


FLIGHT TRAINING SECTION

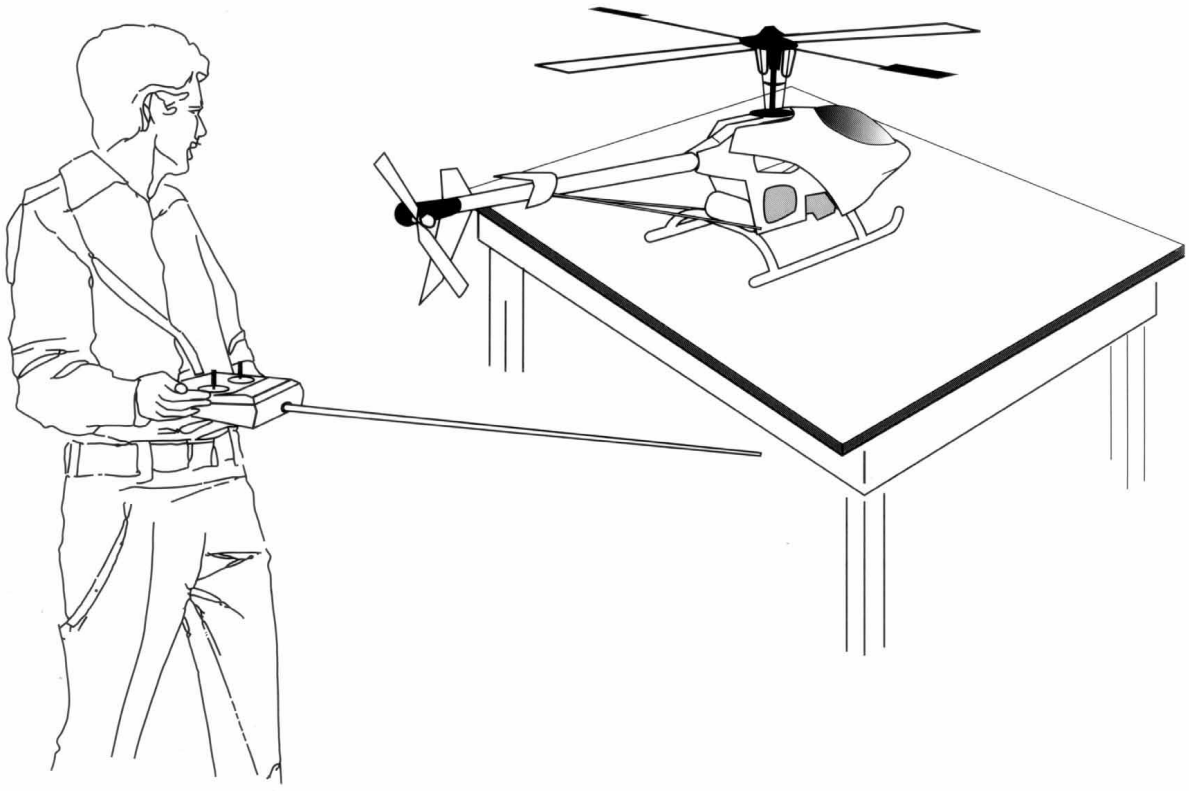


Preflight Adjustments

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.



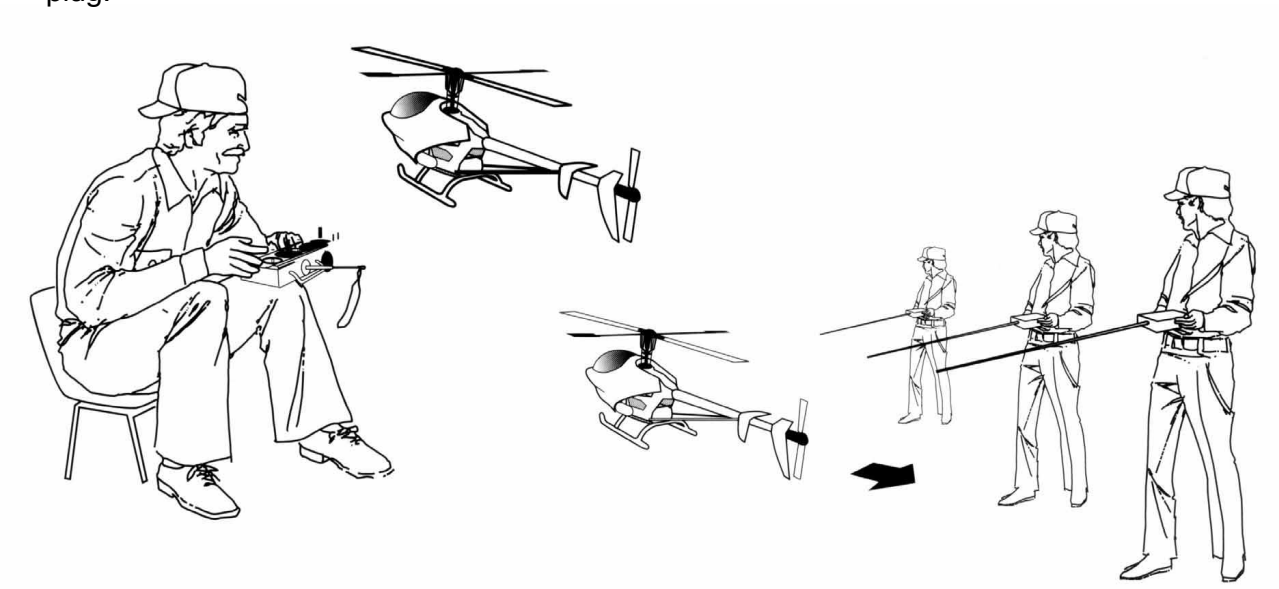
Preflight Checklist and Starting Procedure

(1) Check to make sure there is no radio interfence before operating the model helicopter.

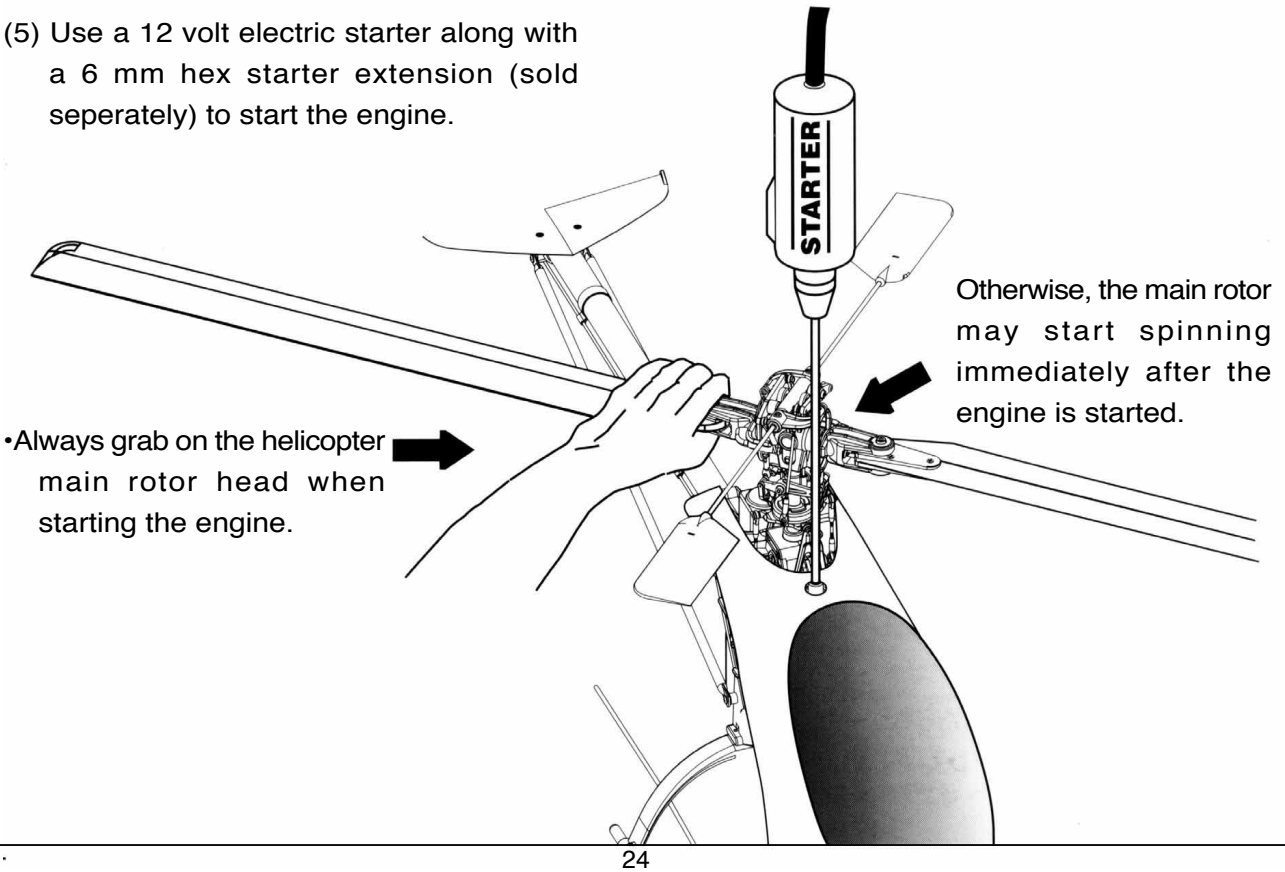
(2) Make sure the transmitter and receiver are on and all controls operate properly before flight. Range check the radio.

(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 seperately) to start the engine.



•Always grab on the helicopter main rotor head when starting the engine.

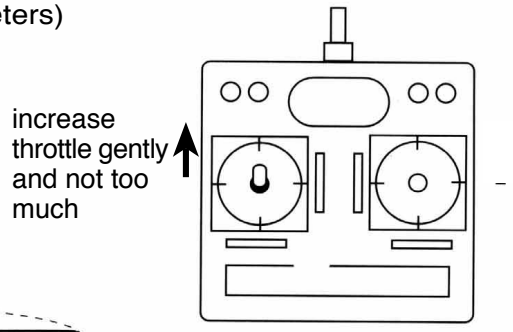
Otherwise, the main rotor may start spinning immediately after the engine is started.

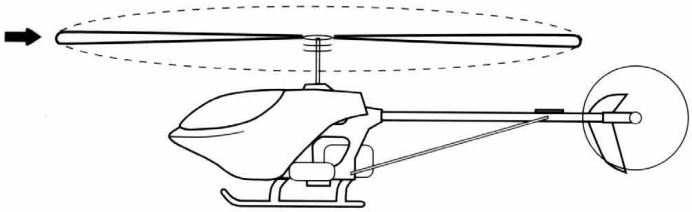
Flying Adjustments (1)

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

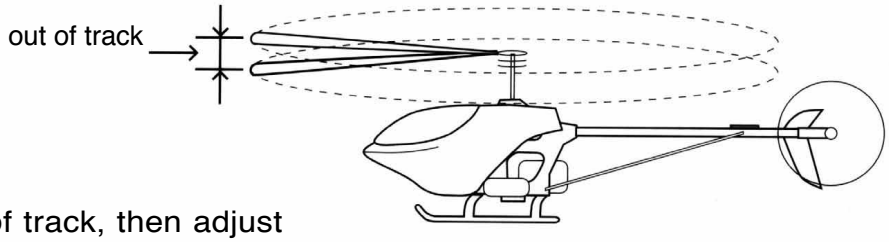
(1) Rev up the motor until the helicopter becomes light on its skids. Stand about 15 feet(4 meters) alway from the helicopter.

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



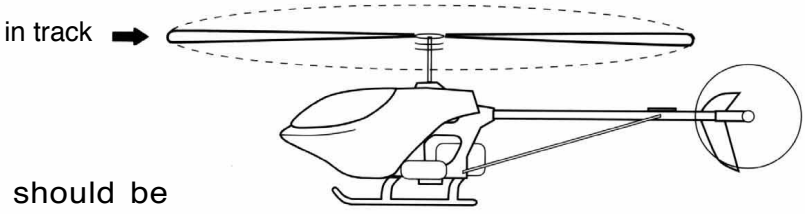


(3) When both blades are in track, the blade tips will appear to overlap as seen from the edge of the rotor plane.



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.

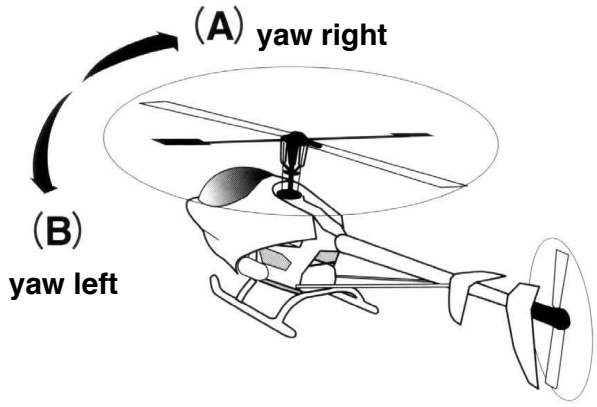


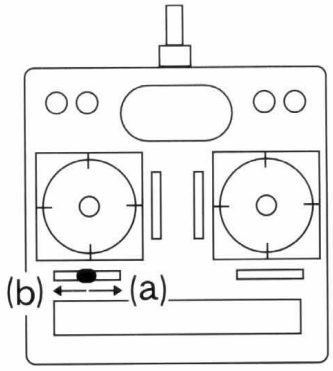
In hover, the main blades should be around 5.5 to 6 degrees in pitch.

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.

