

X-cell
WHIPLASH
700EX

**FRAME ASSEMBLY
INSTRUCTIONS**



**ELECTRIC
HELICOPTER KIT
MA1032-4 FLYBARLESS**

miniature aircraft usa



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KIT INTRODUCTION

Thank you for purchasing the X-Cell Whiplash by Miniature Aircraft USA. This model is the culmination of years of designing and manufacturing R/C helicopters. It is designed with the highest standards, and will provide years of enjoyment. Whether this is your first R/C model helicopter or you are an advanced R/C helicopter modeler, the X-Cell Whiplash is a fantastic choice for a "700 size" model.

R/C HELICOPTER SAFETY

A radio controlled model helicopter is not a toy, but rather a technically complex device that must be built and operated with care. It is also a fascinating and challenging part of the R/C sport, the mastery of which is very rewarding. A model helicopter must be built exactly in accordance with the building instructions. The kit manufacturer has spent much time and effort refining his product to make it reliable in operation and easy to build. The essentially bolt together construction can proceed quite rapidly, giving the builder a strong sense of accomplishment that encourages hasty progress from one construction phase to the next, so that the completed model can be more quickly seen and enjoyed. It is essential to recognize and guard against this tendency. Follow building instructions exactly. Vibration and stress levels are high and all fasteners and attachments must be secure for safe operation.

Note that this is the first use of the word SAFETY in these comments. Previously the kit manufacturer's efforts to ensure reliable operation were mentioned. That is ALL that he can do. Safe operation is the responsibility of the builder/flyer and starts with careful construction and continues with selection and installation of reliable radio equipment and engine.

The need for safety is nowhere greater than at the flying field. A number of guidelines for safe flight have been developed by experienced flyers and are set down here. It is urged that they be read, understood and followed.

WARNING! – RISK OF DEATH OR SERIOUS INJURY

Remote Control ("R/C") Helicopters can be dangerous. Inexperienced pilots of R/C Helicopters should be trained and supervised by experienced operators. All operators should use safety glasses and other appropriate safety equipment. All operators should exercise necessary precautions when fueling, repairing, maintaining, flying and storing R/C Helicopters, and when using or storing R/C Helicopter accessories, equipment, fuels, and related materials. R/C Helicopters should be used only in open areas free of obstacles and far enough from people to minimize the possibility of injury from the helicopter or any of its components falling or flying in unexpected directions.

This helicopter is not a toy but a complex flying machine that must be assembled with care by a responsible individual. Failure to exert care in assembly, or radio or accessory installation, may result in a model incapable of safe flight or ground operation. Rotating components are an ever present danger and source of injury to operators and spectators. Since the manufacturer and his agents have no control over the proper assembly and operation of his products, no responsibility or liability can be assumed for their use.

GENERAL GUIDELINES FOR SAFE R/C HELICOPTER FLIGHT

- Fly only at approved flying fields and obey field regulations.
- Follow frequency control procedures. Interference can be dangerous to all.
- Know your radio. Check all transmitter functions before each flight.
- Be aware that rotating blades are very dangerous and can cause serious injury.
- Never fly near or above spectators or other modelers.
- If you're a beginner, get help trimming the model first and flight training later.
- Don't "track" the main blades by holding the tail boom. This is a temptation to builders who cannot hover yet and is very dangerous.
- Follow all recommended maintenance procedures for model, radio and engine.



ACADEMY OF MODEL AERONAUTICS

Miniature Aircraft USA highly recommends joining the Academy of Model Aeronautics (AMA).

- AMA is the Academy of Model Aeronautics.
- AMA is the world's largest model aviation association, representing a membership of more than 150,000 from every walk of life, income level and age group.
- AMA is a self-supporting, non-profit organization whose purpose is to promote development of model aviation as a recognized sport and worthwhile recreation activity.
- AMA is an organization open to anyone interested in model aviation.
- AMA is the official national body for model aviation in the United States. AMA sanctions more than a thousand model competitions throughout the country each year and certifies official model flying records on a national and international level.
- AMA is the organizer of the annual National Aeromodeling Championships, the world's largest model airplane competition.
- AMA is the chartering organization for more than 2,500 model airplane clubs across the country. AMA offers its chartered clubs official contest sanction, insurance and assistance in getting and keeping flying sites.
- AMA is the voice of its membership, providing liaison with the Federal Aviation Administration, the Federal Communications Commission, and other government agencies through our national headquarters in Muncie, Indiana. AMA also works with local governments, zoning boards and parks departments to promote the interests of local chartered clubs.
- AMA is an associate member of the National Aeronautic Association. Through NAA, AMA is recognized by the Fédération Aéronautique Internationale (FAI), the world governing body of all aviation activity, as the only organization which may direct U.S. participation in international aeromodeling activities.

For more detailed information, contact the Academy of Model Aeronautics
5161 E. Memorial Drive, Muncie, Indiana, 47302
or telephone (800) 435-9262.

You may also visit the AMA website at www.modelaircraft.org



KIT ASSEMBLY

Your Whiplash kit will require a number of different supplies and tools to ensure the best final result. They are as follows:

REQUIRED LUBRICANTS AND COMPOUNDS:

1. Medium Strength Thread Locking Compound - X-Cell Super Lock Blue (MA3200-20)
2. Tri-Flow Oil (MA3200-02)
3. Tri-Flow Synthetic Grease (MA3200-06)
4. Medium Cyanoacrylate (CA)
5. Retaining Compound - X-Cell Super Lock Green (MA3200-22)

REQUIRED TOOLS:

1. m4 Nut Driver
2. m5 Nut Driver
3. m5.5 Nut Driver
4. m7 Nut Driver
5. 1.5mm Allen Driver
6. 2.0mm Allen Driver
7. 2.5mm Allen Driver
8. 3.0mm Allen Driver
9. 4.0mm Allen Driver x2
10. 5.0mm Allen Driver
11. 7.0mm Open-end Wrench
12. Needle Nose Pliers
13. Phillips Screwdriver
14. Razor Knife (X-acto)
15. Rotary Tool w/Grinding Bit

OTHER REQUIRED COMPONENTS:

The X-Cell Whiplash is an airframe kit. To complete the model, several other items are required but are not included with the kit. There are many choices for these other required components, and any competent hobby retailer with R/C helicopter experience will be happy to make suggestions. You will need:

1. Brushless electric motor KV Range approx 500-530kv suitable for use with a “.90”/700 size model, with 6mm shaft diameter.
2. Electronic Speed Control (ESC) suitable for use in R/C helicopters, approx 100 Amp HV or better is recommended.
3. Lithium Polymer Batteries: 6 cell 5000mah x 2 (12 cell LiPo) are recommended. Maximum battery width 2”.
4. Cyclic servos (Miniature Aircraft USA recommends high quality digital cyclic servos with no less than 80 oz. in. of torque.)
5. R/C helicopter gyro (Miniature Aircraft USA recommends for Flybarless Kits a flybarless electronic unit with rudder gyro and for Flybar Kits only a tail “heading hold” style gyro is needed)
6. Rudder servo suitable for use with the gyro you choose. Digital servo is recommended.
7. R/C helicopter transmitter and receiver with at least 6 channels, and eCCPM capabilities.
8. Receiver battery pack or suitable BEC.
9. 690-710mm Main Blades and 105mm Tail Blades



IMPORTANT ASSEMBLY TIPS - PLEASE READ

- Follow the instructions. The methods of construction documented in this manual have been proven to work. Do not rush the build of your model! You have purchased a world class model helicopter kit, take your time and realize that the final result is now up to you. Take the time to fully understand each step and if you are unsure please contact Miniature Aircraft USA.
- Follow the order of assembly. The instructions have been organized into major sections and have been written in such a way that each step builds upon the work done in the previous step. Changing the order of assembly may result in unnecessary steps.
- Clean all metal parts. All of the steel parts in this kit are coated with a lubricant to prevent them from rusting. This coating can interfere with the adhesives and thread locks needed for assembly. Use a solvent such as alcohol or acetone to clean the various metal parts, especially threads. Be sure not to overtighten bolts as damage to bearings and other components will occur.
- It is very important to lightly sand the edges of all carbon fiber pieces. Miniature Aircraft USA recommends doing so prior to the assembly process. Carbon fiber edges are sharp and can easily cut component wires and battery mounting straps. It is important to use safety precautions when creating carbon fiber dust. The use of a particulate mask, preferably one with a P100 HEPA filter is recommended. Always clean up carbon fiber dust with a damp rag right away.
- Use thread lock as indicated. Generally any bolt or screw that threads into a metal part requires thread lock. Model helicopters are subject to vibration and failing to use thread lock on any non-locking assembly may result in a part becoming loose or falling off.



KIT CONTENTS

Please take some time to familiarize yourself with the contents of the kit. The Whiplash kit has been broken down into three “bags”. Each bag contains parts and hardware. The hardware for each bag will be used only for that bag. There will be no left over parts after each bag is assembled. The individual parts of the factory assembled parts are not listed out here. They can be found in the components section of the manual.

Bag 1 - Flybarless Head Assembly

Bag	Part No.	Part Description	Qty	Bag	Part No.	Part Description	Qty
1-A	0869	Washout Link	2	1-Hardware	0021	M4 Lock Nut	1
1-A	128-176	Washout Pin	2	1-Hardware	0023	M5 Nut	2
1-A	128-195	Head Button	1	1-Hardware	0051	M3x3 Set Screw	3
1-A	128-314	Swashplate Follower	2	1-Hardware	0061	M3x8 Socket Bolt	4
1-A	131-187	Head Axle	1	1-Hardware	0063	M3x10 Socket Bolt	2
1-A	131-190	Damper (80D)	2	1-Hardware	0064-4	M3x16 Button Head Socket Bolt	2
1-A	131-368	FBL Head Block	1	1-Hardware	0067	M3x14 Socket Bolt	1
				1-Hardware	0082-4	M5x32 Shouldered Socket Bolt	2
1-B	0133-1	M3x21.2 Ball Link	10	1-Hardware	0086-1	M5x16 Flanged Socket Bolt	2
1-B	0217	Swashplate	1	1-Hardware	0107	M3x6 Threaded Steel Ball	5
1-B	121-4	Servo To Swash Linkage Rod	3	1-Hardware	0109	M3x8 Threaded Steel Ball	4
1-B	121-7	Swash To PA Linkage Rod	2	1-Hardware	0447-1	M2 E-clip	2
1-B	131-308	FBL Main Shaft	1	1-Hardware	120-7	5x15 C/F Safety Washer	2
				1-Hardware	131-83	Anti-rotation Pin	1
1-C	131-161	Main Blade Grip	2	1-Hardware	131-184	C/F Damper Washer	2
1-C	131-163	FBL Pitch Arm	2	1-Hardware	131-200	M4x33 Shouldered Socket Bolt	1

Bag 2 - Tail Assembly

Bag	Part No.	Part Description	Qty	Bag	Part No.	Part Description	Qty
2-A	0133	M2x21.2 Ball Link	2	2-C	128-80	Front Boom Clamp	1
2-A	128-144	T/R Control Rod Guide	4	2-C	128-149a	Upper Rear Boom Support Mount	1
2-A	131-57	Torque Tube Ends	2	2-C	128-149b	Lower Rear Boom Support Mount	1
2-A	131-58	Torque Tube	1	2-C	131-60	C/F Tail Fin	1
2-A	131-62	Tail Boom	1	2-C	131-128	C/F Boom Clamp Plate	1
2-A	131-69-1	T/R Control Rod	1				
2-A	131-80	Torque Tube Bearing Cup	2	2-Hardware	0009	M3 Washer	2
2-A	131-81	Torque Tube Bearing Cup O-ring	4	2-Hardware	0016-1	M4 External Serrated Lock Washer	2
2-A	131-86	Assembled Boom Support	2	2-Hardware	0019	M3 Lock Nut	3
				2-Hardware	0056	M3x5 Dog-Point Set Screw	2
2-B	131-35	Boom Clamp W/TX Holes	1	2-Hardware	0059-0	M2.5x4 Socket Bolt	6
2-B	131-64	T/R Hub	1	2-Hardware	0059-1	M2.5x6 Socket Bolt	1
2-B	131-75	T/R Pitch Slider Assembly	1	2-Hardware	0060-1	M3x6 Socket Bolt	4
2-B	131-112	T/R Blade Grip	2	2-Hardware	0061	M3x8 Socket Bolt	3
2-B	131-130	Tail Pitch Control Bellcrank	1	2-Hardware	0064-3	M3x6 Button Head Socket Bolt	2
2-B	131-131	C/F Bellcrank Bracket	1	2-Hardware	0065	M3x12 Socket Bolt	6
2-B	131-132	Bellcrank Slider Cup	1	2-Hardware	0067	M3x14 Socket Bolt	2
2-B	132-118	Front Tail Transmission Assembly	1	2-Hardware	0069	M3x16 Socket Bolt	2
2-B	132-119	Tail Box Assembly	1	2-Hardware	0073	M3x20 Socket Bolt	1
				2-Hardware	0078	M4x12 Socket Bolt	2
				2-Hardware	0107	M3x6 Threaded Steel Ball	3



Bag 3 - Electric Frame Assembly

Bag	Part No.	Part Description	Qty	Bag	Part No.	Part Description	Qty
3-A	131-29	C/F X-Brace	1	3-D	131-50	Elevator Servo Mount	2
3-A	131-47	C/F Servo Rail Spacer	2	3-D	131-69	M2x315 Linkage Rod	1
3-A	131-53	C/F Gyro Plate	2	3-D	131-85	C/F Pushrod Sleeve	1
3-A	131-153	C/F Canopy Breakaway Tabs	4	3-D	131-139	Skid Tubes	2
3-A	131-186	C/F Anti-rotation Bracket	1	3-D	131-148	Servo Plates	12
3-A	131-382	C/F Strut Spacer	4	3-D	131-151	Rear Canopy Post	2
3-A	132-120	C/F Left Frame - 700EX	1	3-D	131-154	Thumb Screw	4
3-A	132-121	C/F Right Frame - 700EX	1	3-D	132-136	Landing Struts - 700EX	2
3-A	132-122	C/F Front Frame Doubler - 700EX	2	3-D	3200-48	3/4" Hook & Loop Tape	20"
3-A	132-123	C/F Rear Frame Doubler - 700EX	2	3-D	3200-54	Adhesive Back Hook & Loop Tape	24"
3-A	132-128	C/F Front Battery Tray - 700EX	1	3-D	3200-57	15" Battery Straps	2
3-A	132-129	C/F Upper Battery Tray - 700EX	1				
3-A	132-130	C/F Vertical Battery Tray - 700EX	1	3-Hardware	0003	M3 Washer	26
				3-Hardware	0004	M4 Washer	1
3-B	0107	M3x6 Threaded Steel Ball	2	3-Hardware	0016-1	M4 External Serrated Lock Washer	2
3-B	128-57	Tray Mount	7	3-Hardware	0017-2	M2.5 Hex Nut	4
3-B	128-58	Main Frame Spacer	4	3-Hardware	0021	M4 Lock Nut	1
3-B	131-20	Middle Main Shaft Bearing Block	1	3-Hardware	0053-5	M3x16mm Socket Set Screw	4
3-B	131-21	Upper Main Shaft Bearing Block	1	3-Hardware	0057	M4x4 Set Screw	3
3-B	131-40	Bottom Main Shaft Bearing Block	1	3-Hardware	0058-1	M4x6 Set Screw	4
3-B	131-46	P/A Servo Rail	2	3-Hardware	0059-1	M2.5 x6 Socket Bolt	4
3-B	131-52	Delrin Tray Mount	4	3-Hardware	0059-3	M2.5x10 Socket Bolt	16
3-B	131-107	T/R Bellcrank Swing Arm	1	3-Hardware	0060-1	M3x6 Socket Bolt	22
3-B	131-109	Swing Arm Pivot Mount	1	3-Hardware	0061	M3x8 Socket Bolt	74
3-B	132-131	Battery Tray Spacers	8	3-Hardware	0062	M3x10 Tapered Socket Bolt	4
				3-Hardware	0063	M3x10 Socket Bolt	8
3-C	131-24	Main Gear Hub	1	3-Hardware	0065	M3x12 Socket Bolt	4
3-C	131-150	Front Canopy Post	2	3-Hardware	0069	M3x16 Socket Bolt	1
3-C	132-101	Lower Pinion Bearing Block	1	3-Hardware	0073	M3x20 Socket Bolt	4
3-C	132-107	One-Way Assembly w/12T Pinion	1	3-Hardware	0078-4	M4x8 Socket Bolt	4
3-C	132-117	117T Helical Main Gear	1	3-Hardware	0081	M4x16 Socket Bolt	2
3-C	132-140	X-Block/Motor Mount - 700EX	1	3-Hardware	0088	M3x8 Tapered Socket Bolt	19
				3-Hardware	131-201	M4x25 Shouldered Socket Bolt	1
3-D	0116	M2.5 Threaded Steel Ball	4				
3-D	0133	M2x21.2 Ball Link	2	BOX	131-254	Whiplash 700EX Painted Canopy	1
3-D	0390	Large Wire Retainers	3	BOX	132-230	Whiplash Electric Instruction Manual	1
3-D	106-22	5x11 Grommet	4	BOX	132-231	700EX Frame Assembly Manual	1
3-D	129-49	9/16" Rubber Wire Grommet	2	BOX	3000-73	MA Towel	1
3-D	128-59	M4 Front Boom Support Spacer	1				