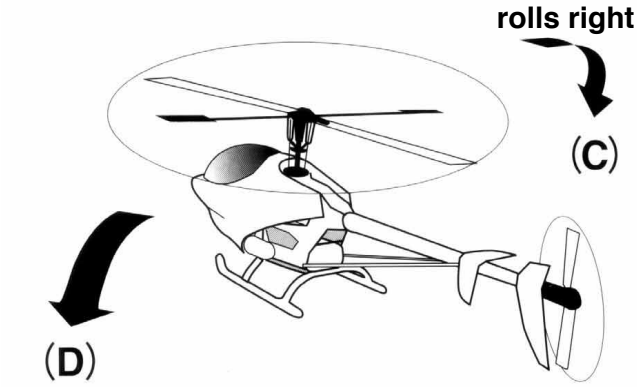
(1) If the helicopter nose starts to yaw left or right, then use the transmitter trim to compensate:

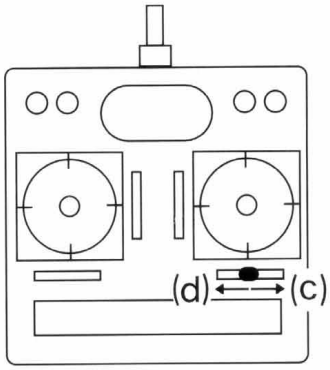




(A) situation: move to (b)
(B) situation: move to (a)

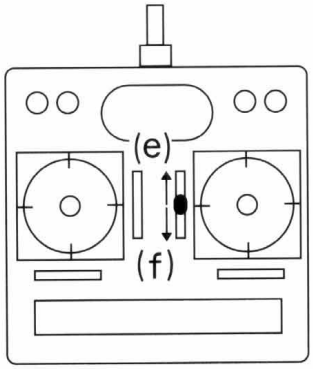
(2) If the helicopter rolls to left or right, then:





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

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

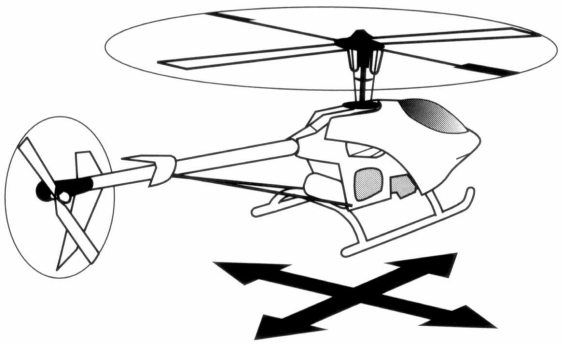


(E) situation: move to (f)
(F) situation: move to (e)

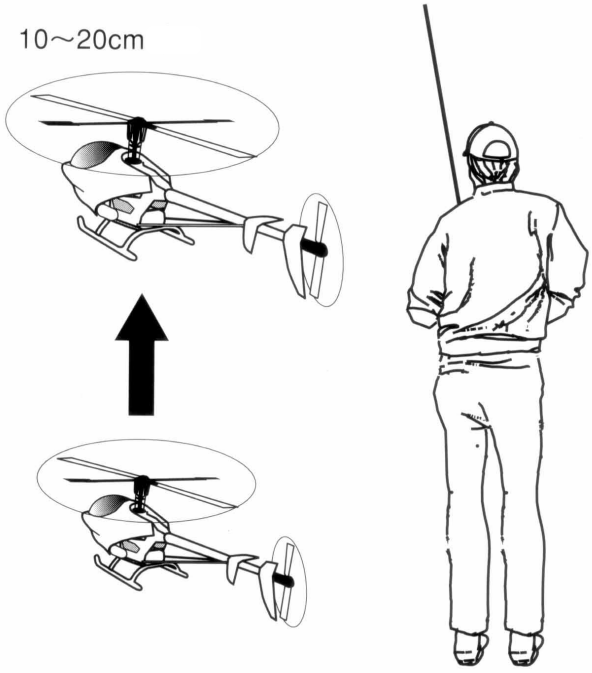
Hover Training (1)

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.



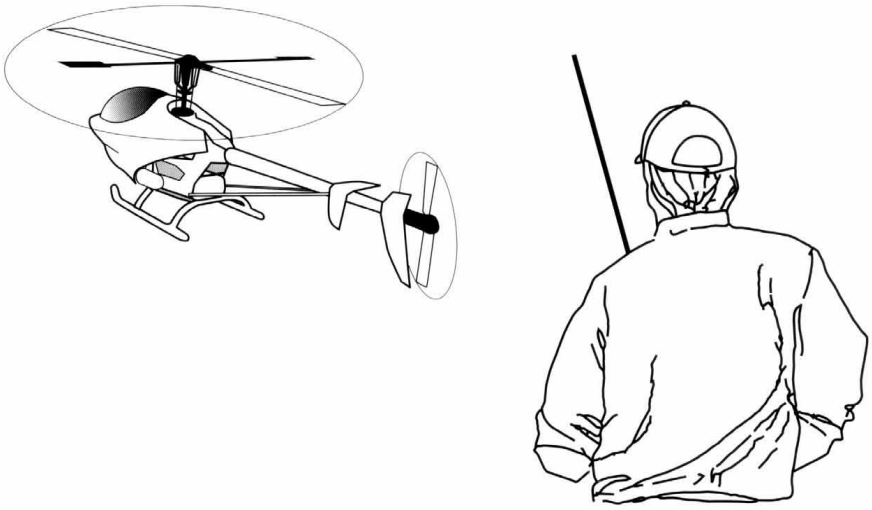
(2) Prior to lifting off, while the main rotor is spinning and the helicopter is on the ground, check the main rotor fore/aft and left/right cyclic to make sure the main rotor is tilting in the correct direction according to your cyclic command. Move the tail rotor control stick to make sure the helicopter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



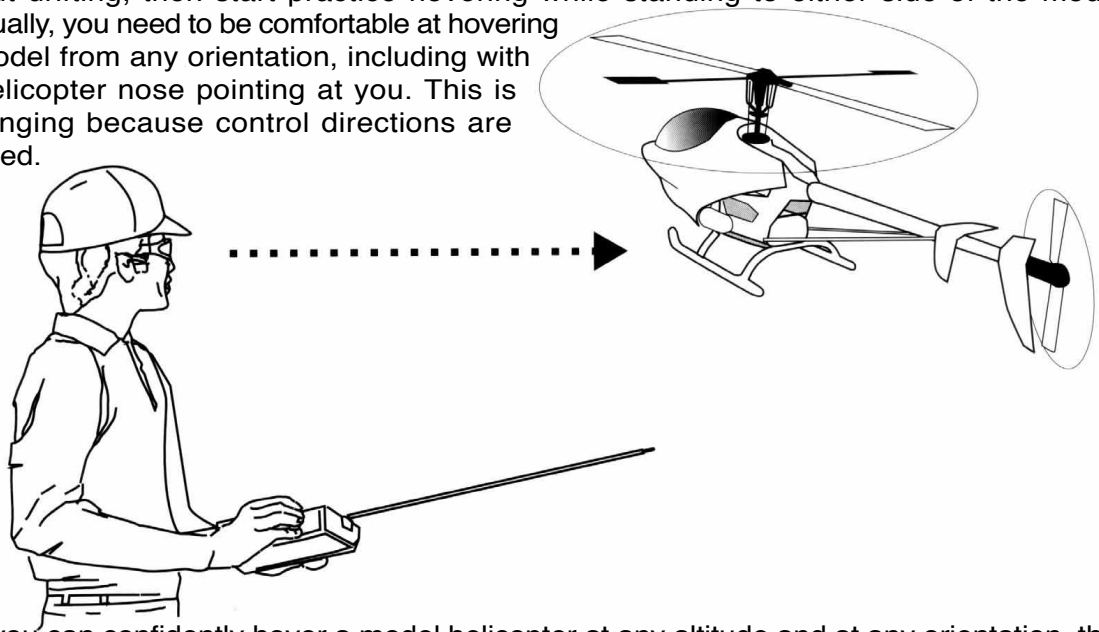
(3) Increase the throttle/collective to lift the model helicopter skids off the ground to no more than 10 cm(4 inches). Initially, it will be very difficult to control the model to prevent it from moving. For a beginner it will also be difficult to determine whether the helicopter is in trim or not. 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.

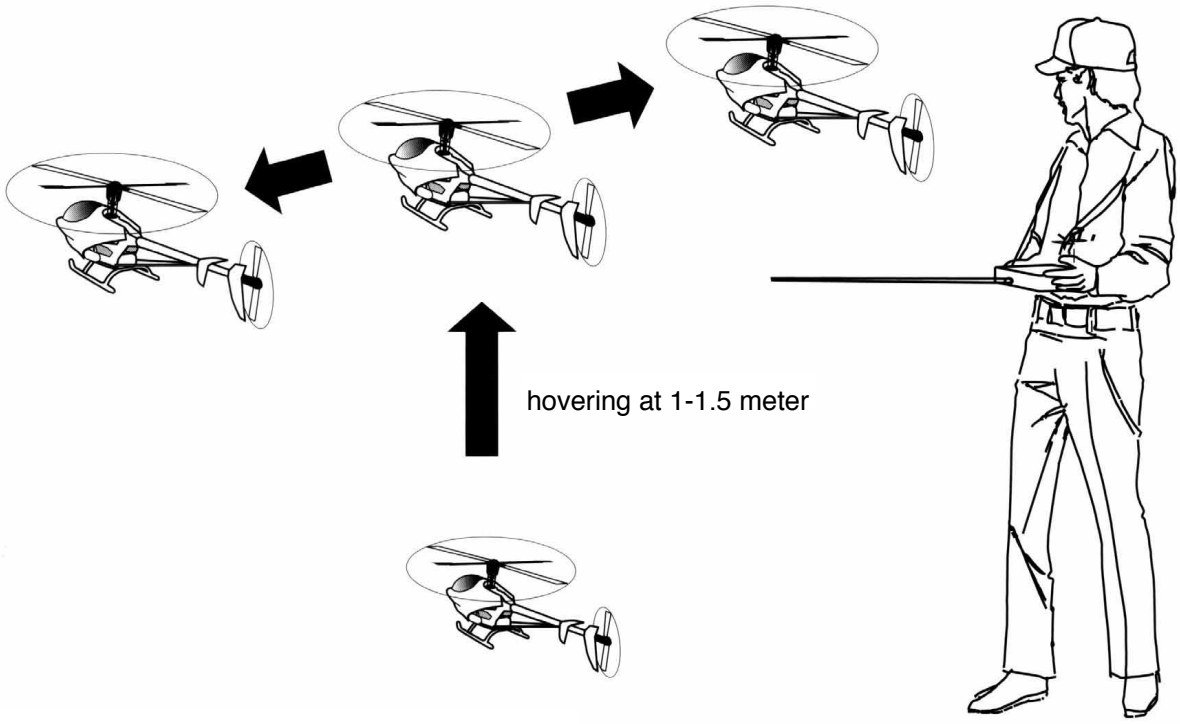


(3) Once you can confidently hover a model helicopter at any altitude and at any orientation, then congratulate yourself because you have mastered 80% of the fundamental control movements of a helicopter.

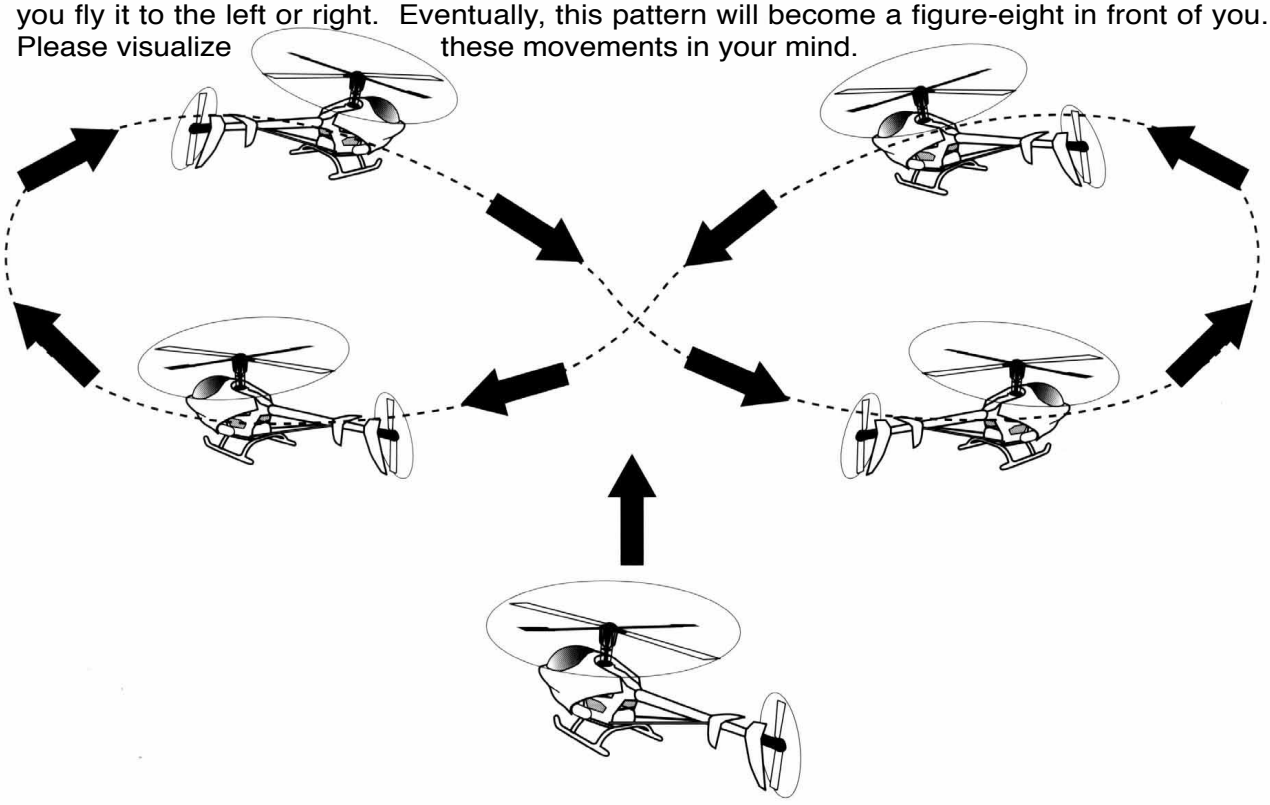
Forward Flight Training

After mastering hovering flight:

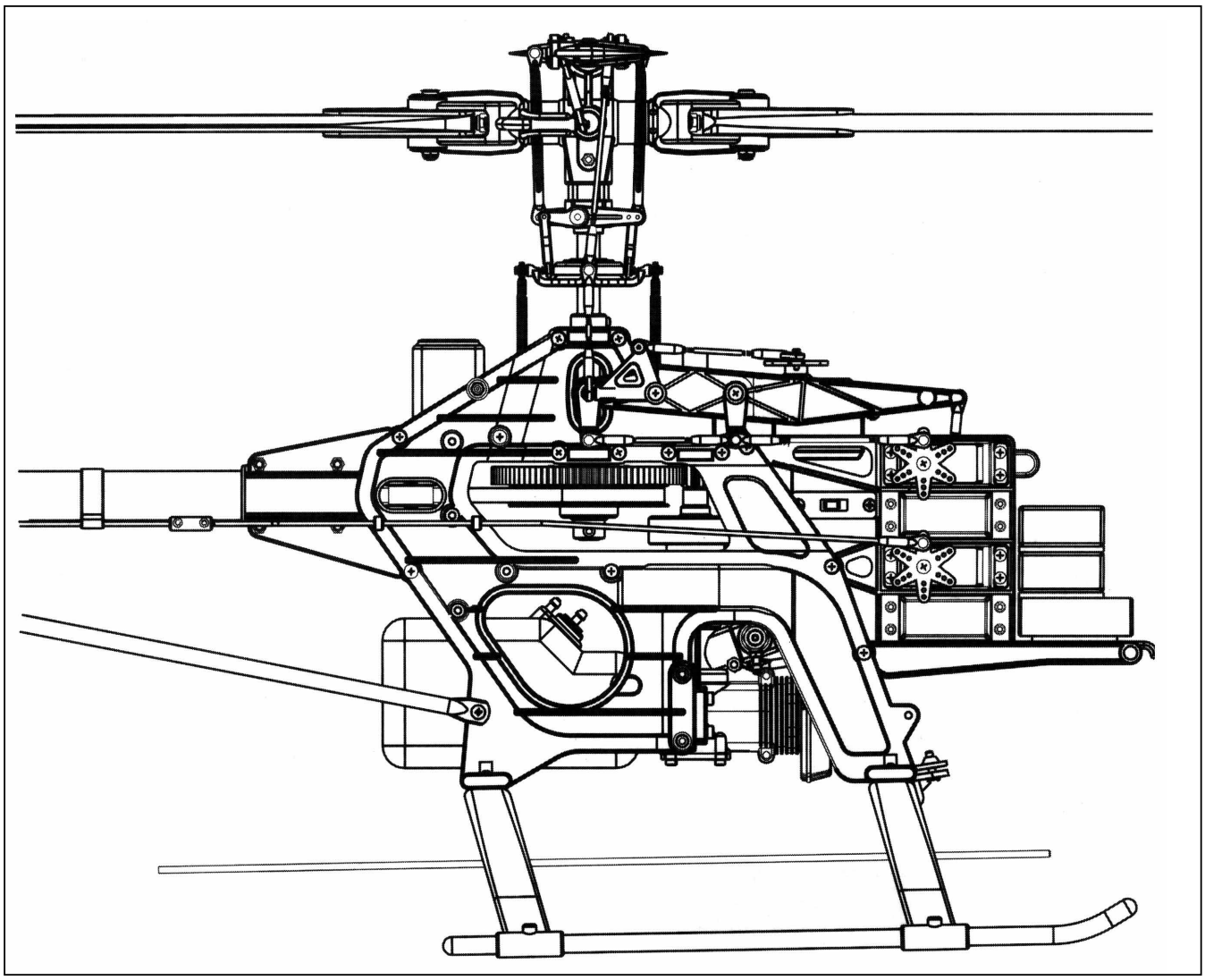
(1) Start practicing moving the helicopter laterally to the left or right slowly from a 1.5 meter (60 inches) high hover. This is the beginning exercise of translational flight.



(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, 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 proper needle setting.
(3) Does the throttle control arm move properly and in the correct direction according to 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 one that suits your operating condition best.

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

(1) Check the main rotor blade pitch angle, it 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 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 may be 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.

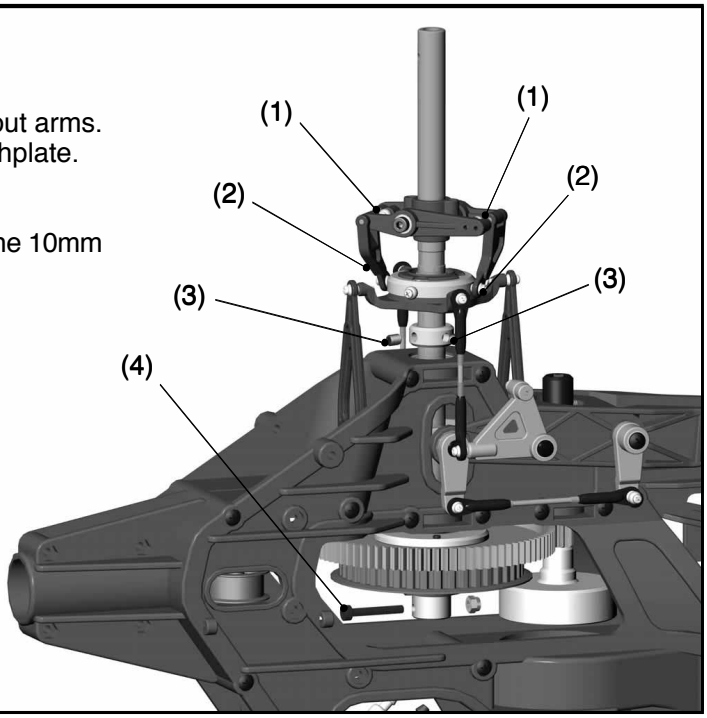
(1) Is the blade spindle bent?
(2) Is the flybar bent?
(3) Is the main rotor shaft bent?
(4) Are the two control paddles mounted at the same distance from the rotor shaft, are the paddles parallel to each other, and in the proper direction?
(5) Is the tail rotor shaft bent? The tail rotor blades mounted 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 4 mm 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.

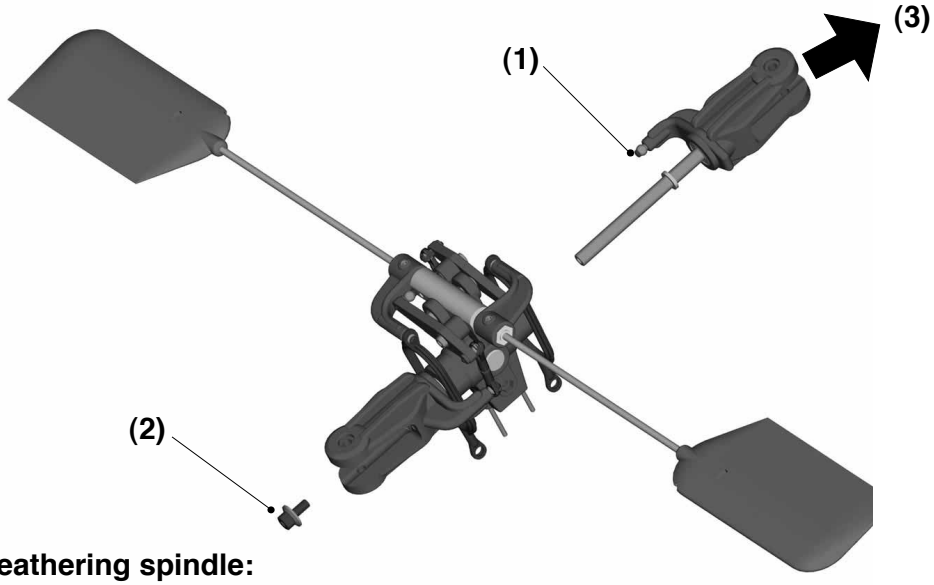
In the event the model has crashed.

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 swashplate.
(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.



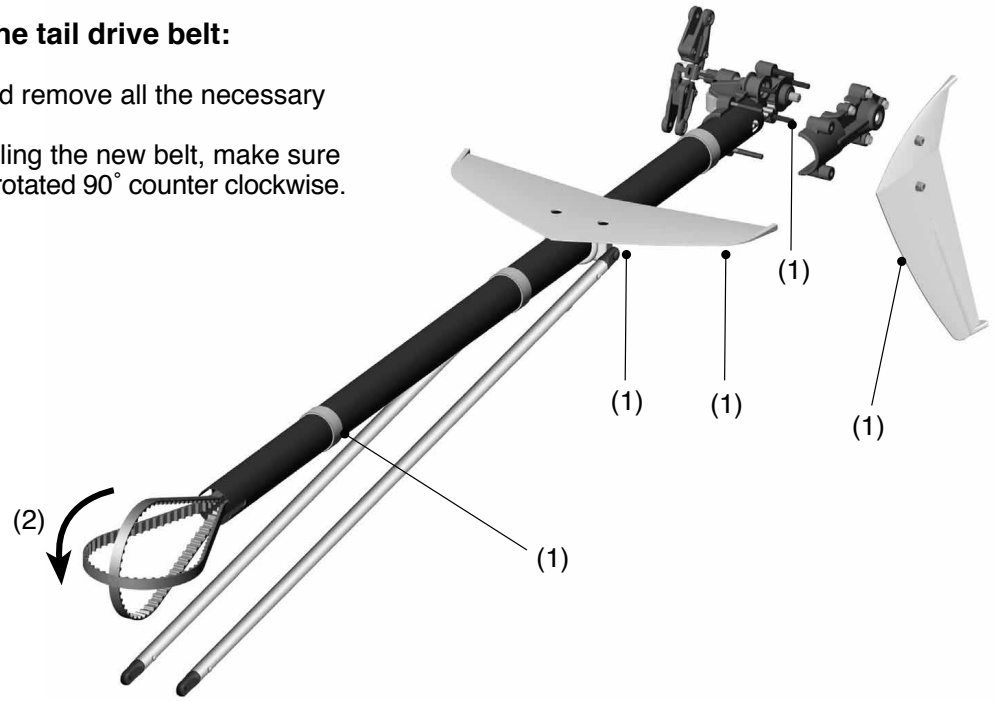


Changing the blade feathering spindle:

(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:

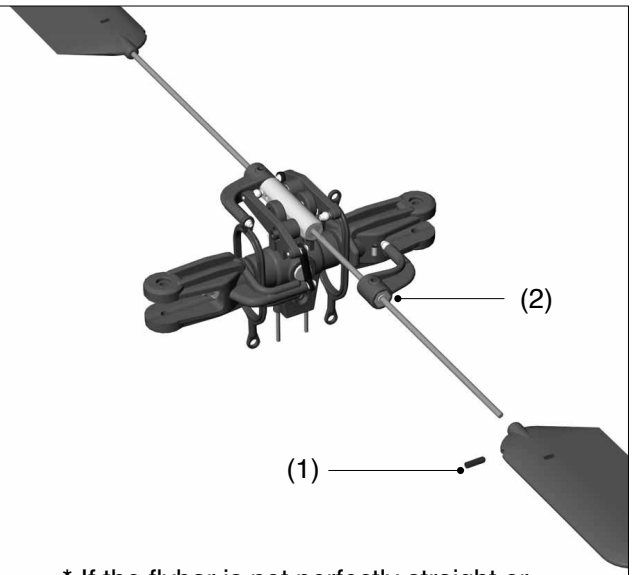
(1)Loosen and remove all the necessary screws.
(2)After installing the new belt, make sure the belt is rotated 90˚ counter clockwise.



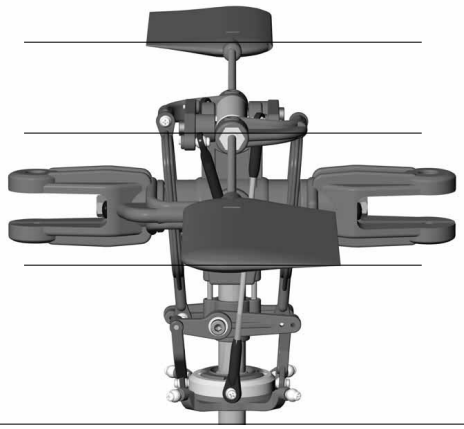
Changing the flybar:

(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.



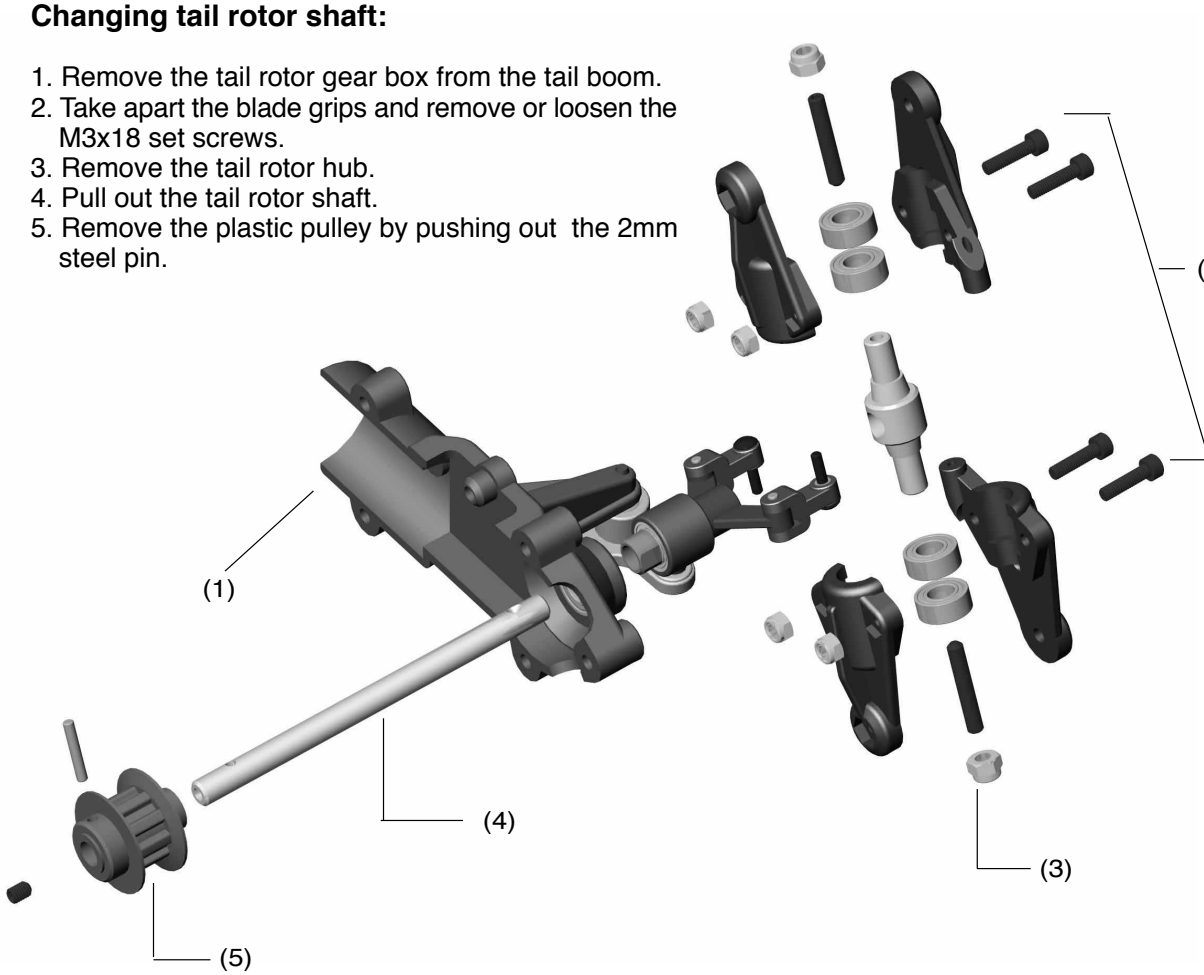
* Make sure the distance from the rotor shaft to both paddles are the same.