Whiplash 700EX Specifications:

- Length 52.5" (1333mm)
- Height 16.5" (419mm)
- Rotor Span 1561-1601mm - 690-710mm blades
- Tail Rotor Span 286mm with 105mm T/R blades
- Avg. Ready-to-Fly Weight 8-9 lbs - 3.63-4.08 kg (w/o batteries)
11.5-12.5 lbs - 5.22-5.67 kg (w/batteries)
- Main Drive Ratio 9.75:1 (9:1 options)
- Tail Drive Ratio 4.5:1
- Main Rotor Blades 690-710mm
- Recommended Power 12S - 500-560KV



FLYBARLESS HEAD ASSEMBLY PARTS



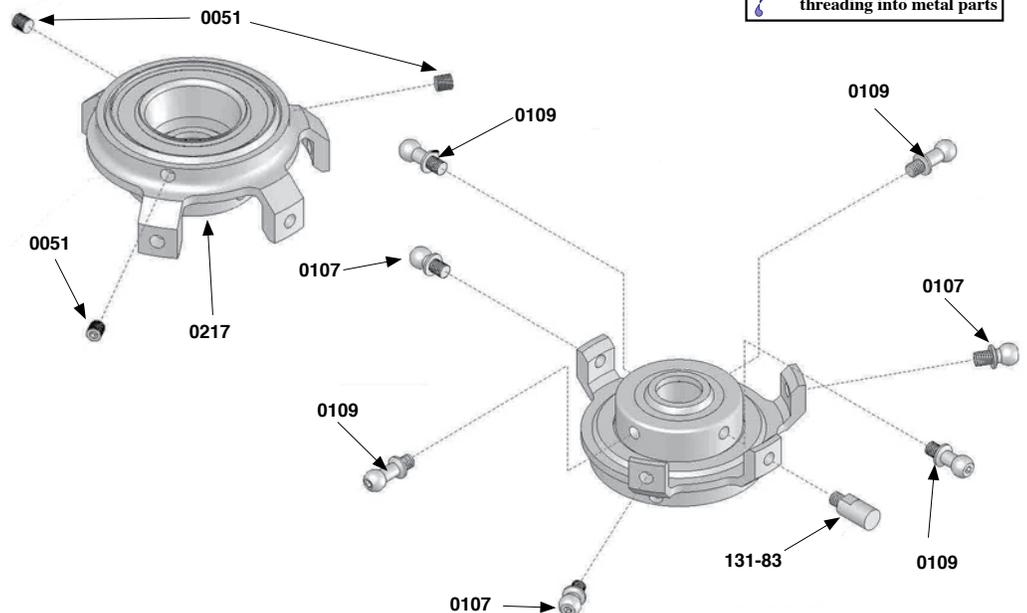
Apply a small amount of medium thread lock when threading into metal parts

HARDWARE FOR THIS ASSEMBLY

- 0051 x 3
M3x3 Socket Set Screw
- 0107 x 3
M3x6 Threaded Steel Ball
- 0109 x 4
M3x8 Threaded Steel Ball
- 131-83 x 1
Swashplate Pin

ASSEMBLY TIP

- Install MA0051 M3x3 Socket Set Screws only until they bottom out against the lower bearing. No not overtighten or damage to swashplate bearing will occur.



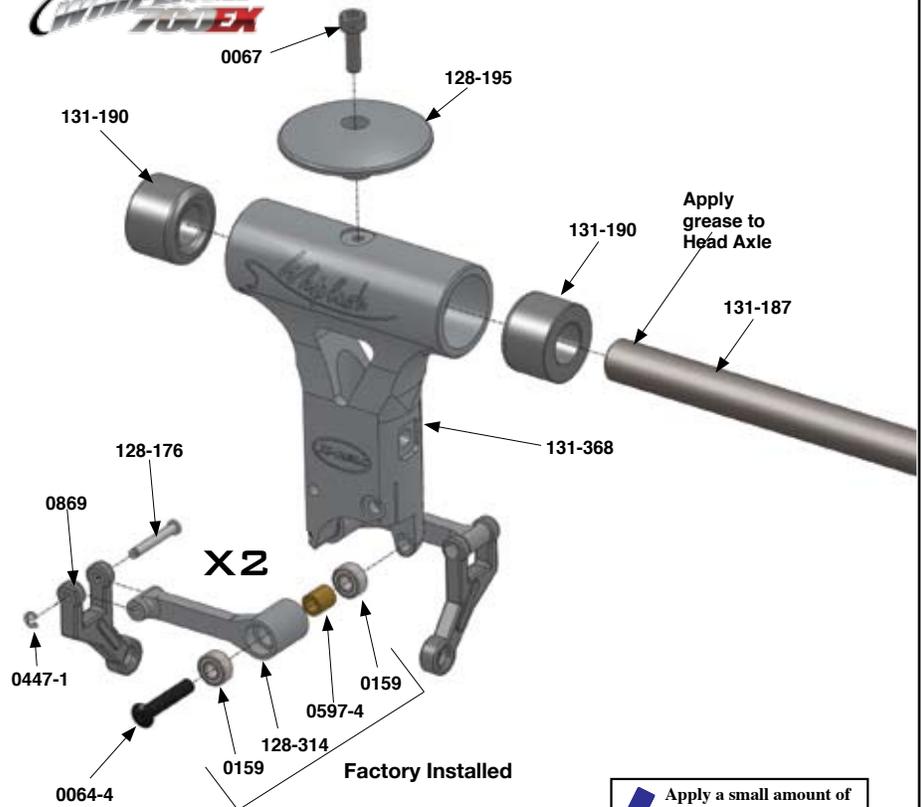


HARDWARE FOR THIS ASSEMBLY

-  0064-4 x 2
M3x16 Button Head Socket Bolt
-  0067 x 1
M3x14 Socket Bolt
-  0447-1 x 2
E-clip
-  128-176 x 2
M2x.584 Washout Pivot Pin

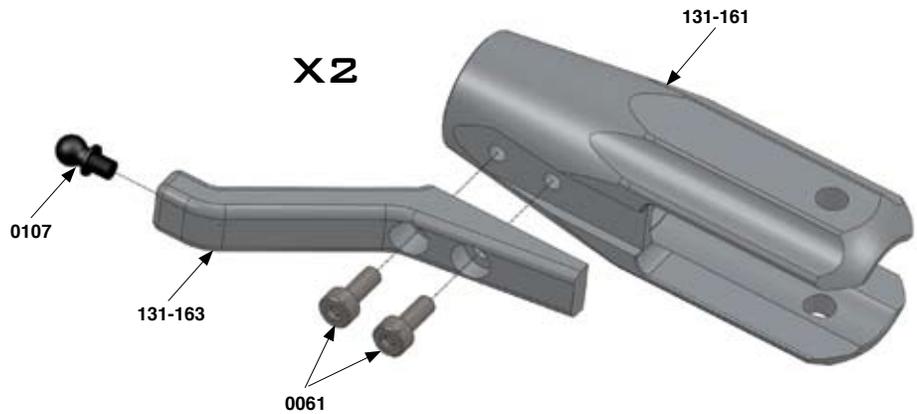
ASSEMBLY TIP

- The use of a light grease such as MA3200-06 Tri-Flow Synthetic Grease is required for damper/head axle lubrication



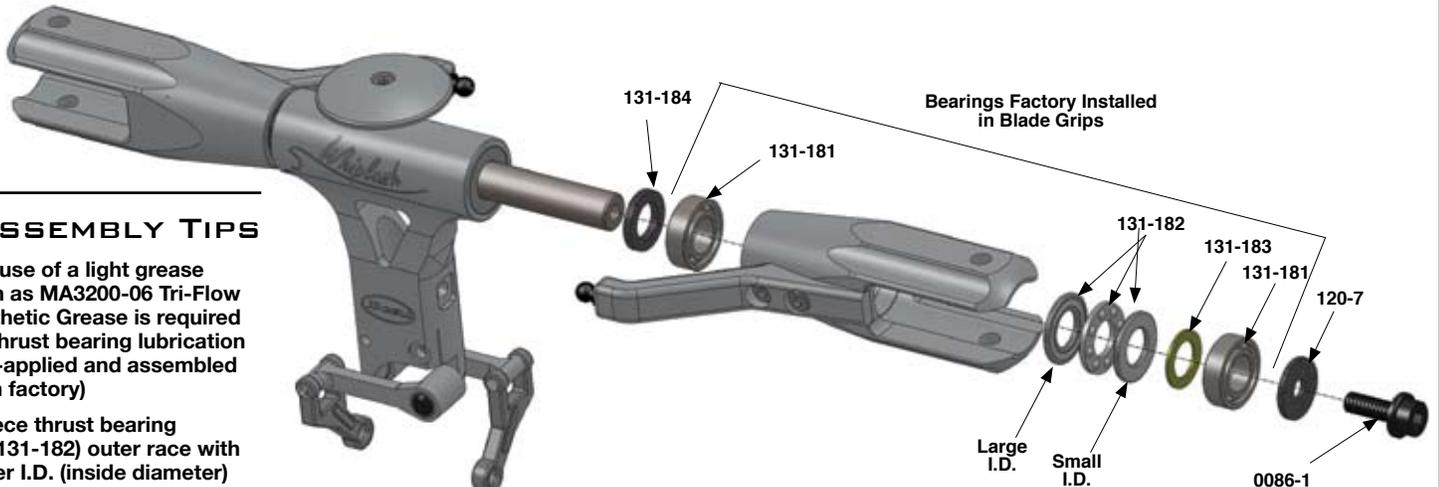
HARDWARE FOR THIS ASSEMBLY

-  0107 x 2
M3x6 Threaded Steel Ball
-  0061 x 4
M3x8 Socket Head Cap Screw
-  0086-1 x 2
M5x16 Flanged Bolt
-  120-7 x 2
M5x15 Carbon Fiber Safety Washer
-  131-183 x 2
9x14x.75 Washer
-  131-184 x 2
Carbon Fiber Damper Washer



ASSEMBLY TIPS

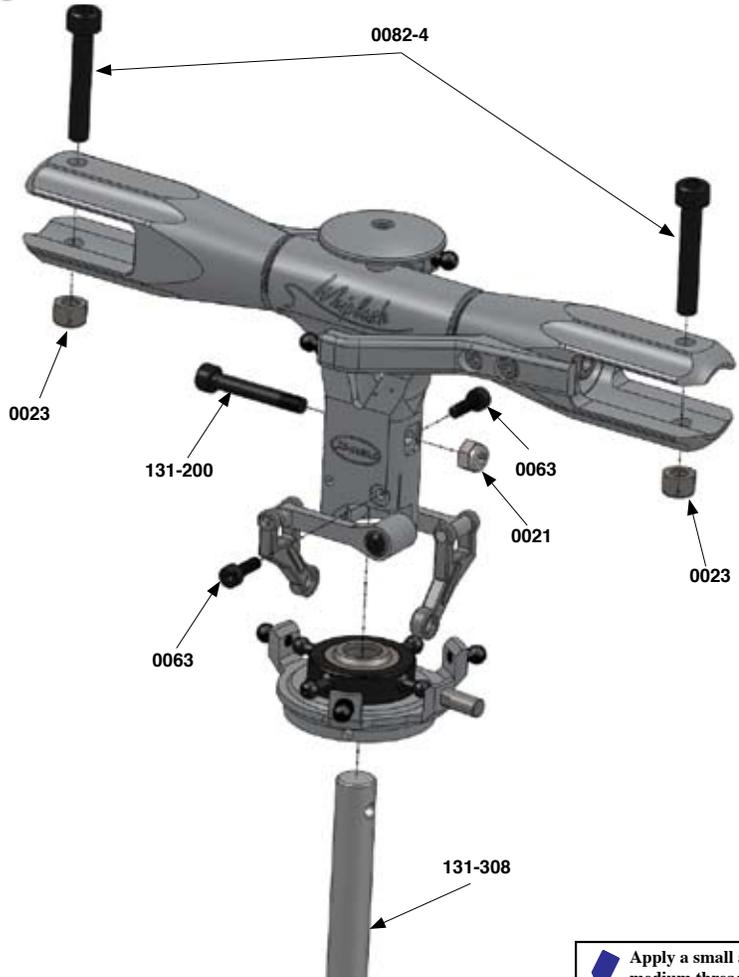
- The use of a light grease such as MA3200-06 Tri-Flow Synthetic Grease is required for thrust bearing lubrication (pre-applied and assembled from factory)
- 3 piece thrust bearing (MA131-182) outer race with larger I.D. (inside diameter) installs closest to hub.





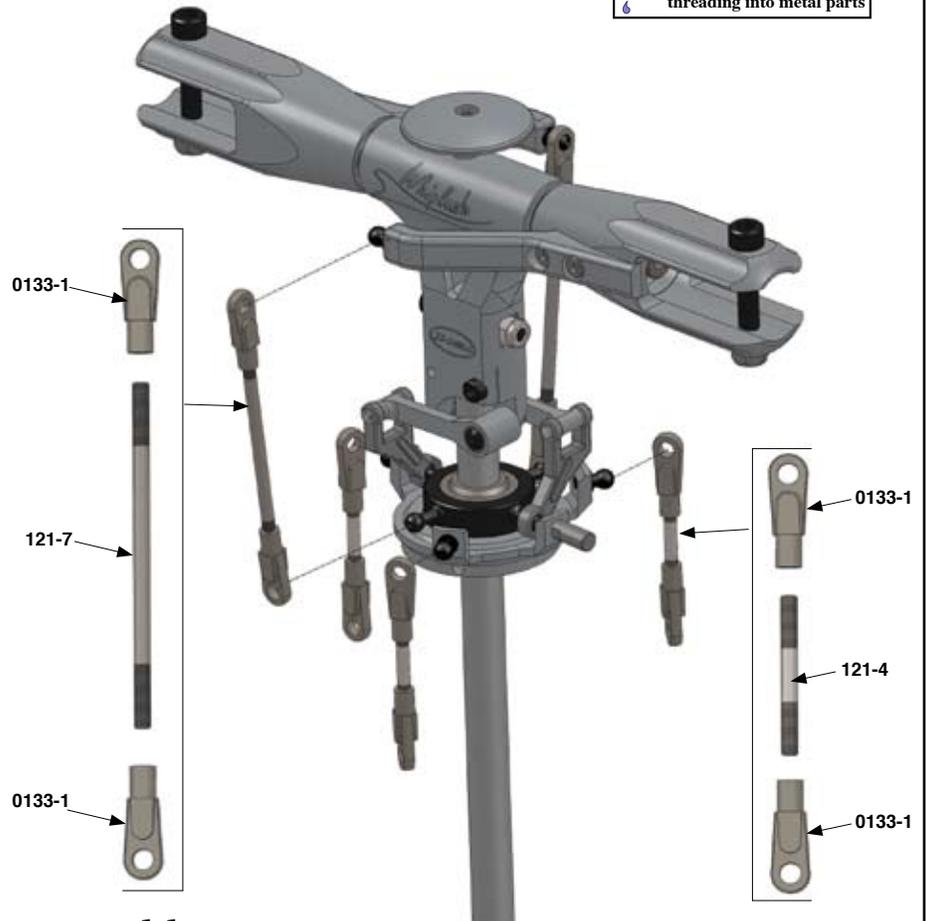
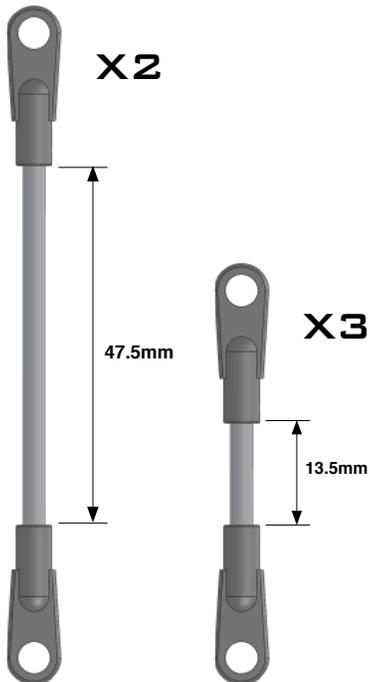
HARDWARE FOR THIS ASSEMBLY

-  0021 x 1
M4 Hex Locknut
-  0023 x 2
M5 Hex Locknut
-  0063 x 2
M3x10 Socket Bolt
-  0082-4 x 2
M5x32 Shouldered Socket Bolt
-  131-200 x 1
M4x33 Shouldered Socket Bolt



 Apply a small amount of medium thread lock when threading into metal parts

LINK ARM LENGTHS AND INSTALLATION





TAIL ASSEMBLY PARTS



0009
3mm Flat Steel
Washer



0012-2
M3 Pem Nut



0016-1
4mm External
Serrated Lockwasher



0019
3mm Hex
Locknut



0051
M3x3 Socket Set
Screw



0056
M3x5 Dog Point
Socket Screw



0058-3
M4x16 Socket Set
Screw



0059-0
M2.5x4 Socket Bolt



0059-1
M2.5x6 Socket
Bolt



0060-1
M3x6 Socket
Bolt



0061
M3x8 Socket
Bolt



0064-3
M3x6 Button Head
Socket Bolt



0065
M3x12 Socket
Bolt



0067
M3x14 Socket
Bolt



0069
M3x16 Socket
Bolt



0073
M3x20 Socket
Bolt



0078
M4x12 Socket
Bolt



0107
M3x6 Threaded
Steel Ball



0133
M2x21.2 Ball Links



0159
3x7x3 Bearing



0215
Auto Hub Ret. Collar



0225
Pivot Pin For
Pitch Links



0273
M6x10x.011" Steel
Shim Washer



0319
8x16x5 Bearing



0442
Pivoting T/R Pitch
Link



0597-1
3x4.75x.126 Brass
Spacer



120-39
5x10x4 Bearing



122-70
M.5x.25 Shim



127-86
M6x9.7x1.0 Shim
Washer



128-80
Aluminum Front
Boom Clamp



128-144
T/r Control Rod
Guides



128-149
Rear Boom Support
Mount



128-146
Aluminum Boom
Support Ends



131-17B
Tail Bevel Gear,
Shaft Side



131-18B
Tail Bevel Gear,
Torque Tube Side



131-23
6x13x5 Bearing



131-33
15x21x4 Bearing



131-34
Front Tail Drive
Transmission



131-35 Boom Clamp
W/transmission Holes



131-51
Jack Shaft



131-57
Torque Tube End



131-58
Torque Tube



131-60
Carbon Fiber Vertical
Tail Fin



131-62
Aluminum Tail Boom



131-64
Tail Hub



131-66
5x10 Thrust Bearing



131-69-1
Tail Linkage Rod



131-70
Tail Rotor Output
Shaft



131-73
7x11x3 Bearing



131-74
Pitch Slider Ring



131-76
Tail Pitch Yoke



131-77
Brass Slider



131-78
7mm Retaining Clip



131-80
Torque Tube Bearing
Cup



131-81
Torque Tube Bearing
Cup O-ring



131-84
Carbon Boom
Support Rod



131-86
Tail Boom Support
Assembly



131-112
T/R Blade Grip



131-128
Carbon Fiber Boom
Clamp Plate



131-129
Tail Case



131-130
Tail Bellcrank



131-131
Carbon Fiber
Bellcrank Bracket



131-132
Bellcrank Cup



131-135
Bracket Washer

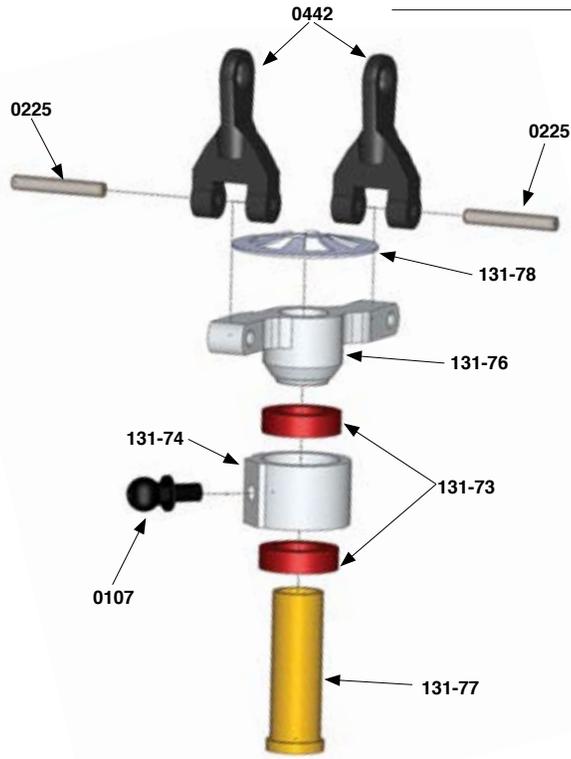


132-126
26T Helical Tail Drive
Gear



HARDWARE FOR THIS ASSEMBLY

-  0107 x 1
M3x6 Threaded
Steel Ball
-  0225 x 2
Pivot Pin for Washout
Arm
-  131-78
7mm Retaining Clip

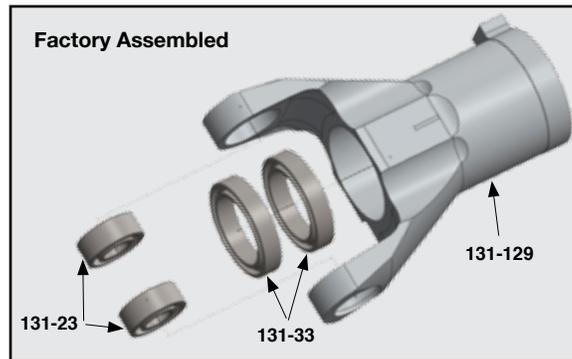


Factory Assembled
131-75

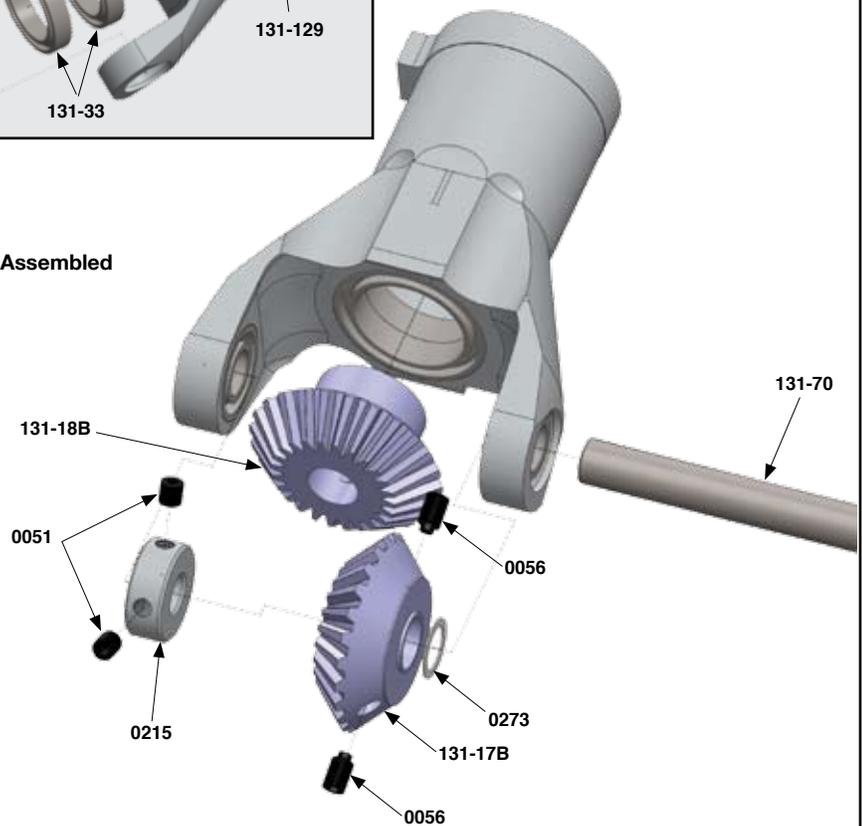
 Apply a small amount of medium thread lock when threading into metal parts

HARDWARE FOR THIS ASSEMBLY

-  0051 x 2
M3x3 Socket Set
Screw
-  0056 x 2
M3x5 Dog Point
Socket Screw
-  0273 x 1
m6x10x.11" Steel
Shim Washer



Factory Assembled



ASSEMBLY TIP

- Make sure to include MA0273 Shim Washer between MA131-17 Output Gear and transmission case bearing.

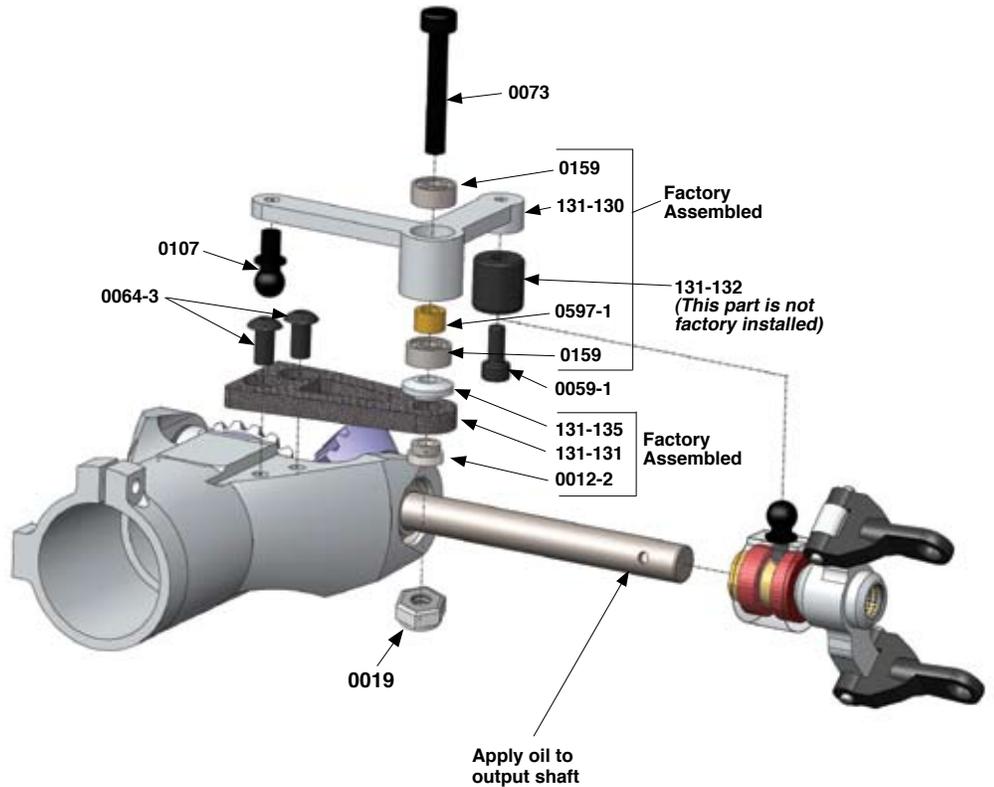


HARDWARE FOR THIS ASSEMBLY

-  0019 x 1
3mm Hex Nut
-  0059-1 x 1
M2.5x6 Socket Bolt
-  0064-3 x 2
M3x6 Button Head Socket Bolt
-  0073 x 1
M3x20 Socket Bolt
-  0107 x 1
M3x6 Threaded Steel Ball

ASSEMBLY TIP

- The use of a light oil such as MA3200-02 Tri-Flow Oil is required for tail rotor output shaft/pitch slider lubrication



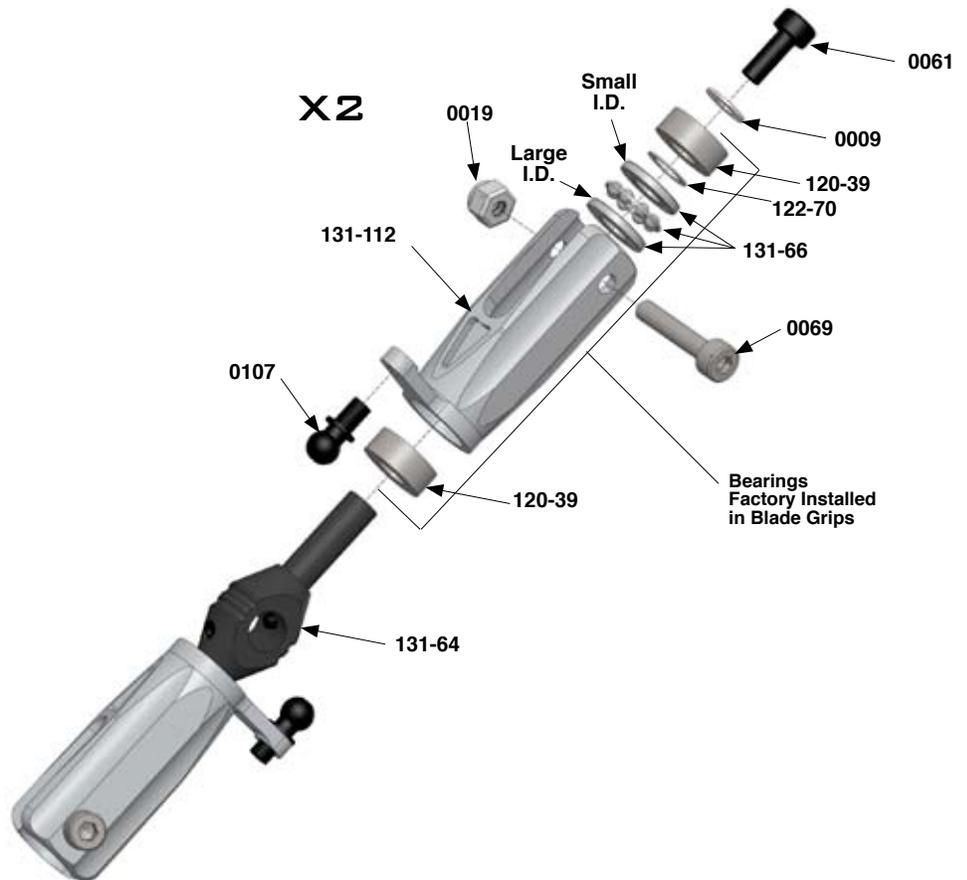
 Apply a small amount of medium thread lock when threading into metal parts

HARDWARE FOR THIS ASSEMBLY

-  0009 x 2
3mm Flat Steel Washer
-  0019 x 1
3mm Hex Nut
-  0061 x 2
M3x8 Socket Bolt
-  0069 x 2
M3x16 Socket Bolt
-  0107 x 2
M3x6 Threaded Steel Ball
-  122-70 x 2
M.5x.25 Shim

ASSEMBLY TIPS

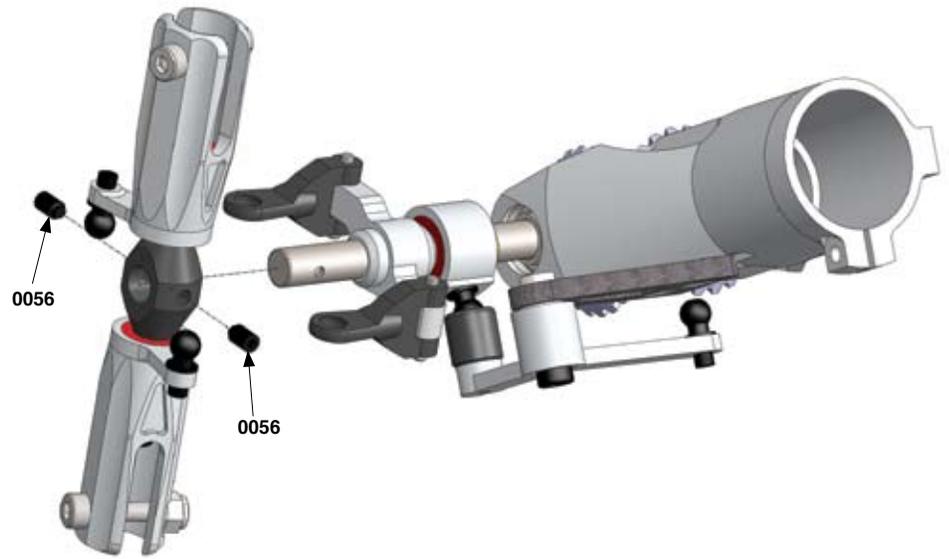
- 3 piece thrust bearing (MA131-66) outer race with larger I.D. (inside diameter) installs closest to hub.
- Grease the center ball cage of the thrust bearing. We recommend using MA3200-06 Tri-Flow synthetic grease.
- Only hand tighten MA0061 Socket Bolt until it is moderately tight. Do not overtighten bolt or it may result in fatigue to bolt. Use green thread lock on these bolts.