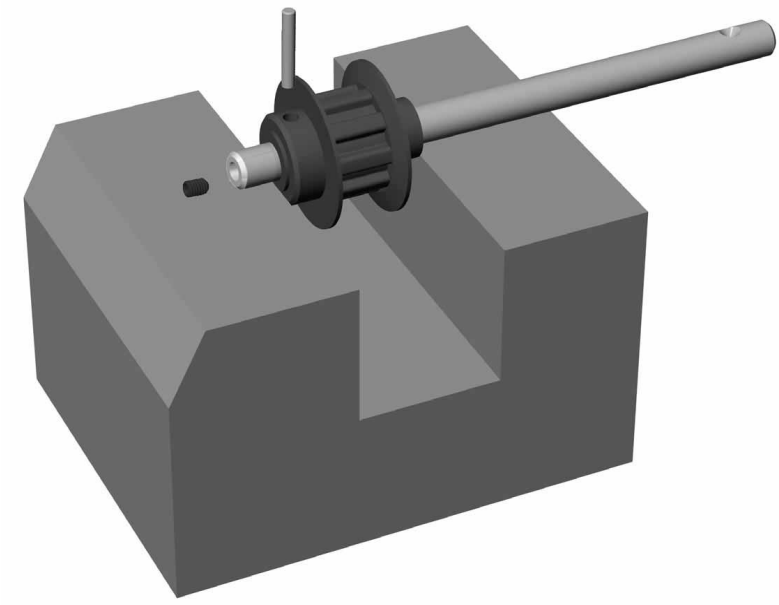


* If the flybar is not perfectly straight or smooth, it can be lightly sanded.

Changing tail rotor shaft:

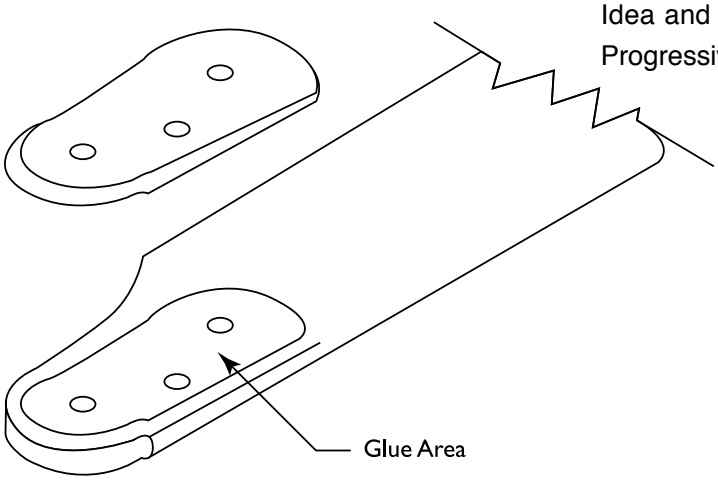
1. Remove the tail rotor gear box from the tail boom.
2. Take apart the blade grips and remove or loosen the M3x18 set screws.
3. Remove the tail rotor hub.
4. Pull out the tail rotor shaft.
5. Remove the plastic pulley by pushing out the 2mm steel pin.

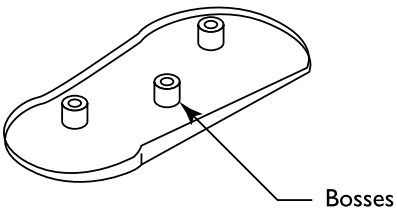




Blade Modification

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



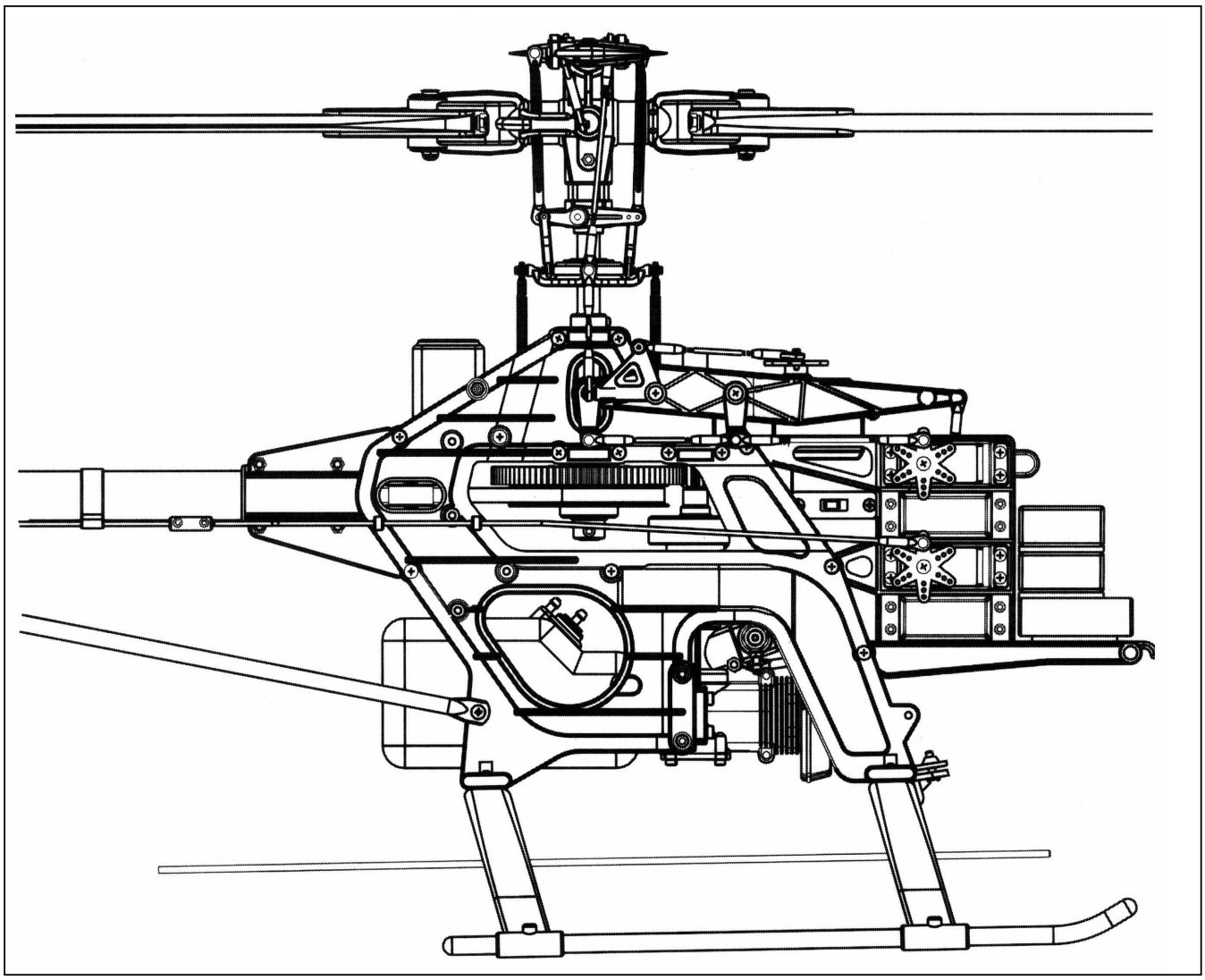


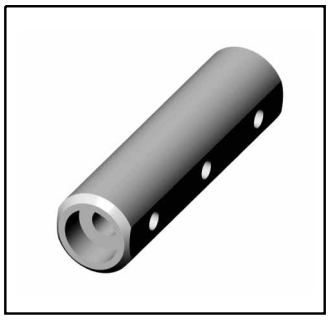
1. Mark around blade grips with a felt-tip marker.
2. Remove blade grips and cut covering lightly .125” inside of mark, being careful not to cut into the blade.
3. Repeat for opposite side.
4. Trim bosses if necessary to allow tight fit to the blades.
5. Lightly sand inside of grips for better adhesion. 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:

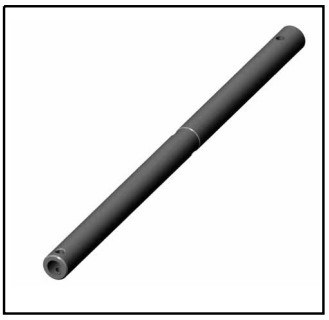
The stock wood blades should be operated with a main rotorspeed of no more than 1700 RPM. If the blades are going to be operated at more than 1700 RPM, such as for aerobatics, then it is recommended reinforcing the blade root section with epoxy. The enclosed drawing illustrates how to remove the plastic 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 rotorspeed is around 1550 RPM. For advanced fliers, a good hovering RPM is around 1550, and a constant 1800RPM in idle-up for 3-D aerobatics. We recommend using the Thunder Tiger TR-2000 optical tachometer to help you check the rotorspeed and to help you set the engine mixture. This tachometer is especially helpful for the beginners and we highly recommend it.

PARTS LIST SECTION

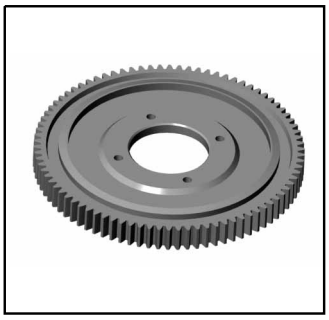




AK0004 Flybar Seesaw



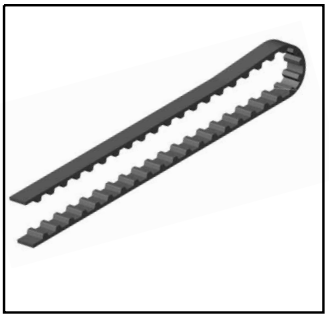
AK0029 Main Shaft



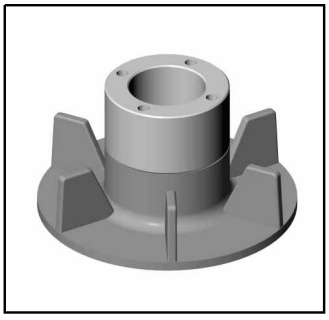
AK0031 Main Spur Gear

AK0032 Tail Drive Pulley

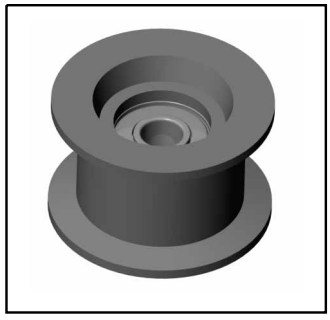
AK0060 Tail Boom



AK0089 Tail Drive Belt



AV0038 Cooling Fan Assy.

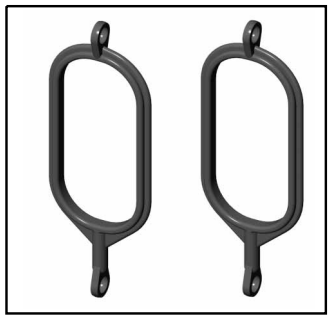


AV0052 Tail Idel Pulley Assy.