HARDWARE FOR THIS ASSEMBLY

- 0056 x 2
M3x5 Dog Point
Socket Screw



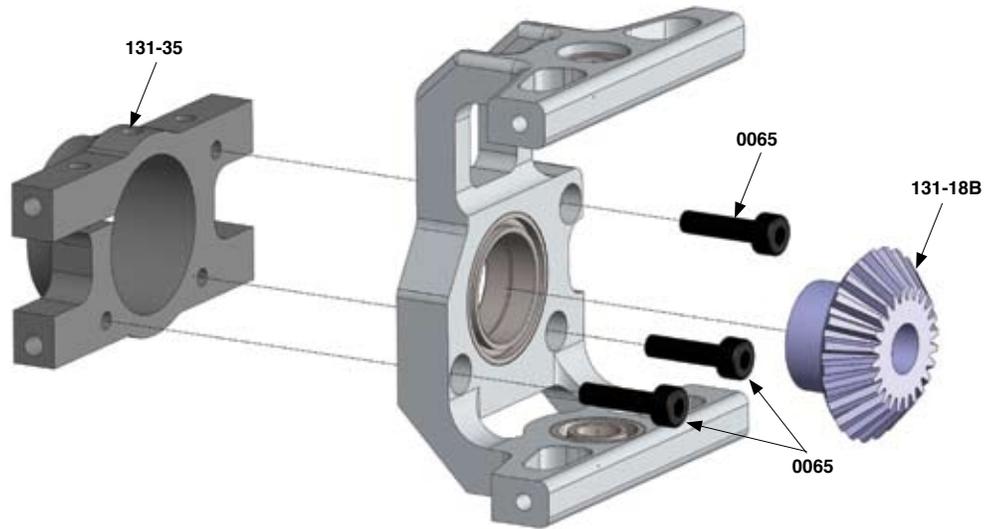
ASSEMBLY TIP

- Ensure the dog point tip is seated into the dimples on the tail rotor shaft.

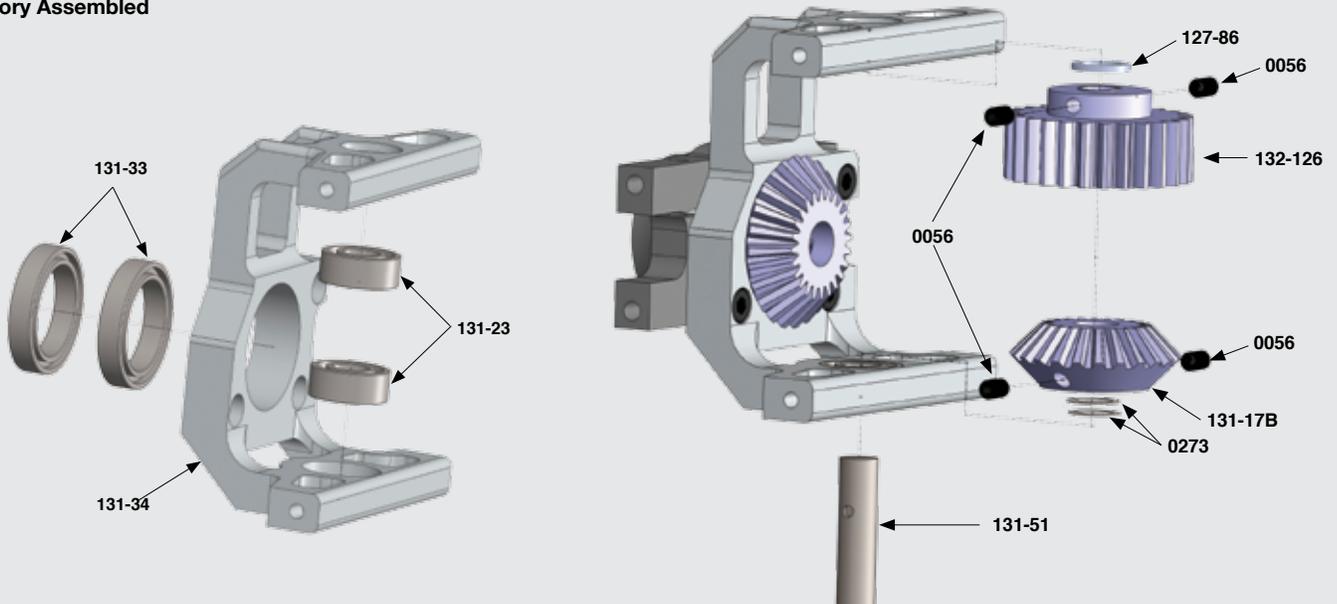
Apply a small amount of medium thread lock when threading into metal parts

HARDWARE FOR THIS ASSEMBLY

- 0056 x 4
M3x5 Dog Point
Socket Screw
- 0065 x 3
M3x12 Socket Bolt
- 0273 x 2
M6x10x.011" Steel
Shim Washer
- 127-86 x 1
M6x9.7x1.0 Shim
Washer



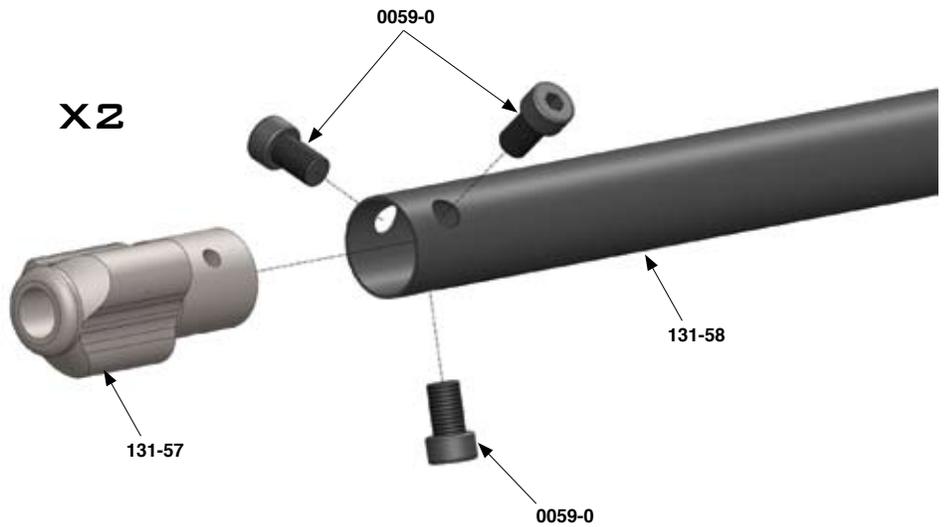
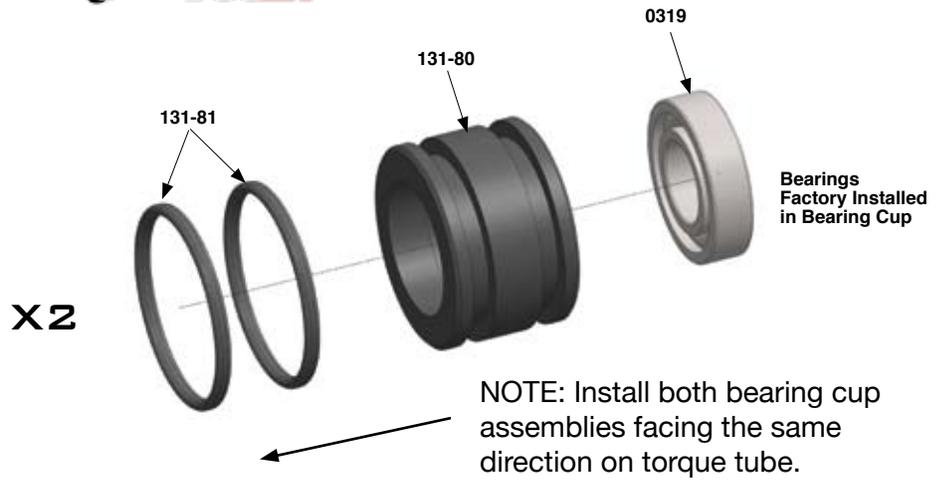
Factory Assembled





HARDWARE FOR THIS ASSEMBLY

 0059-0 x 6
M2.5x4 Socket Bolt



NOTE: Carefully CA glue bearing assemblies to torque tube making sure bearing locations are NOT equal distances from torque tube ends. Use only a very small amount of thin to medium CA ensuring no CA seeps into the bearing. Allow CA glue to dry before installing into tail boom.

 Apply a small amount of medium thread lock when threading into metal parts

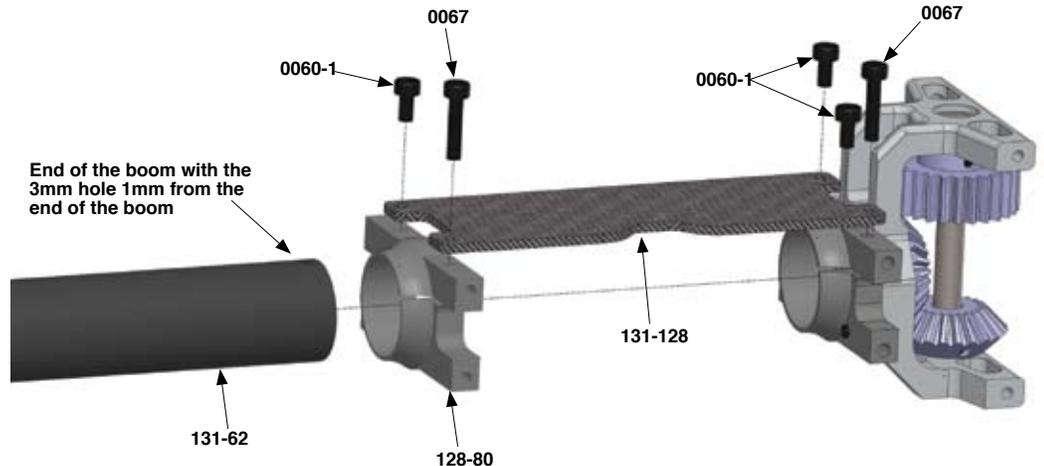
HARDWARE FOR THIS ASSEMBLY

 0060-1 x 3
M3x6 Socket Bolt

 0067 x 2
M3x14 Socket Bolt

ASSEMBLY TIPS

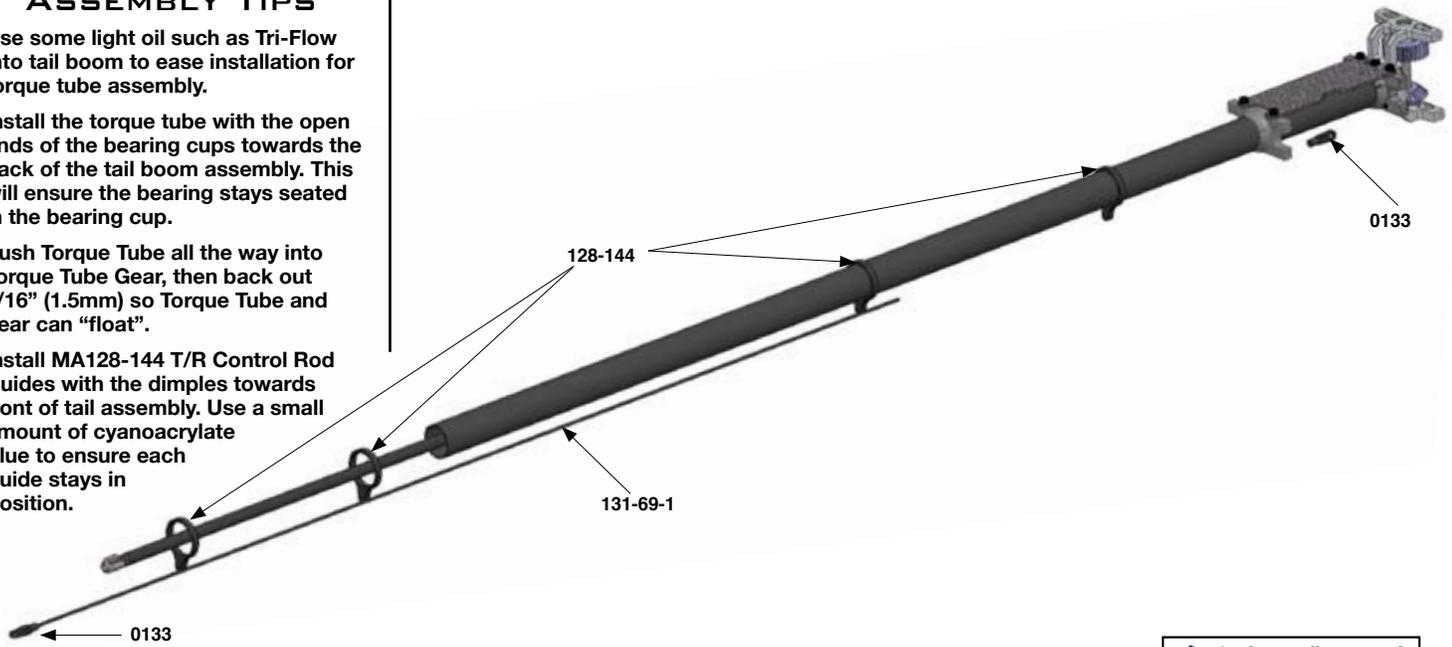
- Ensure that the boom is full inserted through boom clamps.
- Do not overtighten MA0067 Socket Bolts as it is possible to crush tail boom.





ASSEMBLY TIPS

- Use some light oil such as Tri-Flow into tail boom to ease installation for torque tube assembly.
- Install the torque tube with the open ends of the bearing cups towards the back of the tail boom assembly. This will ensure the bearing stays seated in the bearing cup.
- Push Torque Tube all the way into Torque Tube Gear, then back out 1/16" (1.5mm) so Torque Tube and gear can "float".
- Install MA128-144 T/R Control Rod Guides with the dimples towards front of tail assembly. Use a small amount of cyanoacrylate glue to ensure each guide stays in position.



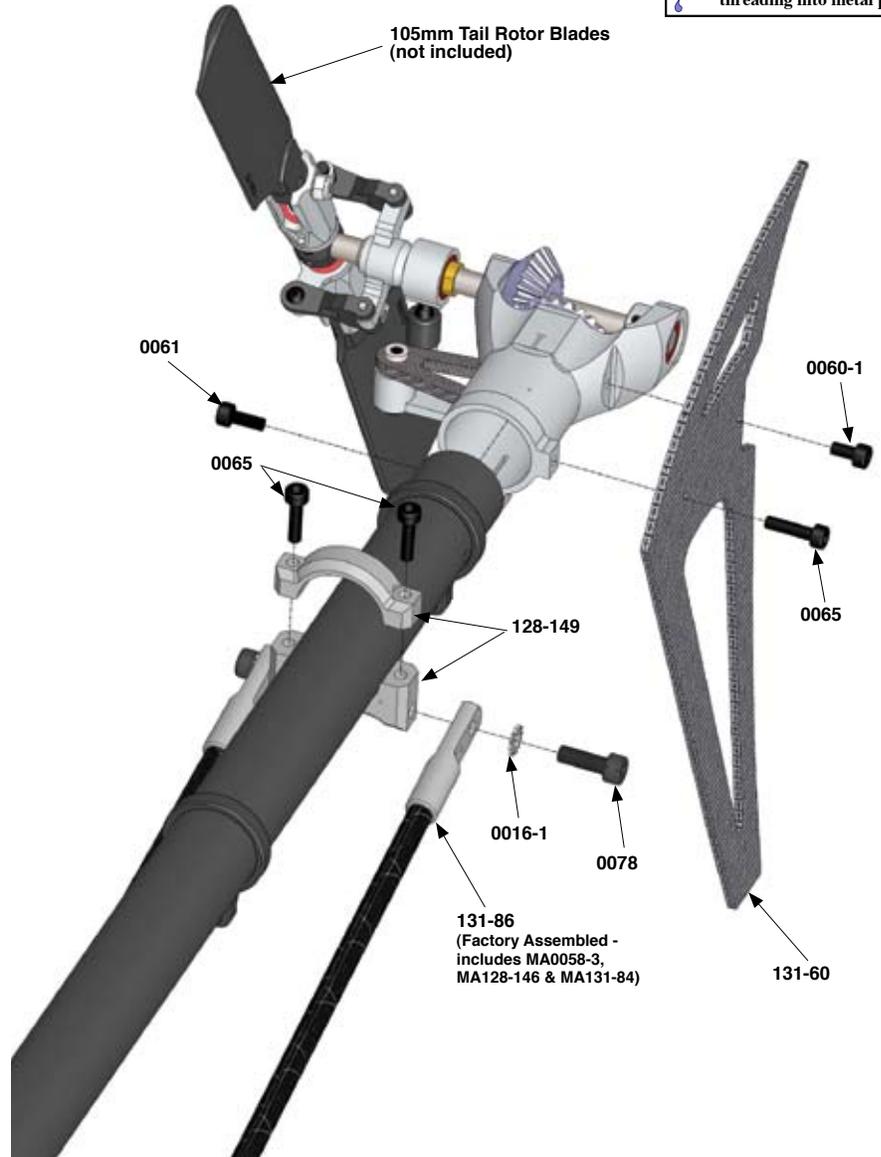
 Apply a small amount of medium thread lock when threading into metal parts

HARDWARE FOR THIS ASSEMBLY

-  0016-1 x 2
4mm External Serrated Lockwasher
-  0060-1 x 1
M3x6 Socket Bolt
-  0061 x 1
M3x8 Socket Bolt
-  0065 x 3
M3x12 Socket Bolt
-  0078 x 2
M4x12 Socket Bolt

ASSEMBLY TIPS

- The use of "green" thread lock such as MA3200-22 is recommended on MA0078 Socket Bolts.
- Do not overtighten MA0065 Socket Bolts on the Rear Boom Support Mounts.
- Aluminum boom support ends have a dimple on one side. The dimple indicates a slight angle built in to this part. On the Boom support assembly side that attaches to the main frame, the dimple will be facing "in".





ELECTRIC FRAME ASSEMBLY PARTS

0003 3mm Flat Steel Washer	0004 M4 Washer	0012-1 2.5mm Pem Nut	0012-2 3mm Pem Nut	0016-1 4mm External Serrated Lockwasher	0017-2 2.5mm Hex Nut	0021 M4 Hex Locknut	0053-5 M3x16 Set Screw	0057 M4x4 Set Screw	
0058-1 M4x6 Set Screw	0059-1 M2.5x6 Socket Bolt	0059-3 M2.5x10 Socket Bolt	0060-1 M3x6 Socket Bolt	0061 M3x8 Socket Bolt	0062 M3x10 Tapered Socket Bolt	0063 M3x10 Socket Bolt	0065 M3x12 Socket Bolt	0069 M3x16 Socket Bolt	0073 M3x20 Socket Bolt
0078-4 M4x8 Socket Bolt	0081 M4x16 Socket Bolt	0088 M3x8 Tapered Socket Bolt	0107 M3x6 Threaded Steel Ball	0116 2.5mm Threaded Steel Ball	0133 M2x21.2 Ball Link	0159 3x7x3 Bearing	0597-1 3x4.75x.126 Brass Spacer	106-22 Rubber Canopy Grommets	127-37 10x19x5 Flanged Bearing
128-57 Tray Mount	128-58 Main Frame Spacer	128-59 Front Boom Support Spacer	129-49 Rubber Wire Grommet	131-19 10x26x8 Bearing	131-20 Middle Main Shaft Bearing Block	131-21 Upper Main Shaft Bearing Block	131-24 Main Gear Hub		
131-29 Carbon Fiber X-brace	131-40 Bottom Main Shaft Bearing Block	131-46 Pitch/Aileron Servo Rail	131-47 Carbon Fiber Servo Rail Spacer	131-50 Elevator Servo Mount	131-52 Delrin Tray Mount	131-53 Gyro Plate	131-54 M4 Tray Mount		
131-69 M2x315 Linkage Rod	131-85 Carbon Tube	131-107 Swing Arm	131-109 Swing Arm Pivot Mount	131-139 Skid Tube	131-148 Servo Plate	131-150 Front Canopy Post	131-151 Rear Canopy Post		
131-153 Carbon Fiber Breakaway Tab	131-154 Thumb Screw	131-186 Anti Rotation Bracket	131-201 M4x25 Shouldered Socket Bolt	131-254 700EX Painted Canopy	131-382 Carbon Fiber Strut Spacer	132-101 Lower Pinion Bearing Block	132-105 One-Way Bearing		
132-106 One-Way Housing	132-112 12T Helical Pinion Gear	132-117 117T Helical Main Gear	132-120 700EX Carbon Fiber Frame (L)	132-121 700EX Carbon Fiber Frame (R)	132-122 700EX Carbon Fiber Doubler - Front	132-123 700EX Carbon Fiber Doubler - Rear	132-128 700EX Front Battery Tray		
132-129 700EX Upper Battery Tray	132-130 700EX Vertical Battery Tray	132-131 700EX Battery Tray Spacers	132-136 700EX Landing Struts	132-40 700EX Motor Mount	3200-48 1/2" Hook & Loop Tape	3200-54 Adhesive Back Hook & Loop Tape	3200-57 15" Battery Straps		



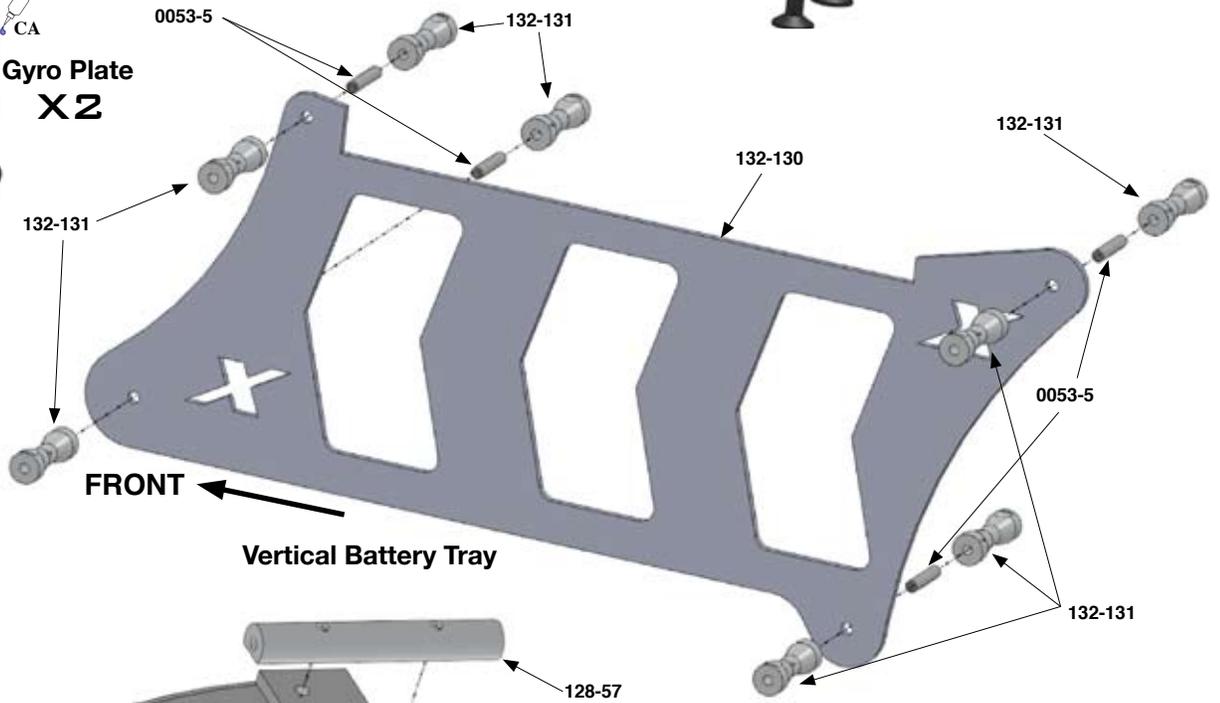
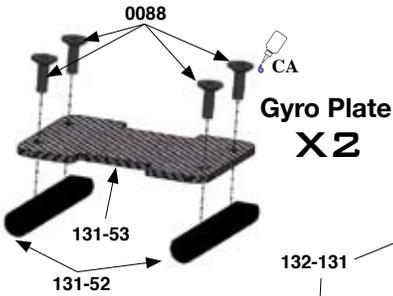
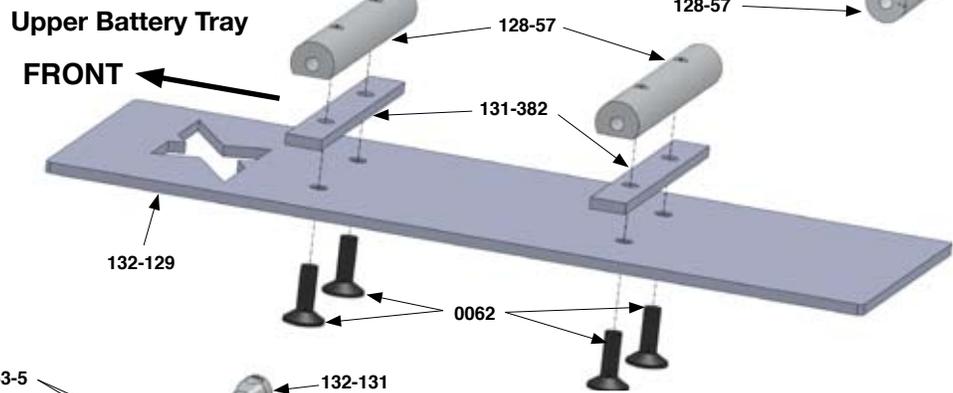
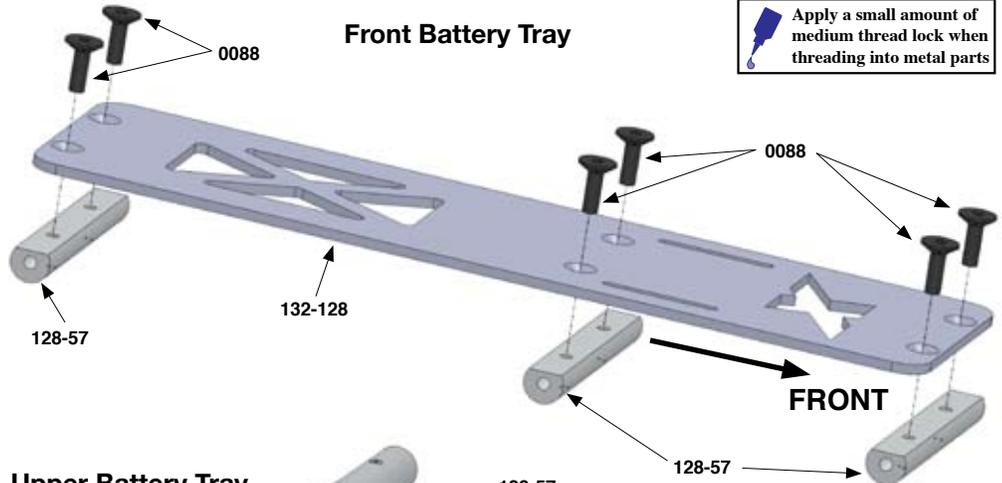
HARDWARE FOR THIS ASSEMBLY

-  0003 x 4
3mm Flat Steel Washer
-  0053-5 x 4
M3x16 Socket Set Screw
-  0062 x 4
M3x10 Tapered Socket Bolt
-  0073 x 4
M3x20 Socket Bolt
-  0088 x 14
M3x8 Tapered Socket Bolt

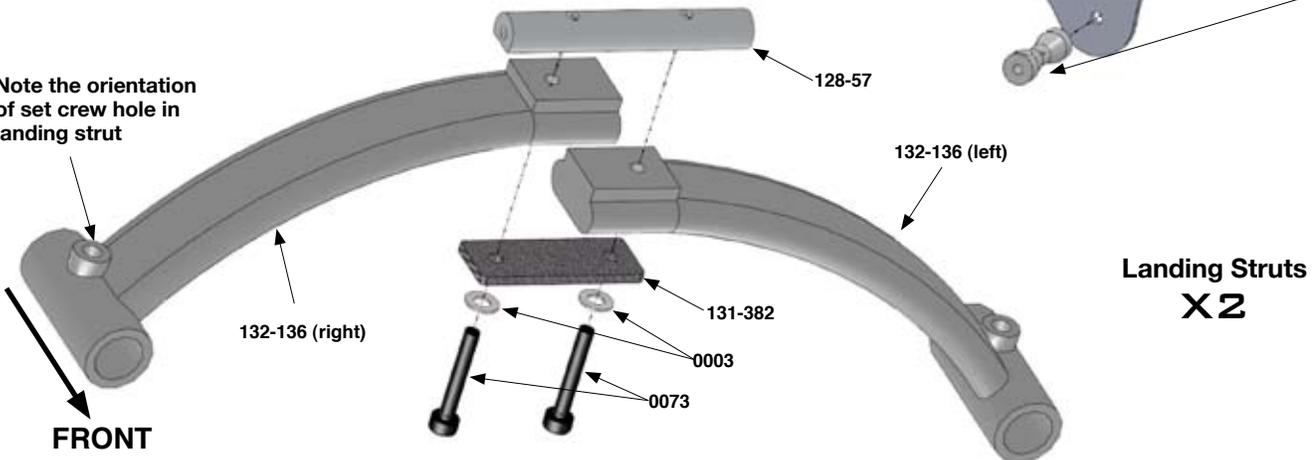
ASSEMBLY TIPS

- Do not overtighten MA0088 Tapered Socket Bolt into MA131-52 Delrin Tray Mount. Secure screws with a small amount of CA glue.

 Apply a small amount of medium thread lock when threading into metal parts



- Note the orientation of set crew hole in landing strut



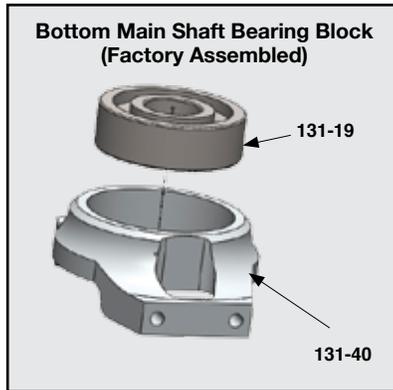


HARDWARE FOR THIS ASSEMBLY

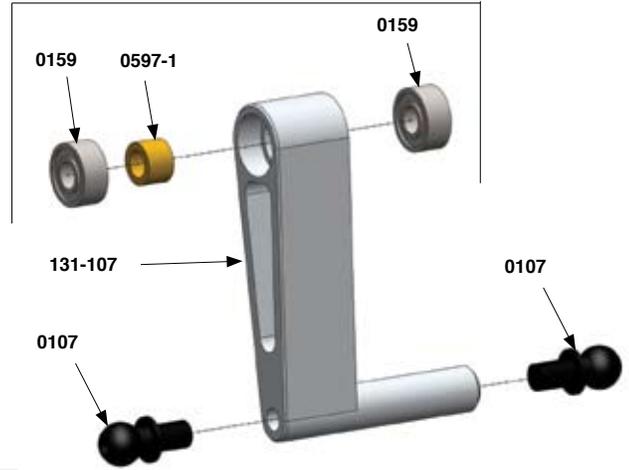
-  0003 x 2
3mm Flat Steel Washer
-  0060-1 x 2
M3x6 Socket Bolt
-  0061 x 14
M3x8 Socket Bolt
-  0069 x 1
M3x16 Socket Bolt
-  0107 x 2
M3x6 Threaded Steel Ball

 Apply a small amount of medium thread lock when threading into metal parts

Bottom Main Shaft Bearing Block (Factory Assembled)

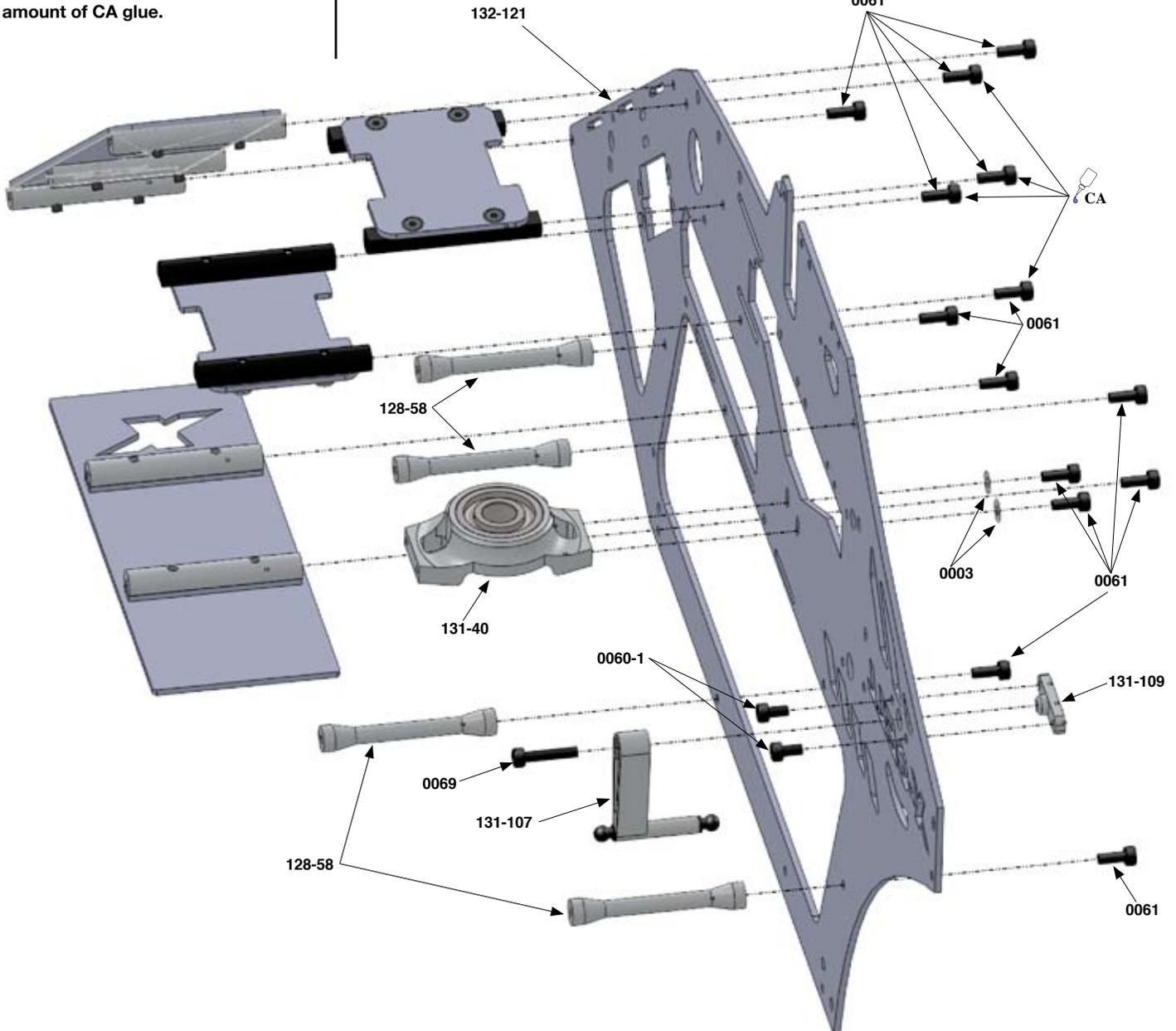


Bearings Factory Installed



ASSEMBLY TIP

- Do not overtighten MA0061 Socket Bolt into MA131-52 Delrin Tray Mount. Secure screws with a small amount of CA glue.