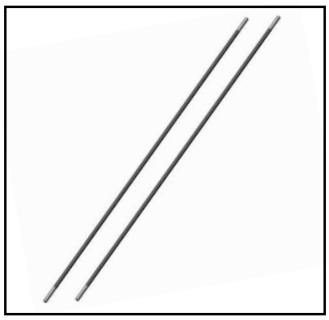
No.9219 Muffler

PV0002 Flybar Control Arm

PV0004 Mixing Lever

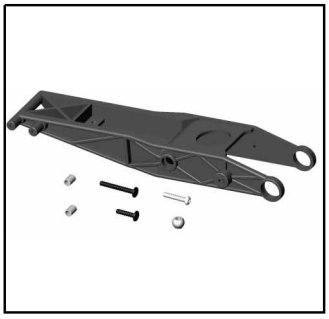


PV0005 Flybar Control Rod



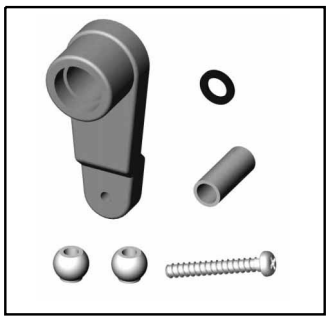
PV0008 Flybar Rod

PV0011 Wash Out Set

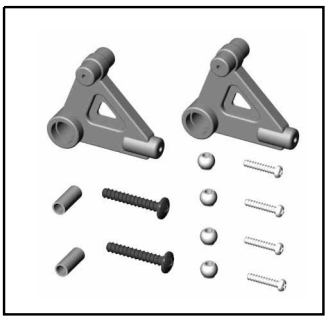


PV0012 Pitch Control Arm

PV0013 Elevator Arm



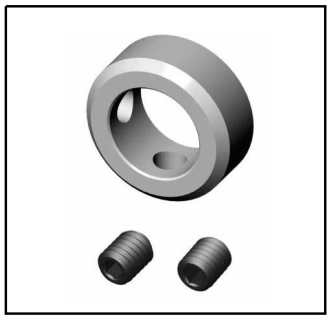
PV0014 Elevator Lever



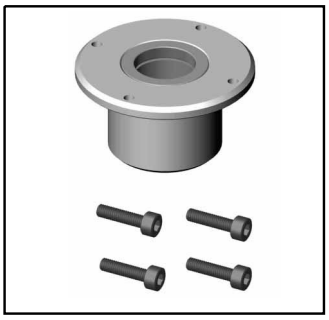
PV0015 Aileron Lever

PV0016 Tail Pitch Control Lever

PV0017 Tail Pitch Slider

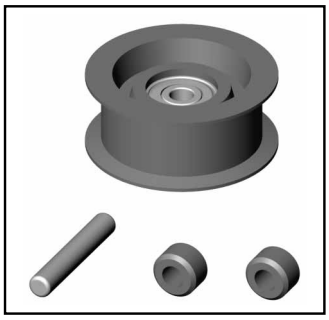


PV0018 Main Shaft Lock Ring



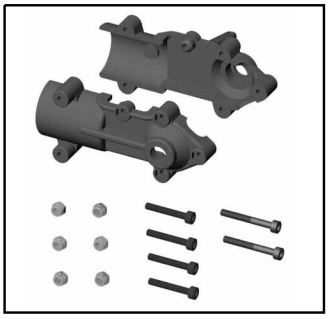
PV0019 One Way Clutch

PV0020 One Way Clutch Shaft

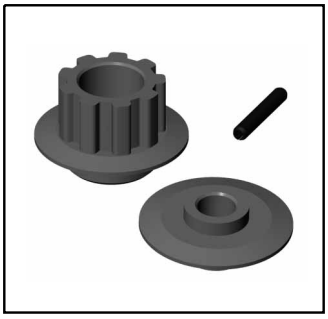


PV0021 Guide Pulley Assy

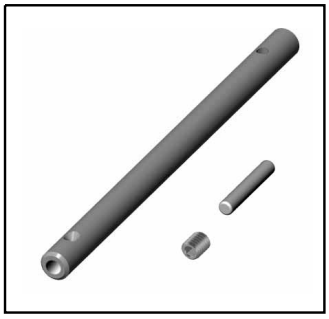
PV0022 Engine Mount



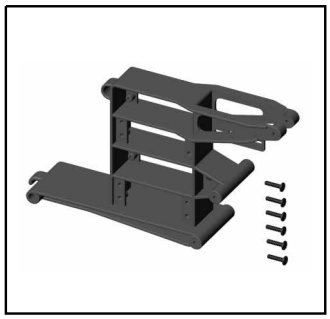
PV0027 Tail Case



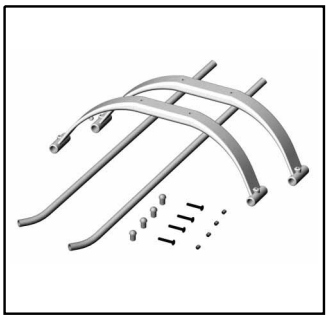
PV0029 Tail Pulley Set



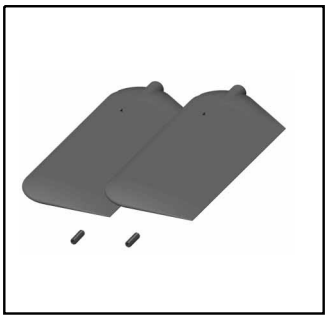
PV0030 Tail Rotor Shaft



PV0033 Servo Frame

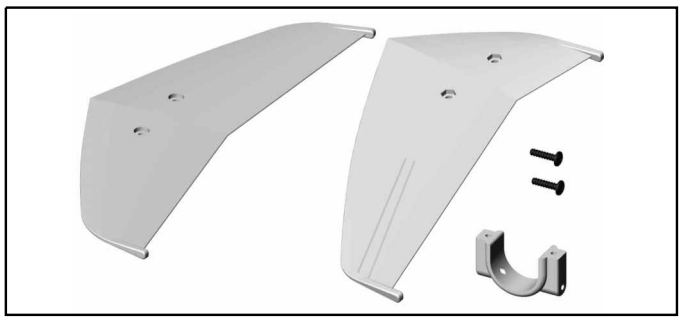


PV0035 Landing Skid set

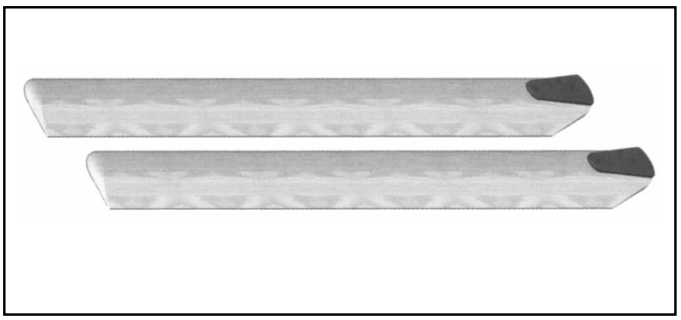


PV0036 Flybar Paddle

PV0037 Tail Rotor Blade

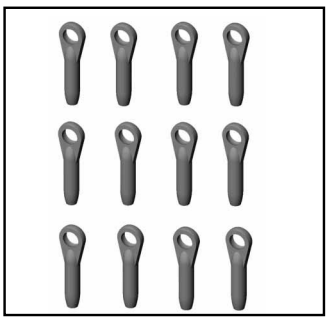


PV0038 Tail Fin

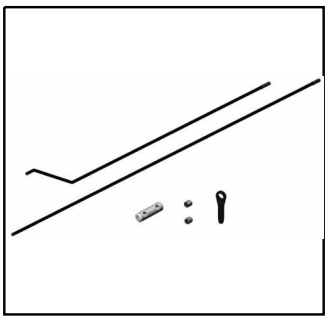


PV0039 Main Rotor Blades

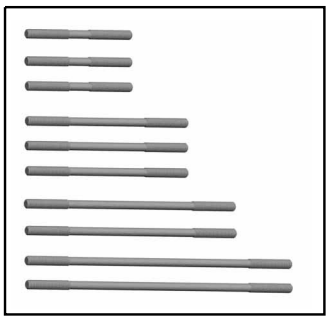
PV0040 Double Link



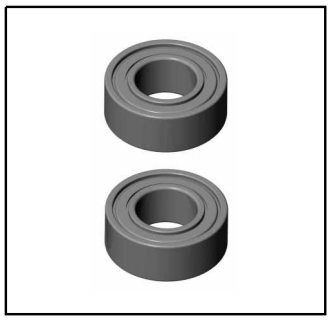
PV0041 Ball Link



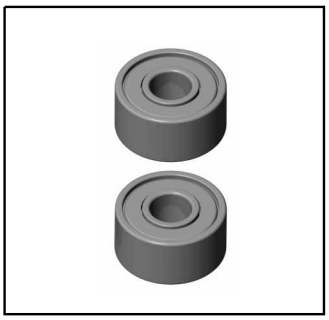
PV0043 Tail Control Rod



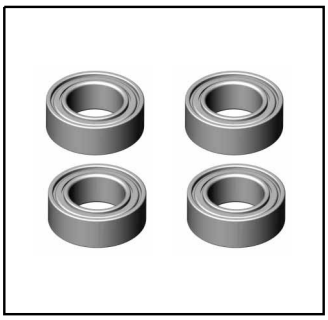
PV0044 Linkage Rod



PV0048 Pitch Frame/Rotor Hub Seesaw Brg.

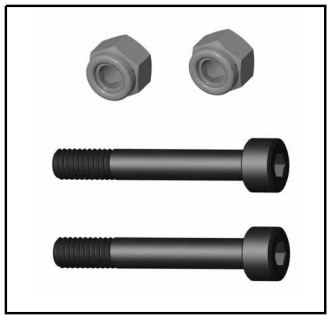


PV0049 Seesaw Brg.

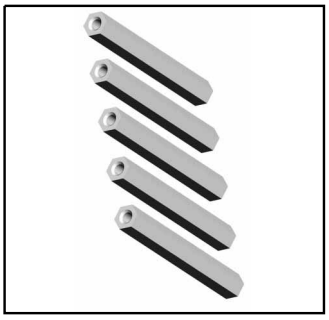


PV0051 Lever Brg.

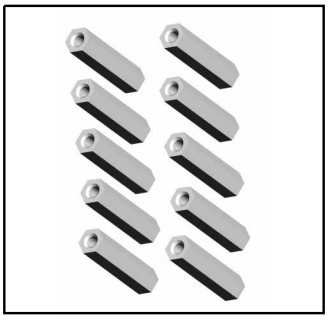
PV0052 Tail Slider Brg.



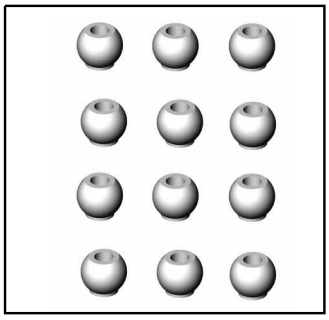
PV0053 Rotor Bolt



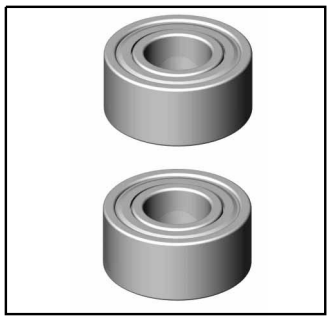
PV0056 Frame Spacer(L)



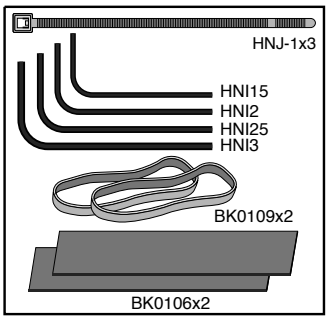
PV0057 Frame Spacer(S)



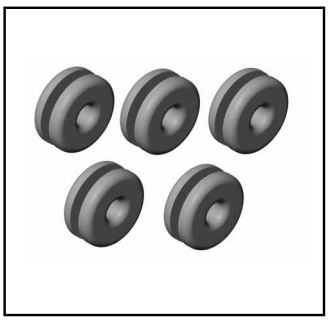
PV0058 Linkage Ball



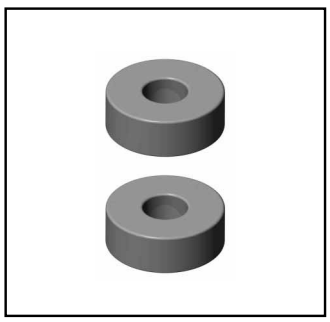
PV0059 Tail Shaft Brg.



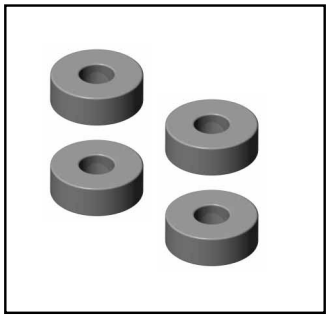
PV0060 Installation Set



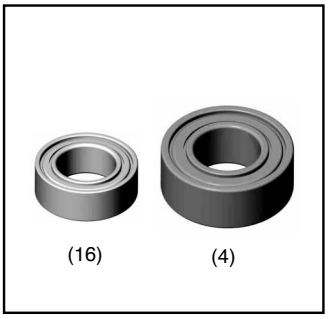
PV0062 Body Mount Rubber Grommets



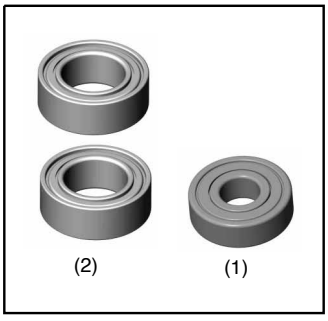
PV0063 Pitch Frame/Rotor Hub Seesaw Bushing



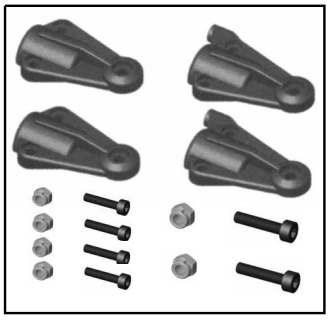
PV0064 Lever Bushing



PV0091 Bearing Upgrade Kit

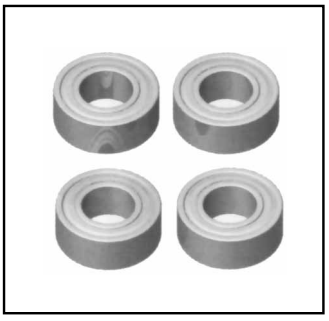


PV0093 Main Shaft Brg

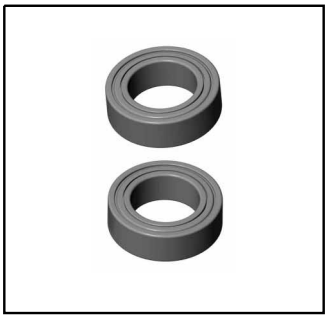


PV0148 Tail Rotor Grip

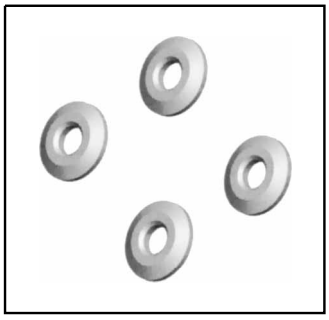
PV0151 Tail Rotor Hub



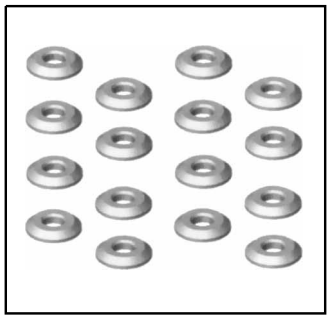
PV0200 Tail Rotor Brg.



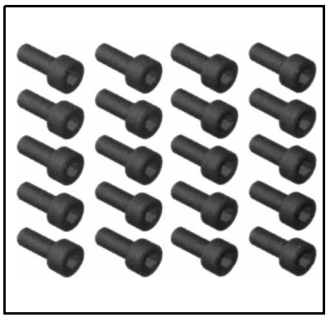
PV0203 Starter Shaft Brg.



PV0209 Washer Bag



PV0210 Washer Bag



PV0223 ScrewBag

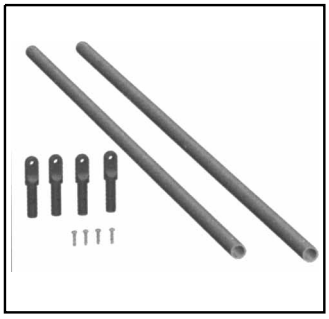
PV0267 Loctite #242

PV0268 Loctite #262

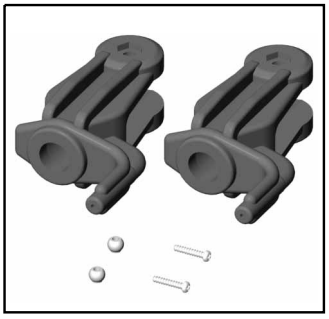
PV0269 Grease (For Plastic Gear)

PV0270 Grease (For Bearing)

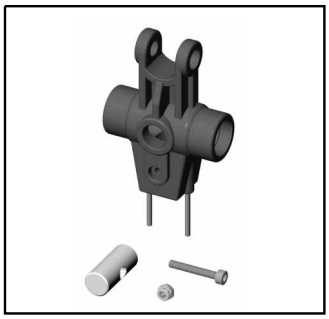
PV0279 Tail Rod Guide



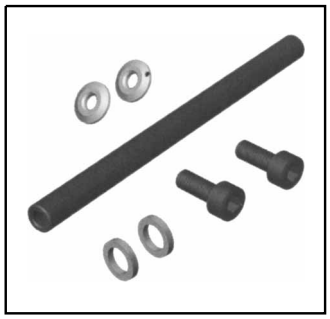
PV0328 Tail Support



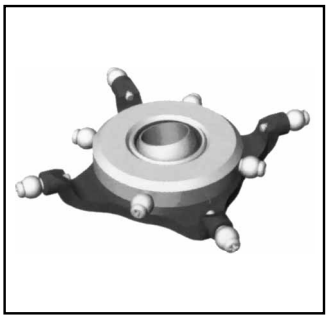
PV0353 Main Rotor Grip



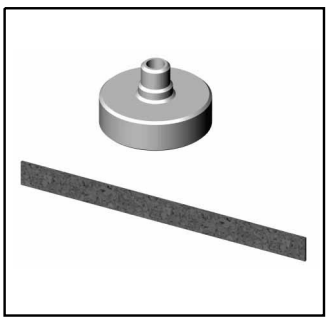
PV0354 Main Rotor Hub



PV0355 Spindle

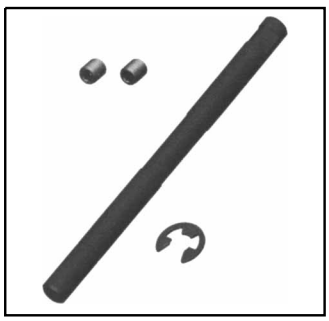


PV0357 Swash Plate Assy.



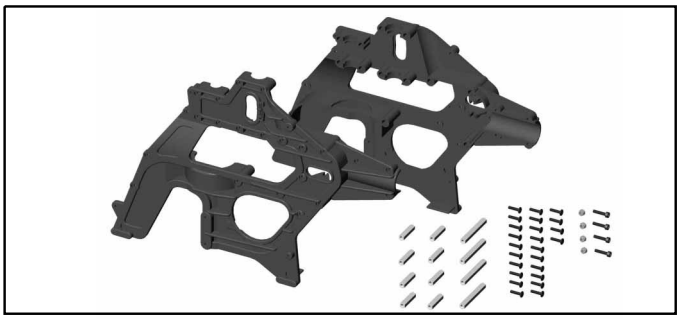
PV0358 Clutch Bell

PV0359 Clutch

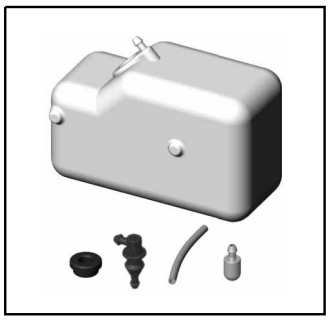


PV0360 Starter Shaft

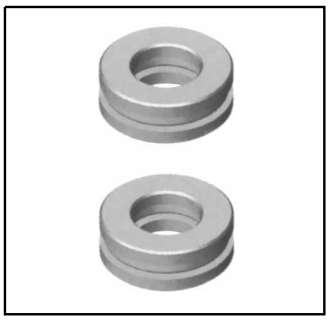
PV0361 Starter Coupling



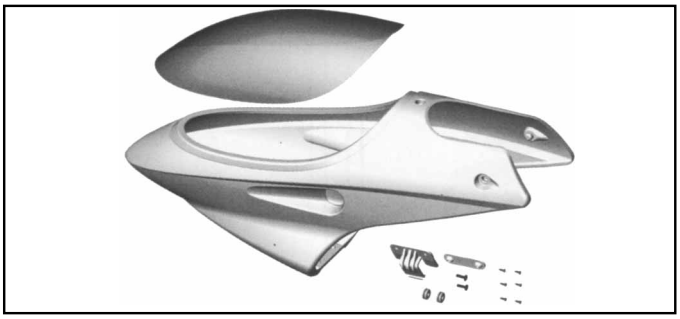
PV0362 Main Frame Set



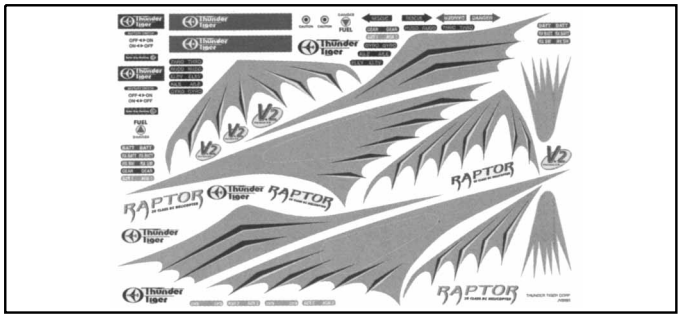
PV0363 Fuel Tank



PV0365 Thrust Brg.

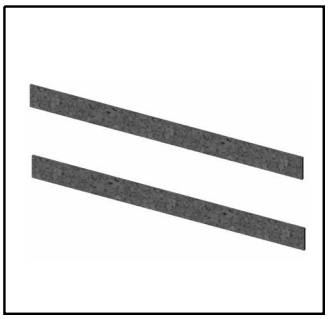


PV0364 Body

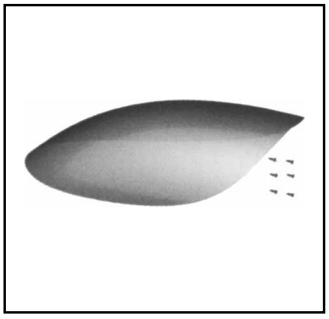


PV0366 Decal

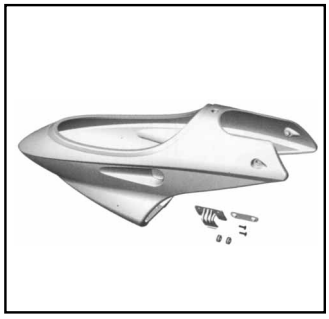
PV0367 Pinion Gear (9T)



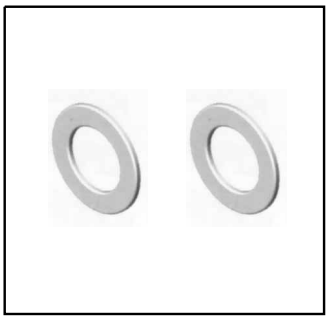
PV0368 Clutch Liner



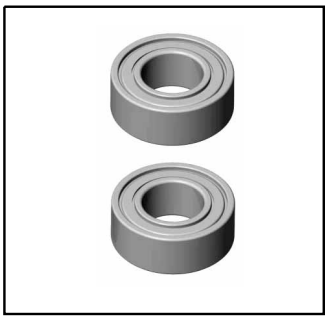
PV0369 Canopy Only



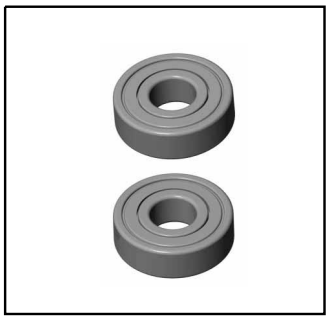
PV0370 Body Only



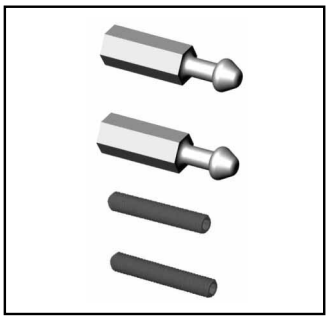
PV0372 Thrust Collar



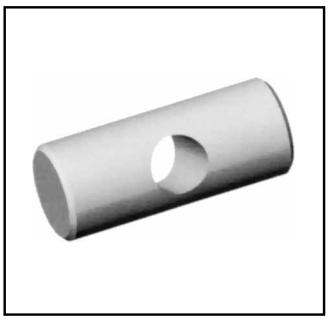
PV0373 Clutch Bell Brg.



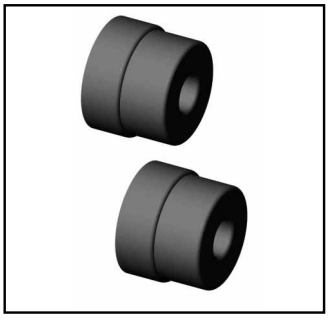
PV0374 Feathering Brg.



PV0375 Body Retaining Set



PV0376 Main Rotor Pin



PV0381 Flap Damper (70)

	HMF2-6N M2X6 HMF2-8N M2X8
	HMJ2-10N M2X10 HMJ2-14N M2X14 HMJ2-6B M2X6 HMJ3-22B M3X22
	HSE2-10B M2X10 HSE2612N M2.6X12 HSE3-12B M3X12 HSE3-18B M3X18
	HSE3-5B M3X5

PV0088 Screw Bag (6pcs each)

	HMC3-10B M3X10 HMC3-12B M3X12 HMC3-14B M3X14 HMC3-20B M3X20 HMC3-25B M3X0.5L25 HMC3-32B M3X0.5XL32 HMC3-8B M3X8 BK0616 M3X20
	HME3-10B M3X10 HME3-18B M3X18 HME4-5B M4X5

PV0089 Screw Bag (6pcs each)

Parts No.	Description	Item No.	Description	quantity	Reference Assemble Step
AK0004	Flybar Seesaw	BK0004	Flybar Seesaw Hub	1	11
AK0029	Main Shaft	BK0029	Main Shaft	1	7
AK0031	Main Spur Gear	BK0031	Main Spur Gear	1	4
AK0032	Tail Drive Pulley	BK0032	Tail Drive Pulley	1	4
AK0060	Tail Boom	BK0060	Tail Boom	1	14
AK0089	Tail Drive Belt	BK0089	Tail Drive Belt	1	14
AV0038	Cooling Fan Assy.	BV0038	Cooling Fan Assy.	1	9
AV0052	Tail Idel Pulley Assy.	BV0052	Tail Idel Pulley	1	14
No.9219	Muffler	BN219	Muffler	1	10
PV0002	Flybar Arm	BK0002	Flybar Control Arm	2	11
		BK0005	Flybar Arm Bushing	2	11
		BK0075	Linkage Ball	2	11
		HME4-5B	Set Screw, M4x5	2	11
		HMJ2-10N	Selftapping Screw, M2x10	2	11
PV0004	Mixing Lever	BK0006	Mixing Lever	2	11
		BK0075	Linkage Ball	4	11
		BK0076	Collar (dxD4xL10)	2	11
		BK0088	Flat Washer	2	11
		HMC3-14B	Socket Screw, M3x14	2	11
		HMJ2-10N	Selftapping Screw, M2x10	4	11
PV0005	Flybar Control Rod	BK0007	Flybar Control Rod	2	11
PV0008	Flybar Rod	BK0010	Flybar Rod	2	11
PV0011	Washout Set	BK0014	Washout Base	1	5
		BK0015	Flybar Control Lever	1	5
		BK0016	Washout Linkage	2	5
		BK0075	Link Ball	2	5
		BK0077	Collar (d3xD4xL6)	2	5
		BK0079	Pin	2	5
		HMC3-10B	Socket Screw, M3x10	2	5
		HMJ2-10N	Selftapping Screw, M2x10	2	5
PV0012	Pitch Control Arm	BK0017	Pitch Control Arm	1	6
		BK0075	Link Ball	1	6
		BK0078	Collar (d3xD4xL4)	2	6
		HMJ2-10N	Selftapping Screw, M2x10	1	6
		HMJ3-22B	Selftapping Screw, M3x22	1	6
		HSE3-12B	Selftapping Screw, M3x12	1	6
PV0013	Elevator Arm	BK0018	Elevator Control Arm	1	6
		BK0019	Elevator Arm Parallel Lever	1	6
		BK0020	Elevator Arm Shaft	1	6
		BK0023	Elevator Arm Linkage	2	6
		BK0075	Linkage Ball	1	6
		BK0084	Pin (D2xL23)	2	6
		HMJ2-10N	Selftapping Screw, M2x10	1	6
		HSE3-18B	Selftapping Screw, M3x18	2	6
PV0014	Elevator Lever	BK0021	Elevator Control Lever	1	6
		BK0075	Linkage Ball	2	6
		BK0076	Collar (d3xD4xL10)	1	6
		BK0088	Flat Washer	1	6
		HMJ2-14N	Selftapping Screw, M2x14	1	6
PV0015	Aileron Lever	BK0022	Aileron Control Lever	2	6
		BK0075	Linkage Ball	4	6
		BK0076	Collar (d3xD4xL10)	2	6
		HMJ2-10N	Selftapping Screw, M2x10	4	6