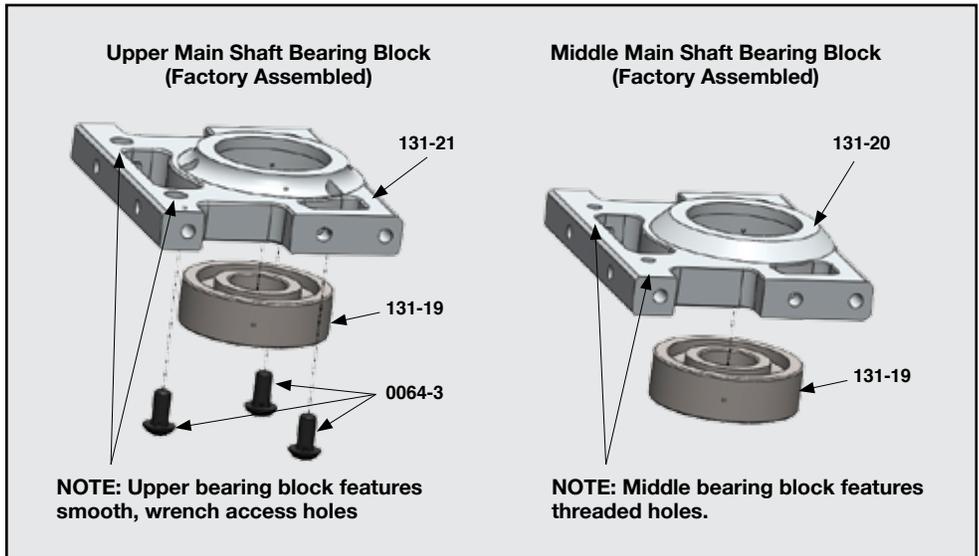


HARDWARE FOR THIS ASSEMBLY

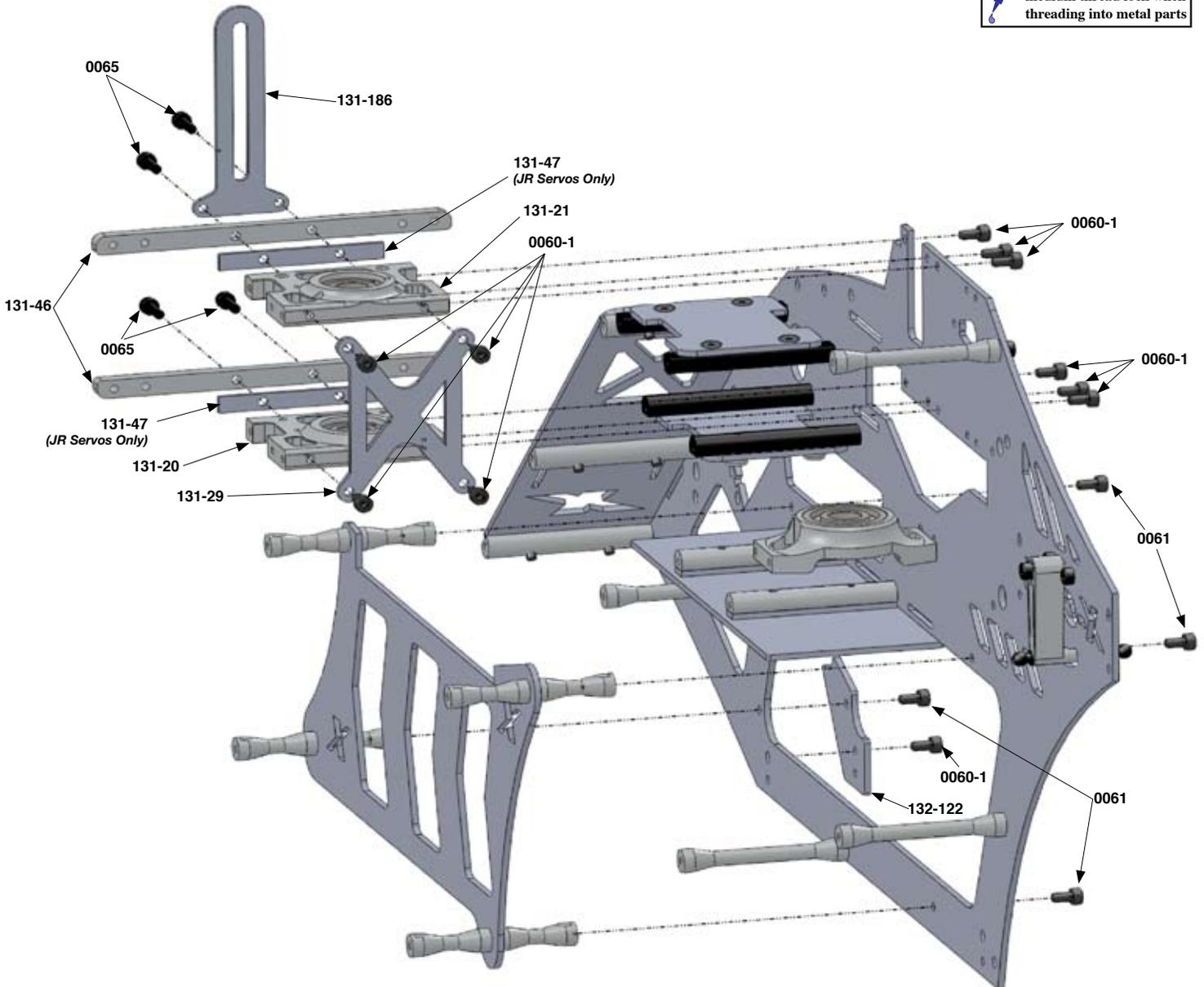
-  0060-1 x 11
M3x6 Socket Bolt
-  0061 x 4
M3x8 Socket Bolt
-  0065 x 4
M3x12 Socket Bolt

ASSEMBLY TIP

- If using JR brand servos or other "tall" servos, the use of MA131-47 Servo Rail Spacer included in this kit may be required.



 Apply a small amount of medium thread lock when threading into metal parts



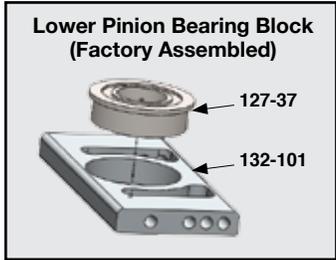


HARDWARE FOR THIS ASSEMBLY

-  0003 x 4
3mm Flat Steel Washer
-  0057 x 3
M4x4 Set Screw
-  0061 x 8
M3x8 Socket Bolt
-  0063 x 2
M3x10 Socket Bolt
-  0078-4 x 4
M4x8 Socket Bolt

ASSEMBLY TIP

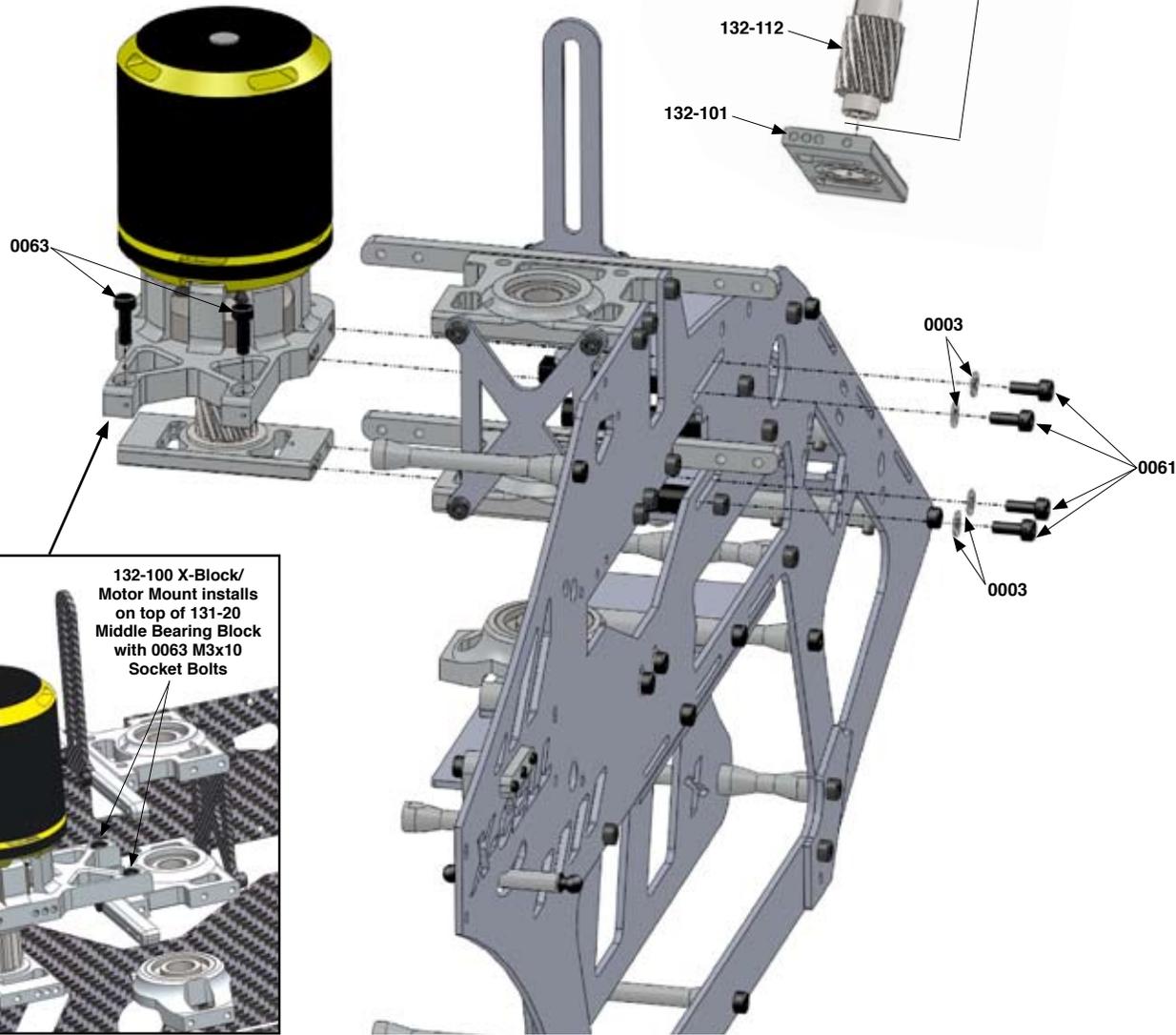
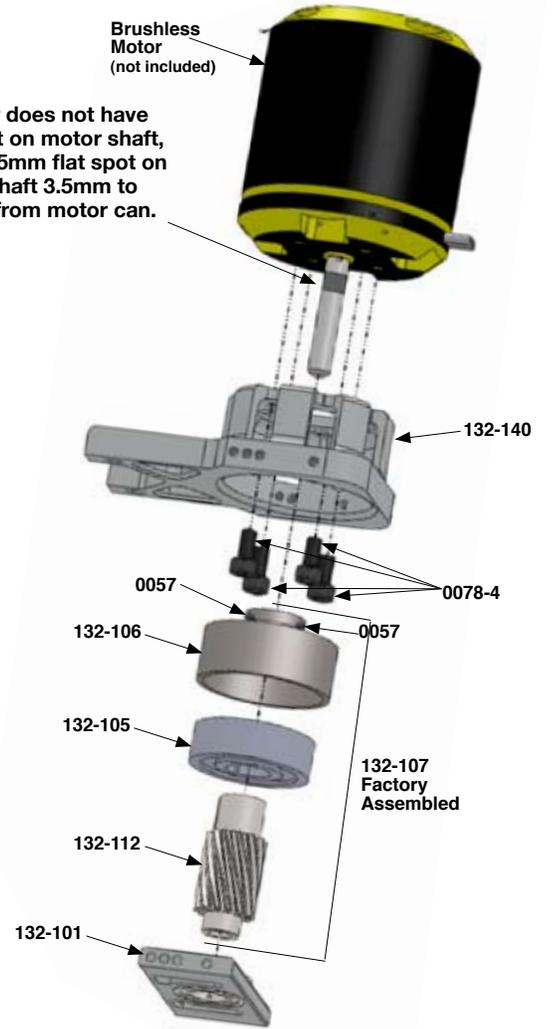
- Motor mounting screws will vary depend on individual motor choice. Four MA0061 M3x8 bolts are also included.
- Slide MA132-107 One-Way Assembly as far as possible onto motor shaft. Tighten MA0057 Set Screws lightly. Final One-Way/Pinion position set on page 9.



If motor does not have flat spot on motor shaft, grind a 5mm flat spot on motor shaft 3.5mm to 8.5mm from motor can.

Brushless Motor (not included)

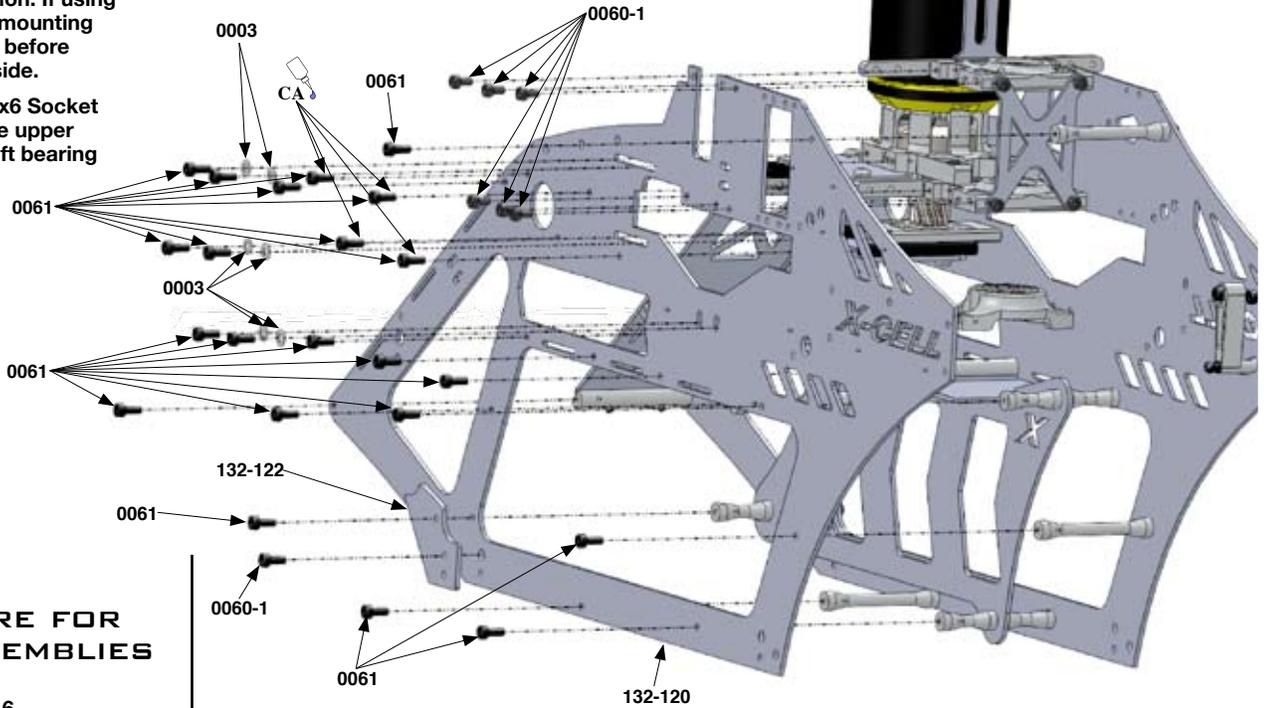
 Apply a small amount of medium thread lock when threading into metal parts





ASSEMBLY TIPS

- Look ahead to page 27 to determine ESC location. If using MA's recommended mounting position, mount ESC before installing left frame side.
- Note - MA0060-1 M3x6 Socket Bolts are used for the upper and middle main shaft bearing blocks.
- Do not overtighten MA0061 Socket Bolt into MA131-52 Delrin Tray Mount. Secure screws with a small amount of CA glue.



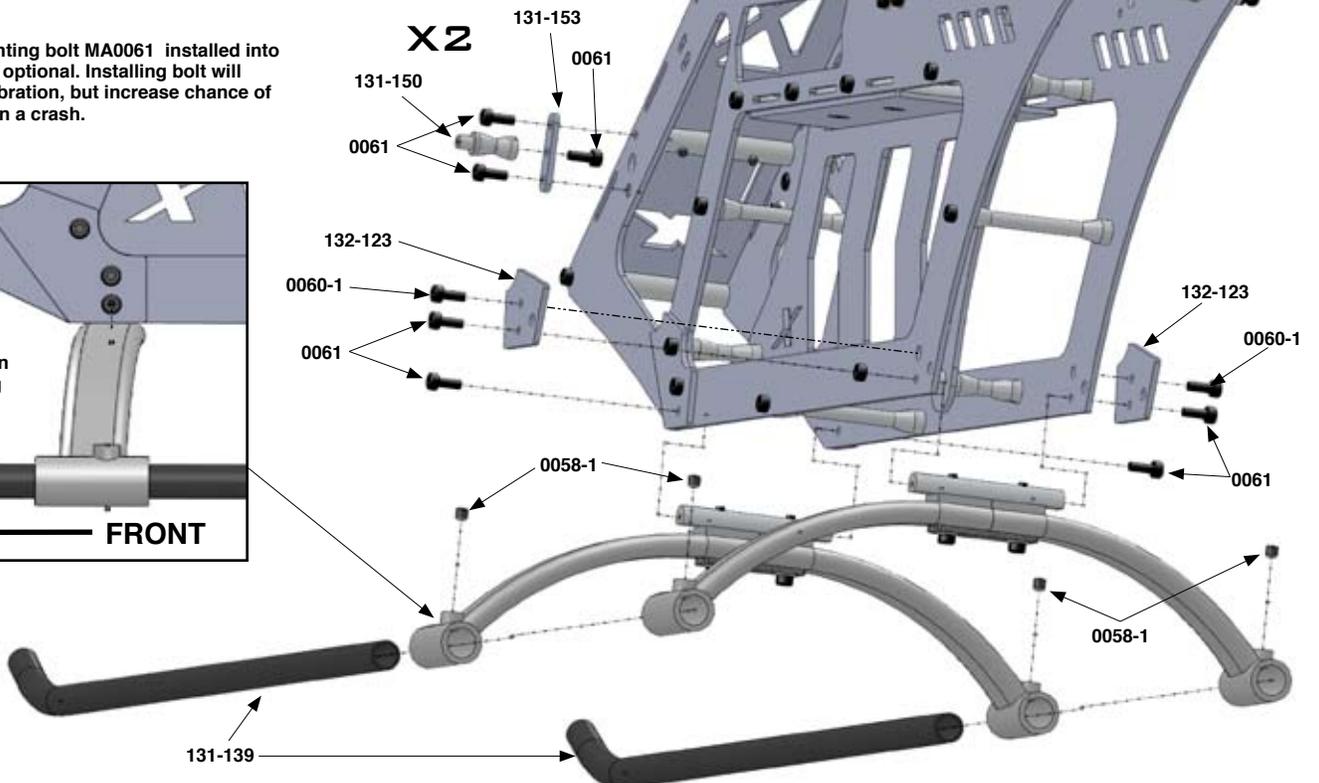
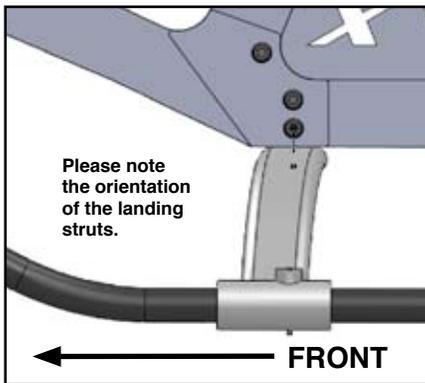
HARDWARE FOR THESE ASSEMBLIES

-  0003 x 6
3mm Flat Steel Washer
-  0058-1 x 4
M4x6 Set Screw
-  0060-1 x 9
M3x6 Socket Bolt
-  0061 x 32
M3x8 Socket Bolt



 Apply a small amount of medium thread lock when threading into metal parts

Lower canopy mounting bolt MA0061 installed into PEM nut in frame is optional. Installing bolt will decrease canopy vibration, but increase chance of damage to canopy in a crash.



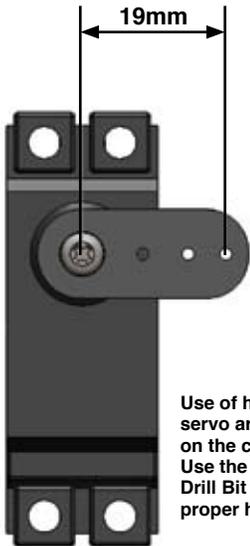
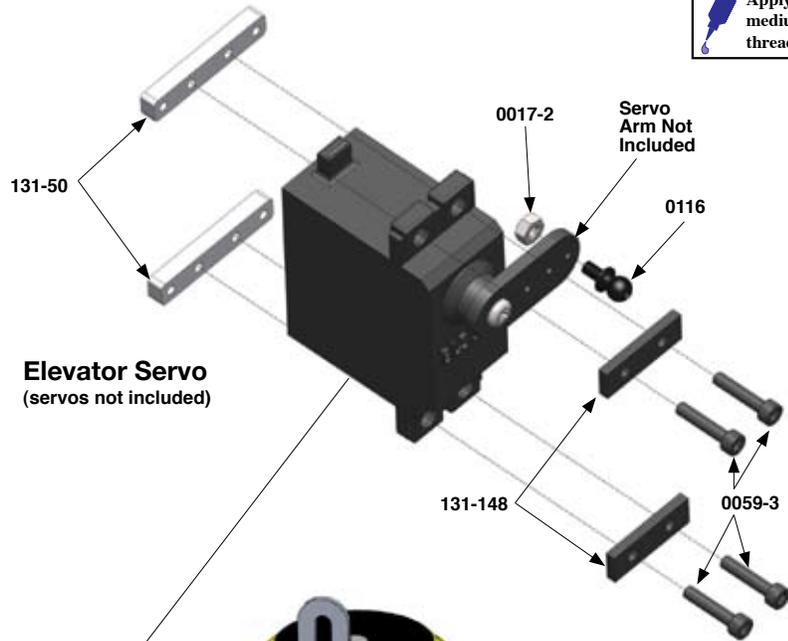
HARDWARE FOR THIS ASSEMBLY

-  0017-2 x 3
2.5mm Hex Nut
-  0059-1 x 4
M2.5x6 Socket Bolt
-  0059-3 x 12
M2.5x10 Socket Bolt
-  0116 x 3
2.5mm Threaded
Steel Ball

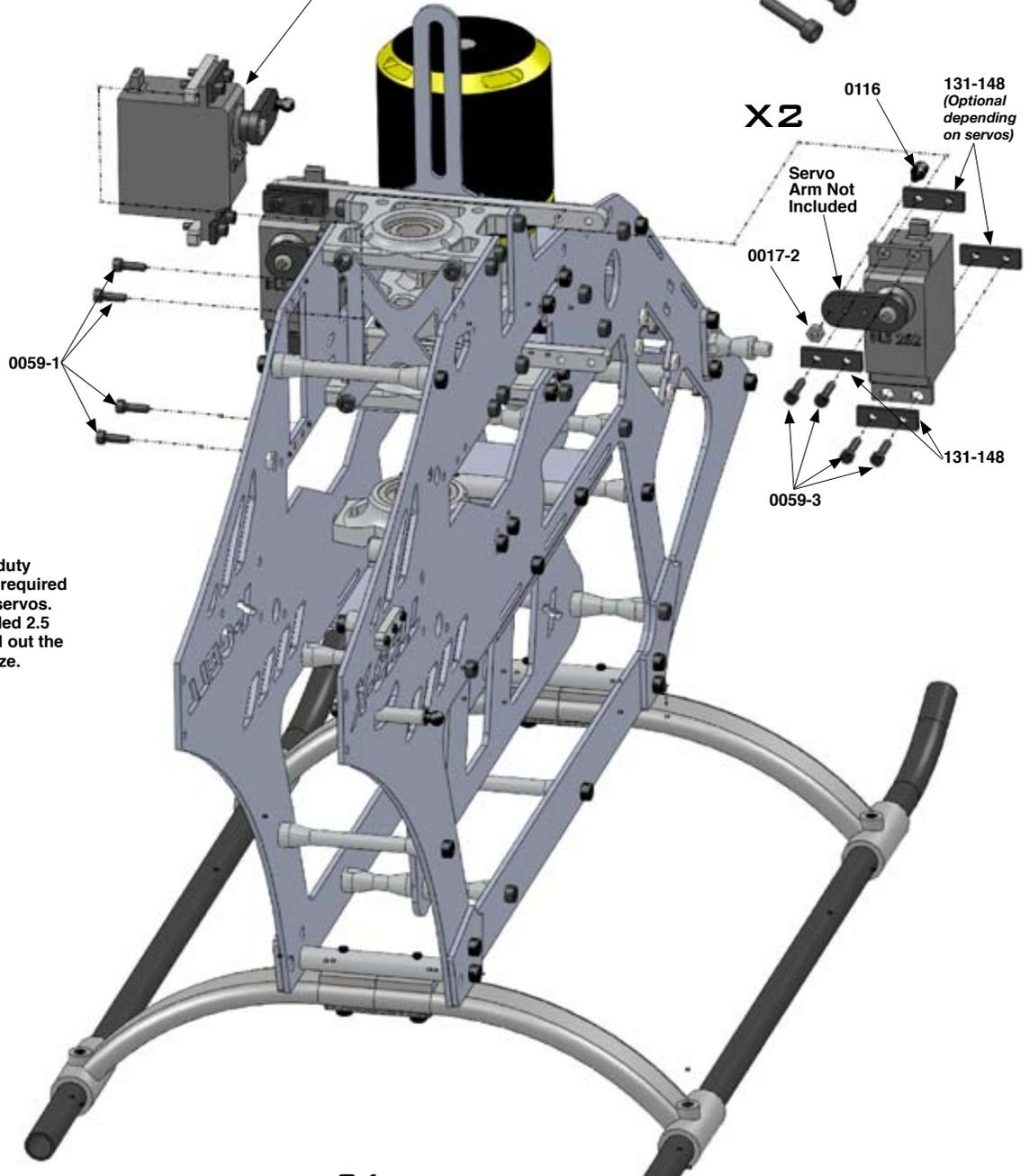
ASSEMBLY TIP

- MA131-48 Servo Spacers are included for proper servo linkage alignment, if required.

 Apply a small amount of medium thread lock when threading into metal parts



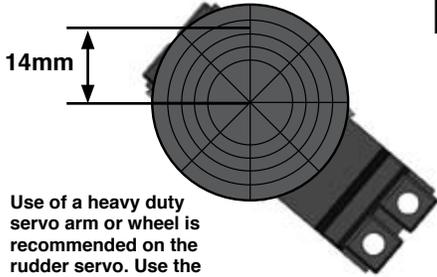
Use of heavy duty servo arms is required on the cyclic servos. Use the included 2.5 Drill Bit to drill out the proper hole size.



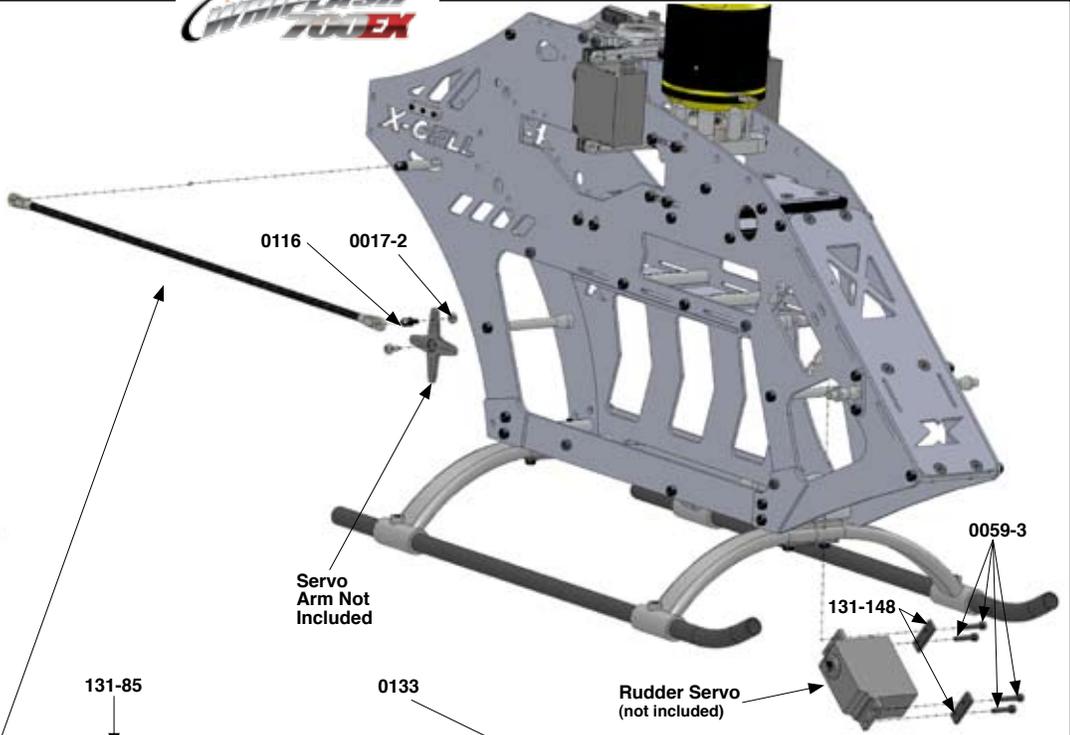


HARDWARE FOR THIS ASSEMBLY

-  0017-2 x 1
2.5mm Hex Nut
-  0059-3 x 4
M2.5x10 Socket Bolt
-  0116 x 1
2.5mm Threaded Steel Ball



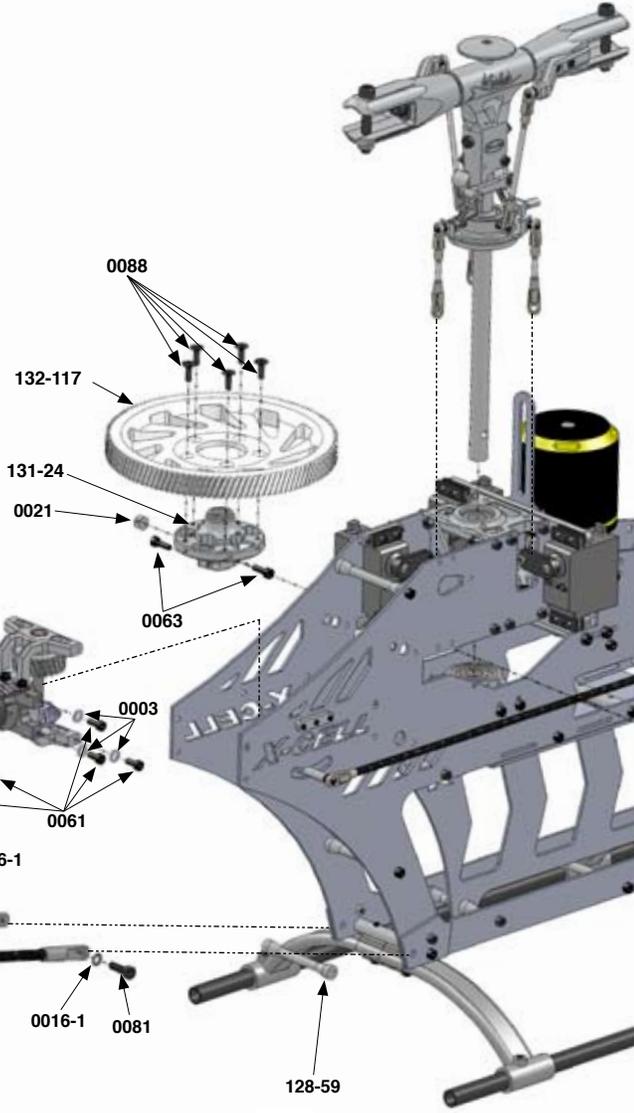
Use of a heavy duty servo arm or wheel is recommended on the rudder servo. Use the included Drill Bit to drill out the proper hole size.