Parts No.	Description	Item No.	Description	quantity	Reference Assemble Step
		HSE3-18B	Selftapping Screw, M3x18	2	6
PV0016	Tail Pitch Control Lever	BK0024	Tail Pitch Control Lever	1	13
		BK0075	Linkage Ball	1	13
		BK0076	Collar (d3xD4xL10)	1	13
		BK0088	Flat Washer	1	13
		HMJ2-8N	Selftapping Screw, M2x8	1	14
		HSE3-18B	Selftapping Screw, M3x18	1	13
PV0017	Tail Pitch Slider	BK0025	Tail Pitch Control Fork	1	13
		BK0026	Tail Pitch Control Linkage	2	13
		BK0027	Tail Pitch Control Slider	1	13
		BK0028	Tail Pitch Control Slide Bushing	1	13
		BK0075	Linkage Ball	1	13
		BK0082	Collar, d2xD3xL4	2	13
		BK0083	Pin, D2xL9	2	13
		HMF2-8N	Screw, M2x8	1	13
		HSE2-10B	Selftapping Screw, M2x10	2	13
PV0018	Main Shaft Lock Ring	BK0030	Main Shaft Lock Ring	1	7
		HME4-5B	Set Screw, M4x5	2	7
PV0019	One Way Clutch	BV0033	One Way Clutch Housing Set	1	4
		HMC3-12	Socket Screw, M3x12	4	4
PV0020	One Way Clutch Shaft	BK0034	One Way Clutch Shaft	1	4
		HMC3-20B	Socket Screw, M3x20	1	15
		HMM3Z	Lock Nut, M3	1	15
		HMQ14	Retaining Ring, ∅14	2	4
PV0021	Guide Pulley Assy.	BV0035	Guide Pulley	1	3
		BK0036	Pulley Collar	2	3
		BK0081	Pin, D13xL18	1	3
PV0022	Engine Mount	BK0037	Engine Mount	1	10
		BK0087	Flat Washer	4	10
		HMC3-14B	Socket Screw, M3x14	8	10
PV0027	Tail Case	BK0046	Tail Unit Housing (L)	1	14
		BK0047	Tail Unit Housing (R)	1	13
		HMC3-20B	Socket Screw, M3x20	4	14
		HMC3-25B	Socket Screw, M3x25	2	14
		HMM3Z	Lock Nut, M3	6	14
PV0029	Tail Pulley Set	BK0050	Tail Pulley Set	1	13
		BK0051	Tail Pulley Flange	1	13
		BK0414	Pin, D2xL12	1	13
		HME3-4B	Set Screw, M3x4	1	13
PV0030	Tail Rotor Shaft	BK0053	Tail Rotor Shaft	1	13
		BK0414	Pin, D2xL12	1	13
		HME3-4B	Set Screw, M3x4	1	13
PV0033	Servo Frame	BK0057	Servo Frame	1	3
		HMJ3-12B	Selftapping Screw, M3x12	6	3
PV0035	Landing Skid Set	BK0064	Skid	2	8
		BK0065	Skid Cap	4	8
		BK0066	Skid Brace	2	8
		HMJ3-18B	Selftapping Screw, M3x18	4	8
		HME4-5B	Set Screw, M4x5	4	8
PV0036	Flybar Paddle	BK0067	Flybar Paddle	2	11
		HME3-10B	Set Screw, M3x10	2	11
PV0037	Tail Rotor Blade	BK0068	Tail Rotor Blade	2	15
PV0038	Tail Fin	BK0069	Stabilizer Fin	1	14

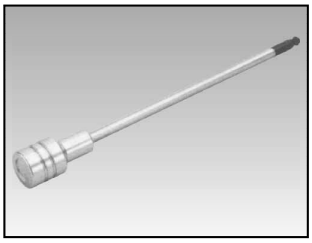
Parts No.	Description	Item No.	Description	quantity	Reference Assemble Step
		BK0070	Stabilizer Fin Bracket	1	14
		BK0071	Vertical Fin	1	14
		HSE3-12B	Selftapping Screw, M3x12	2	14
PV0039	Main Rotor Blades	BV0072	Main Rotor Blades	2	20
PV0040	Double Link	BV0085	Double Link	2	11
PV0041	Ball Link	BK0086	Ball Link	12	6
PV0043	Tail Control Rod	BK0086	Ball Link	2	17
		BK0091	Rod Guide	3	14
		BK0105	Tail Control Rod Joint	1	16
		BK100-1	Push Pull Rod-1	1	16
		BK100-2	Push Pull Rod-2	1	14
		HME4-5B	Set Screw, M4x5	2	16
PV0044	Link Rod	BK0092	LinkageRod (L=30)	3	17
		BK0093	Linkage Rod (L=45)	3	16
		BK0094	Linkage Rod (L=60)	2	16
		BK0095	Linkage Rod (L=76)	2	11
PV0048	Pitch Frame/ Rotor Hub Seesaw Brg.	HMV840ZZ	Bearing, d4xD8xW3	2	6
PV0049	Seesaw Brg.	HMV830ZZ	Bearing, d3xD8xW4	2	11
PV0051	Leaver Brg.	HMV740ZZ	Bearing, d4xD7xW2.5	4	6
PV0052	Tail Slider Brg.	HMV1060	Bearing, d6xD10xW3	2	13
PV0053	Rotor Bolt.	HMC4-27B	Cap Screw, M4x27	2	20
		HMM4Z	Lock Nut, M4	2	20
PV0056	Frame Spacer (L)	BK0058	Frame Spacer (L)	5	3
PV0057	Frame Spacer (S)	BK0059	Frame Spacer (S)	10	3
PV0058	Link Ball	BK0075	Linkage Ball	12	13
PV0059	Tail Shaft Brg.	HMV1150	Bearing, d5xD11xW5	2	13
PV0060	Installation Set	BE1052	Antenna Tube	1	18
		BK0106	Double Sided Tape	2	18
		BK0109	Rubber Band 5x3 20xT1	2	18
		HNI15	Hex Wrench 1.5mm	1	1
		HNI2	Hex Wrench 2mm	1	1
		HNI25	Hex Wrench 2.5mm	1	1
		HNI3	Hex Wrench 3mm	1	1
		HNJ-1	Tie Band 2.5x100	3	8
PV0062	Body Mount Rubber Grommet	BK0102	Body Mount Rubber	5	19
PV0063	Bushing Set	BK0108	Bushing (d4xD8xW2.5)	2	8/11
PV0064	Lever Bushing	BK0107	Bushing (d4xD7xW2.5)	4	7/8/11/12
PV0088	Screw Bag	HMF2-6N	Screw, M2x6	6	
		HMF2-8N	Screw, M2x8	6	
		HMJ2-10N	Selftapping Screw, M2x10	6	
		HMJ2-14N	Selftapping Screw, M2x14	6	
		HMJ2-6B	Selftapping Screw, M2x6	6	
		HMJ3-22B	Selftapping Screw, M3x22	6	
		HSE2-10B	Selftapping Screw, M2x10	6	
		HSE2612N	Selftapping Screw, M2.6x12	6	
		HSE3-12B	Selftapping Screw, M3x12	6	
		HSE3-18B	Selftapping Screw, M3x18	6	
		HSE3-5B	Selftapping Screw, M3x5	6	
PV0089	Screw Bag	BK0616	Socket Screw, M3x20	2	
		HMC3-10B	Socket Screw, M3x10	6	
		HMC3-12B	Socket Screw, M3x12	6	
		HMC3-14B	Socket Screw, M3x14	6	

Parts No.	Description	Item No.	Description	quantity	Reference Assemble Step
		HMC3-20B	Socket Screw, M3x20	4	
		HMC3-25B	Socket Screw, M3x25	6	
		HMC3-32B	Socket Screw, M3x32	6	
		HMC3-8B	Socket Screw, M3x8	6	
		HME3-10B	Set Screw, M3x10	6	
		HME3-18B	Set Screw, M3x18	6	
		HME4-5B	Set Screw, M4x5	6	
PV0091	Bearing Upgrade Kit	HMV740ZZ	Bearing, d4xD7xW2.5	16	5/6/11/13
		HMV840ZZ	Bearing, d4xD8xW2.5	4	6/11
PV0093	Main Shaft Bearing	HMV1680	Bearing, d8xD16xW5	1	2
		HMV6800	Bearing, d10xD19xW5	2	3
PV0148	Tail Rotor Grip	BK0302-1	Tail Pitch Housing (A)	2	13
		BK0303-1	Tail Pitch Housing (B)	2	13
		HMC2610B	Socket Screw, M2.6x10	4	13
		HMM26B	Lock Nut, M2.6	4	13
		HMC3-14B	Socket Screw, M3x14	2	14
		HMM3Z	Lock Nut, M3	2	14
PV0151	Tail Rotor Hub	BK0307	Tail Rotor Hub	1	13
		HME3-18B	Set Screw, M3x18	2	13
		HMM3Z	Lock Nut, M3	2	13
PV0200	Tail Rotor Brg.	HMV1050	Bearing, d5xD10xW5	4	8
PV0203	Starter Shaft Brg.	HMV696Z	Bearing, d6xD15xW5	2	3
PV0209	Washer Bag	BK0435	Washer, d4xD11xt1.7	4	11
PV0210	Washer Bag	BK0087	Washer, d4xD8xt1.4	16	10
PV0223	Screw Bag	HMC4-8B	Socket Screw	20	11
PV0267	Loctite #242			1	
PV0268	Loctite #262			1	
PV0269	Thrust Bearing Grease			1	
PV0270	Plastic Gear Grease			1	
PV0279	Tail Rod Guide	BK0091	Rod Guide	3	14
PV0328	Tail Support	BK0447	Tail Support Rod End	4	14
		BK0540	Tail Support Rod	2	14
		HMJ2-8N	Selftapping Screw, M2x8	4	14
		HSE3-12B	Selftapping Screw, M3x12	4	14
PV0353	Main Rotor Grip	BK0075	Linkage Ball	2	11
		BK0596	Main Pitch Housing	2	11
		HMJ2-10N	Selftapping Screw, M2x10	2	11
PV0354	Main Rotor Hub	BK0587	Main Rotor Pin	1	11
		BK0616	Socket Screw, M3x20	1	11
		BV0595	Main Rotor Hub	1	11
		HMM3Z	Lock Nut, M3	1	15
PV0355	Spindle	BK0581	Flap Collar	2	11
		BK0583	Feathering Shaft	1	11
		BK0435	Washer, d4xD11x1.7	2	11
		HMC4-8B	Socket Screw, M4x8	2	11
PV0357	Swash Plate Assy	BV0601	Swash Plate Assy	1	7
PV0358	Clutch Bell	BV0591	Clutch Bell Set	1	2
PV0359	Clutch	BK0170	Shim	1	9
		BV0589	Clutch Bell Set	1	9
		HMC3-10B	Socket Screw, M3x10	2	9
PV0360	Starter Shaft	BK0592	Starter Shaft	1	3
		HME4-5B	Set Screw, M4x5	2	3
		HMS5	E-Clip	1	3

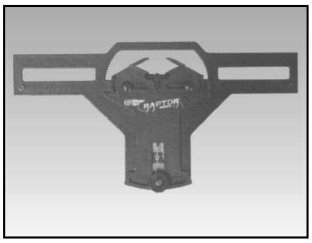
Parts No.	Description	Item No.	Description	quantity	Reference Assemble Step
PV0361	Starter Coupling	BK0594	Starter Coupling	1	3
		HME4-5B	Set Screw, M4x5	2	3
PV0362	Main Frame Set	BK0058	Frame Spacer (L)	4	3
		BK0059	Frame Spacer (S)	8	3
		BK0599	Main Frame Left Side	1	3
		BK0600	Main Frame Right Side	1	3
		HMC3-20B	Socket Screw, M3x20	4	15
		HMM3Z	Lock Nut, M3	4	15
		HSE3-12B	Selftapping Screw, M3x12	24	3
PV0363	Fuel Tank	BV0605	Fuel Tank Set	1	1
PV0364	Body	BK0098	Body Clip A	1	19
		BK0099	Body Clip B	1	19
		BK0102	Rubber Grommet	2	19
		BK0611	Body	1	19
		BK0612	Canopy	1	19
		HMJ2-6B	Self Tapping Screw	6	19
		HSE3-12B	Selftapping Screw, M3x12	2	19
PV0365	Thrust Brg.	HMX0612	Thrust Bearing	2	11
PV0366	Decal	JV0093	Decal	1	19
PV0367	Pinion Gear (9T)	BK0593	Drive Gear	1	2
PV0368	Clutch Liner	BK0590	Clutch Liner	2	2
PV0369	Canopy Only	BK0612	Canopy	1	19
		HMJ2-6B	Selftapping Screw, M2x6	6	19
PV0370	Body Only	BK0098	Body Clip A	1	19
		BK0099	Body Clip B	1	19
		BK0611	Body	1	19
		BK0102	Rubber Grommet	2	19
		HSE3-12B	Selftapping Screw, M3x12	2	19
PV0372	Thrust Collar	BK0584	Thrust Collar	2	11
PV0373	Clutch Bell Brg.	HMV1260Y	Bearing, d6xD12xW4	2	2
PV0374	Feathering Brg.	HMV1260Z	Bearing, d6xD13xW5	2	11
PV0375	Body Retaining Set	BK0626	Body Mount Nut	2	12
		HME3-18B	M3x18 Set Screw	2	12
PV0376	Main Rotor Pin	BK0587	Main Rotor Pin	1	11
PV0381	Flap Damper (70)	BK0586	Flap Damper	2	11

HELICOPTER ACCESSORIES

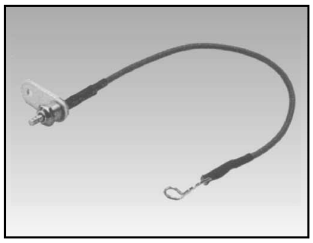
NO. 3800 BLADE SUPPORT



NO. 3801 6MM STARTER EXTENSION

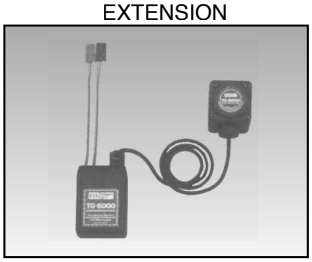


NO. 3802 PRECISION PITCH GAUGE



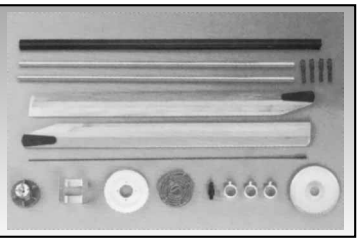
NO. 3803 REMOTE GLOW ADAPTER

NO. 2000 TERA ON-BOARD DIGITAL TACHOMETER

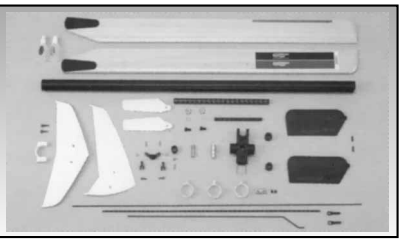


NO. 8000 TG-8000 GYRO

No.3830
Raptor 30 V2 to 50 V2 Conversion Kit

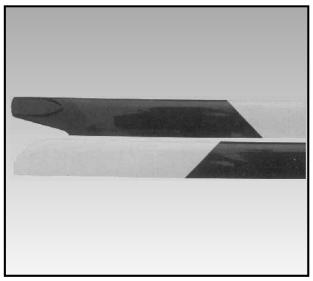


No.3831
Raptor 30 V2 Crash Kit

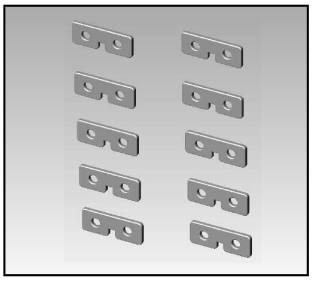


No.3832
Raptor 30 to V2 Conversion Kit

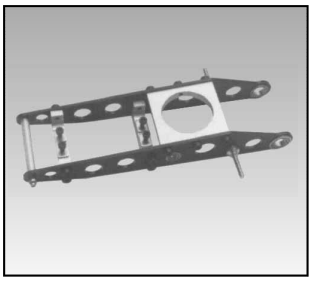
RAPTOR 30 V2 OPTIONAL PARTS



NO.3828 CF ROTOR BLADE, 550 mm
NO.3827 CF ROTOR BLADE, 600 mm

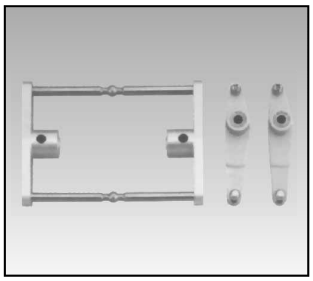


PV0054 SERVO MOUNTING PLATE

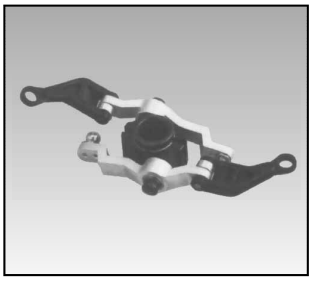


PV0068 ALUM COLL SERVO TRAY

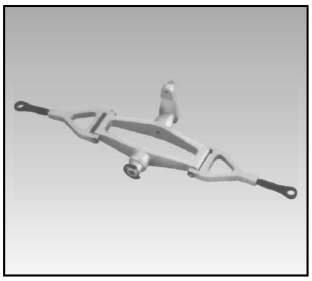
PV0092 SWASHPLATE



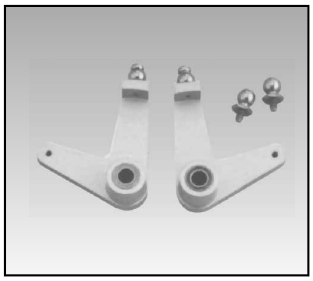
PV0095 STABILIZER CONTROL ARM SET



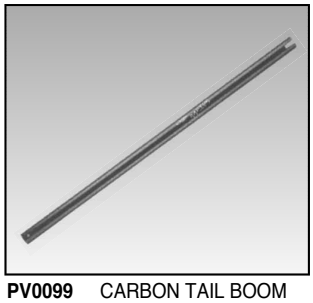
PV0096 WASHOUT ASSEMBLY



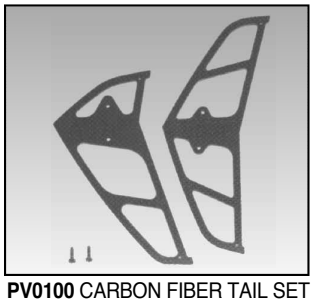
PV0097 ELEVATOR LEVER SET



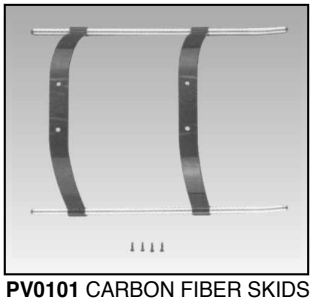
PV0098 AILERON L-TYPE LEVER



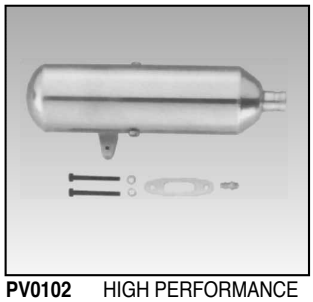
PV0099 CARBON TAIL BOOM



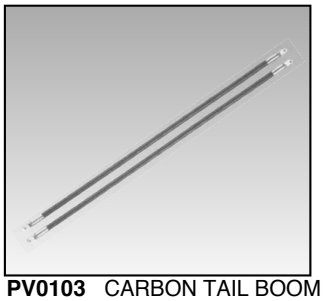
PV0100 CARBON FIBER TAIL SET



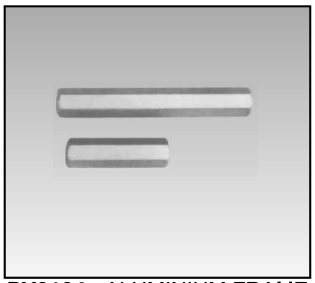
PV0101 CARBON FIBER SKIDS



PV0102 HIGH PERFORMANCE MUFFLER (.36/.39)

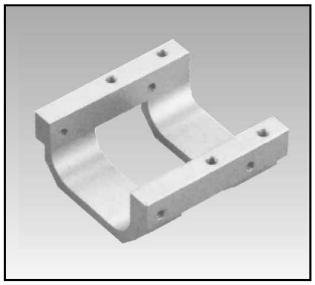


PV0103 CARBON TAIL BOOM BRACE

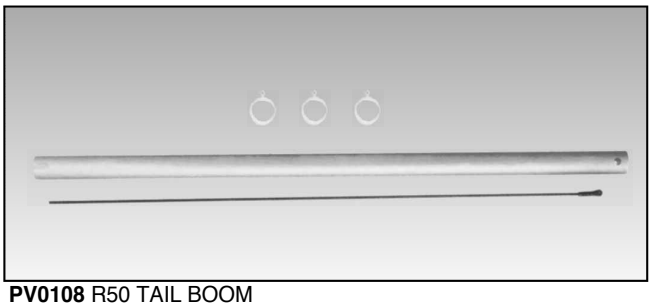


PV0104 ALUMINIUM FRAME POST

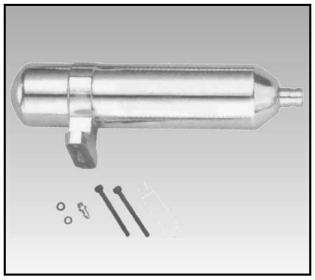
PV0105 COOLING FAN (.36)
PV0106 COOLING FAN (.50)



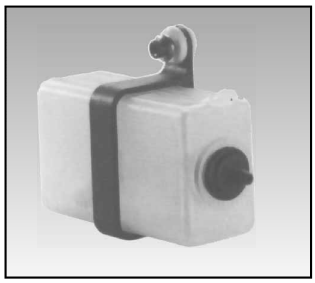
PV0107 ENGINE MOUNT (.50)



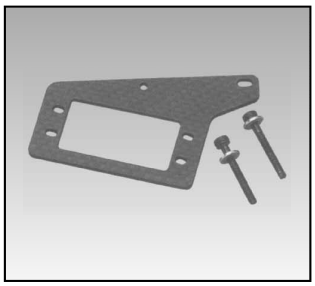
PV0108 R50 TAIL BOOM



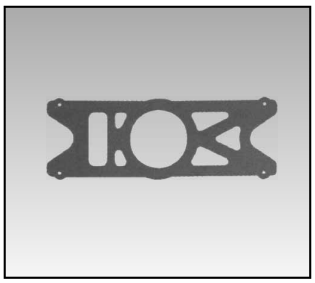
PV0109 HIGH PERFORMANCE MUFFLER (.46~.50)



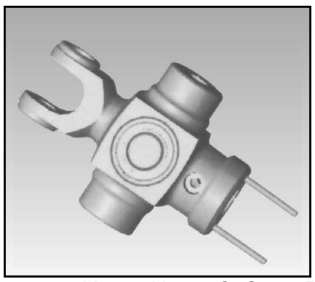
PV0311 HEADER TANK



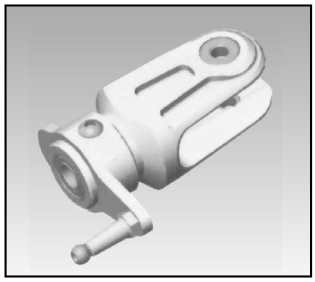
PV0321 REAR MOUNTED TAIL SERVO TRAY



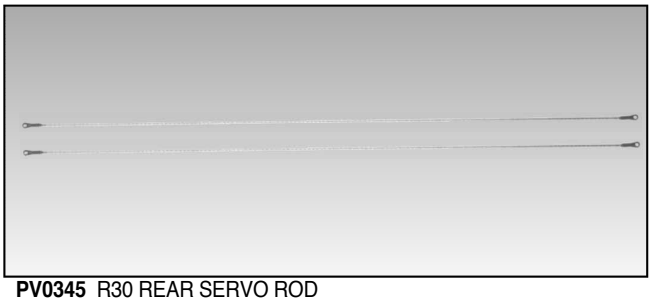
PV0326 CARBON GRAPHITE BASE PLATE



PV0338 METAL MAIN ROTOR HUB FOR V2

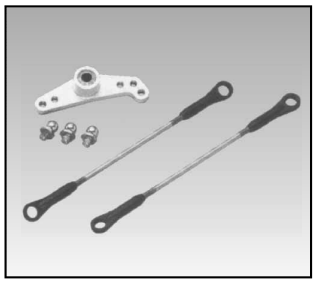


PV0339 METAL MAIN ROTOR GRIP FOR V2

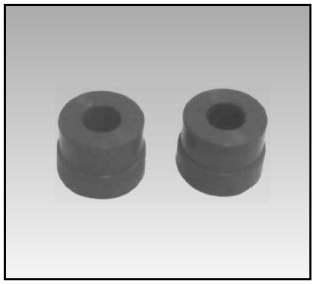


PV0345 R30 REAR SERVO ROD
PV0346 R50 REAR SERVO ROD

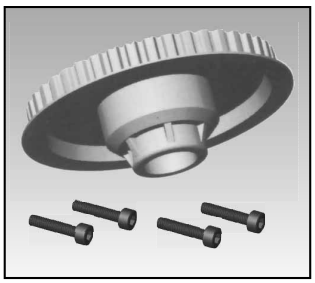
PV0341 METAL TAIL PITCH SLIDER



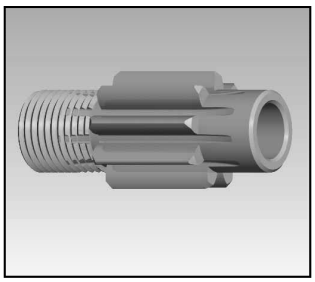
PV0349 PUSH/PULL ELEVATOR LEVER SET



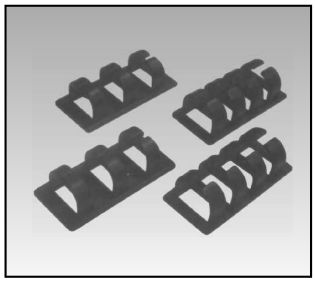
PV0356 60 DUROMETER FLAP DAMPER
PV0382 80 DUROMETER FLAP DAMPER



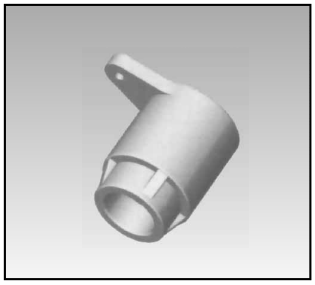
PV0379 AUTO-R TAIL PULLY



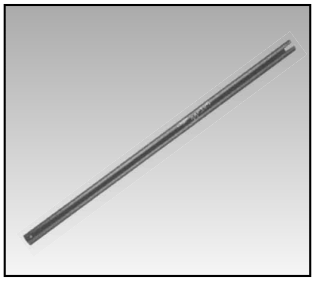
PV0380 PINION GEAR 10T



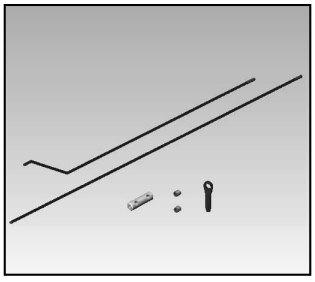
PV0384 WIRE CLAMP



PV0387 THROTTLE LEVER



PV0390 R50 CARBON TAIL BOOM



PV0392 R50 TAIL CONTROL ROD

PV0394 CARBON FIBER-LOOK CANOPY