 Apply a small amount of medium thread lock when threading into metal parts

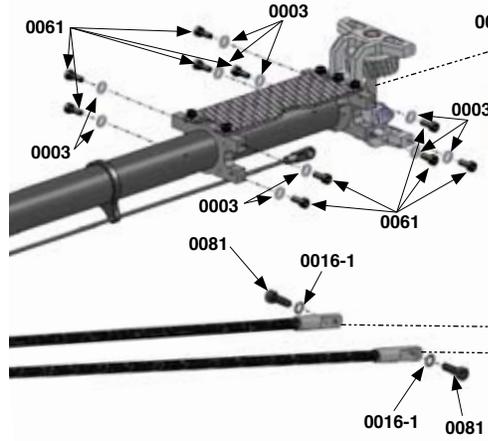
HARDWARE FOR THIS ASSEMBLY

-  0003 x 10
3mm Flat Steel Washer
-  0004 x 1
M4 Washer
-  0016-1 x 2
4mm External Serrated Lockwasher
-  0021 x 1
M4 Hex Locknut
-  0061 x 10
M3x8 Socket Bolt
-  0063 x 2
M3x10 Socket Bolt
-  0081 x 2
M4x16 Socket Bolt
-  0088 x 5
M3x8 Tapered Socket Bolt
-  131-201 x 1
M4x25 Shouldered Socket Bolt



After Main Shaft is bolted to the Main Gear, adjust Bottom Main Shaft Bearing Block to eliminate any vertical play. Tighten Bottom Bearing Block bolts.

Adjust proper Pinion-to-Main Gear mesh and Tail Gear-to-Main Gear mesh to avoid excessive heat and wear on the drivetrain.

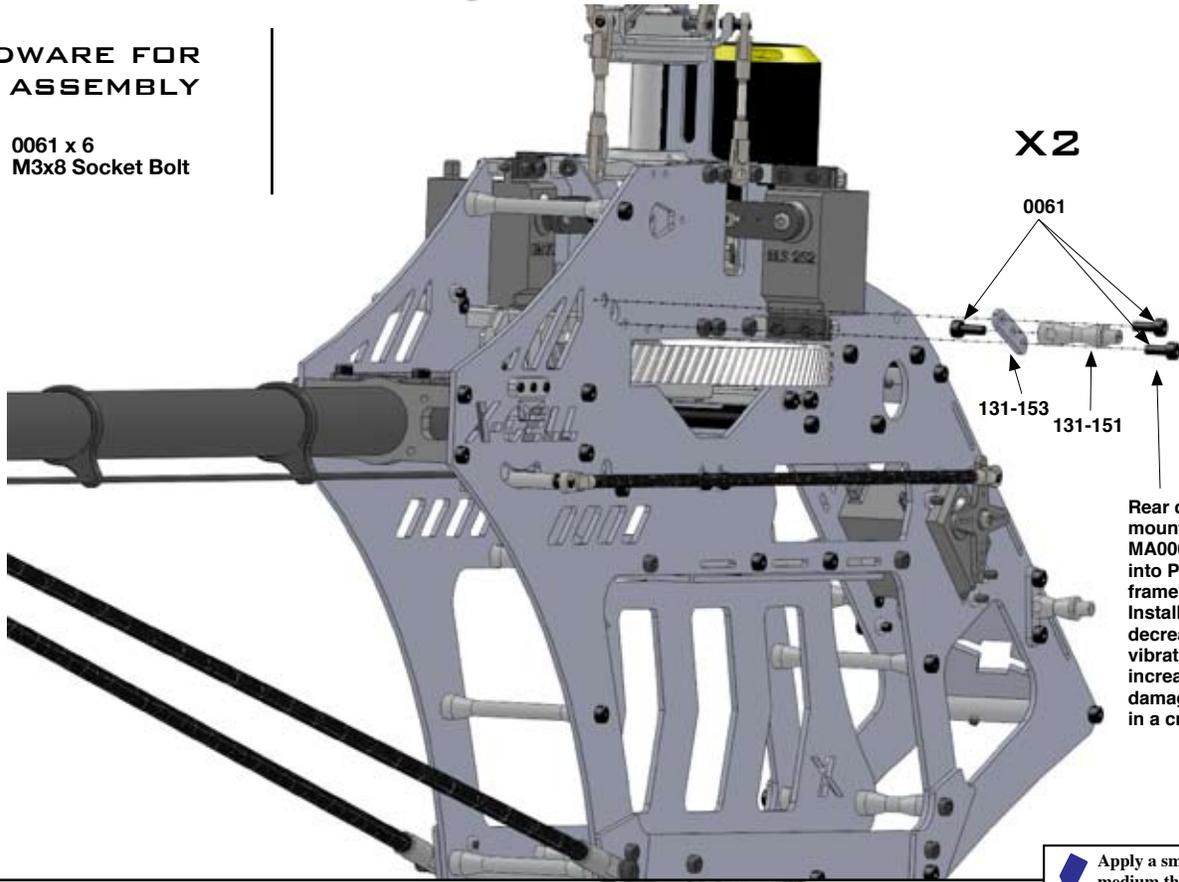




HARDWARE FOR THIS ASSEMBLY



0061 x 6
M3x8 Socket Bolt



X2

0061

131-153

131-151

Rear canopy mounting bolt MA0061 installed into PEM nut in frame is optional. Installing bolt will decrease canopy vibration, but increase chance of damage to canopy in a crash.

Apply a small amount of medium thread lock when threading into metal parts

HARDWARE FOR THIS ASSEMBLY



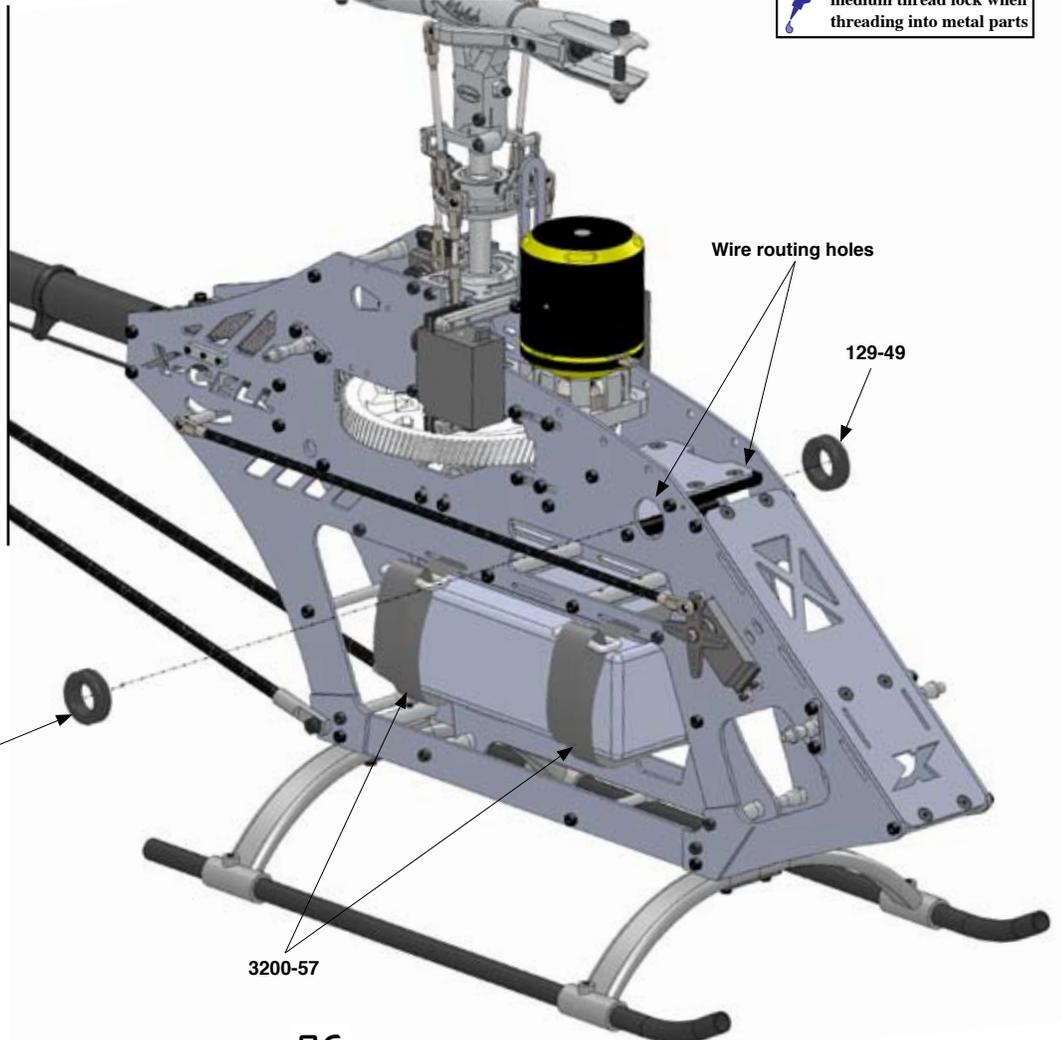
129-49 x 2
Rubber Wire Grommet



3200-57 x 2
Hook & Loop Cinching Strap

ASSEMBLY TIP

- Sand the edges of the frame around the battery strap slots to prevent the sharp edges from cutting the battery straps.



Wire routing holes

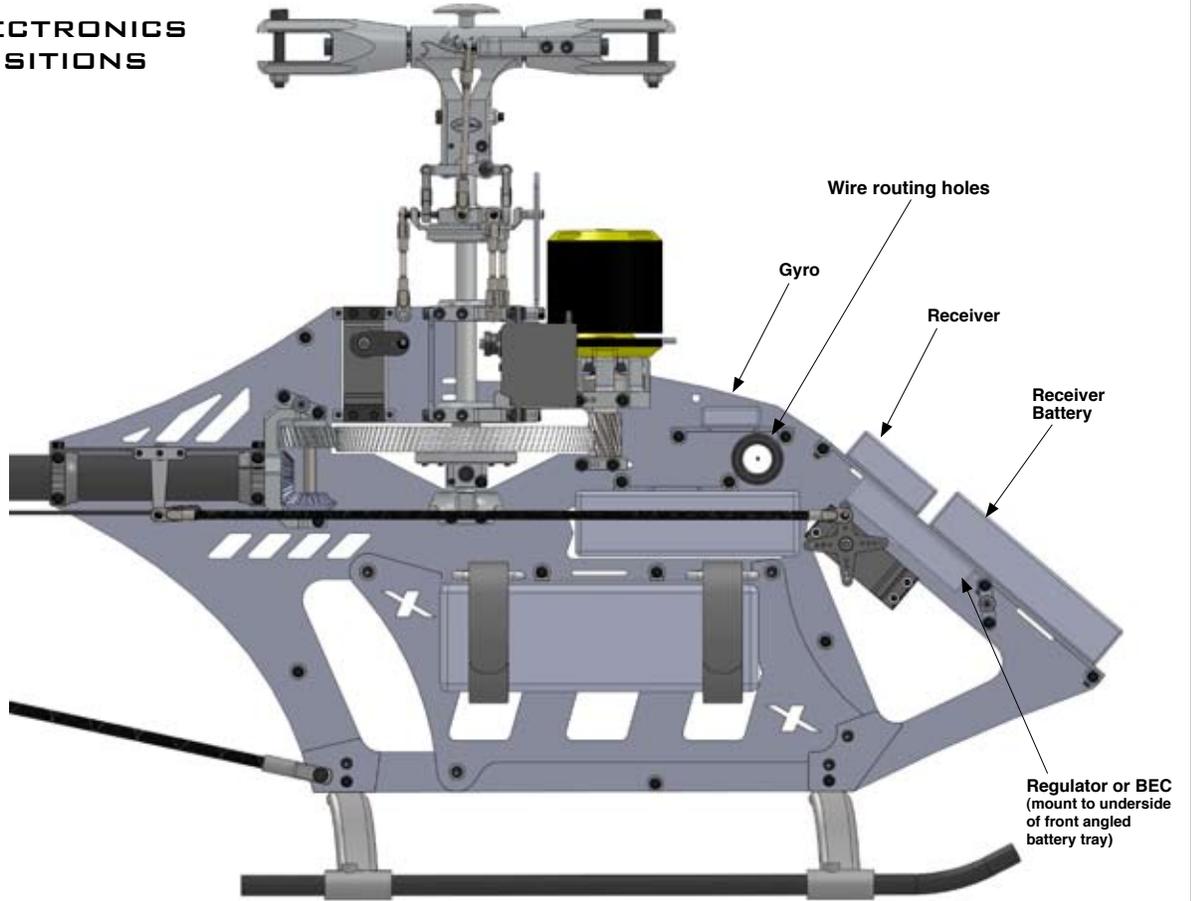
129-49

129-49

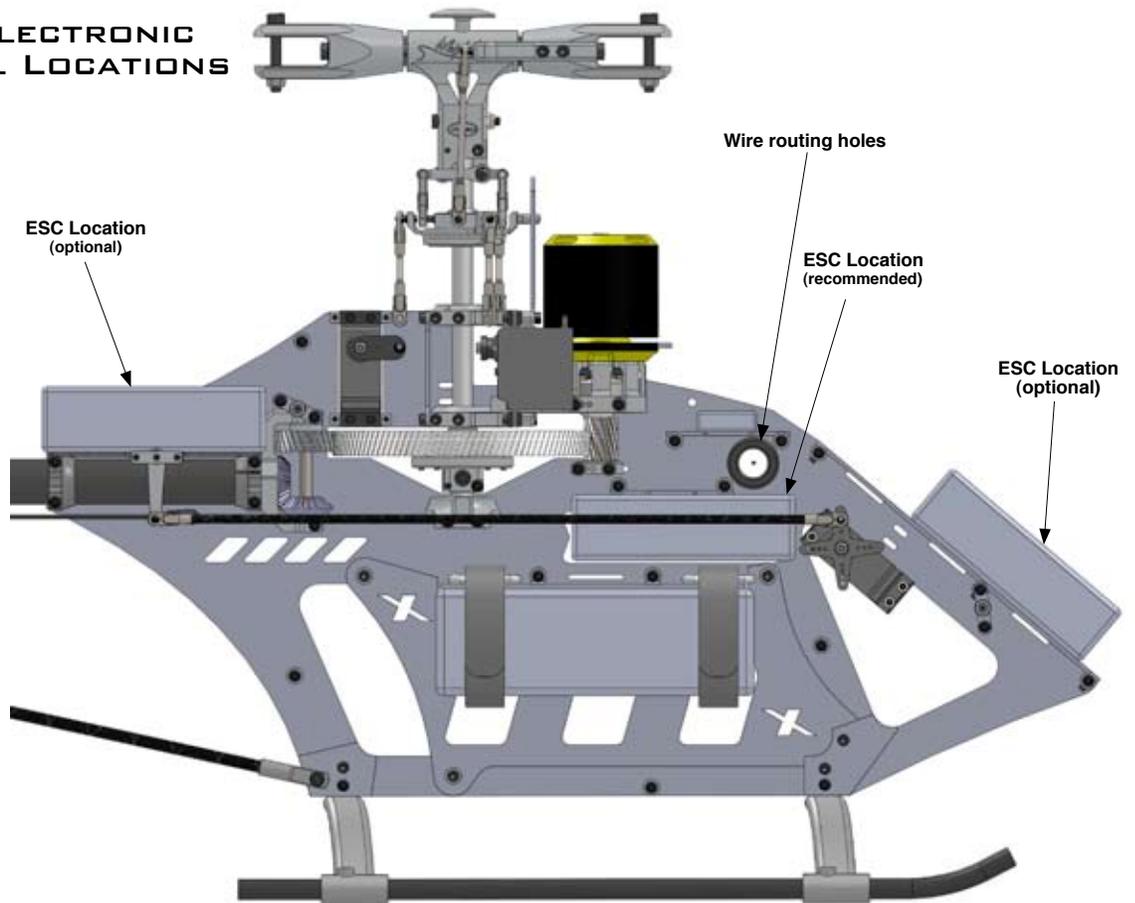
3200-57



SUGGESTED ELECTRONICS MOUNTING POSITIONS

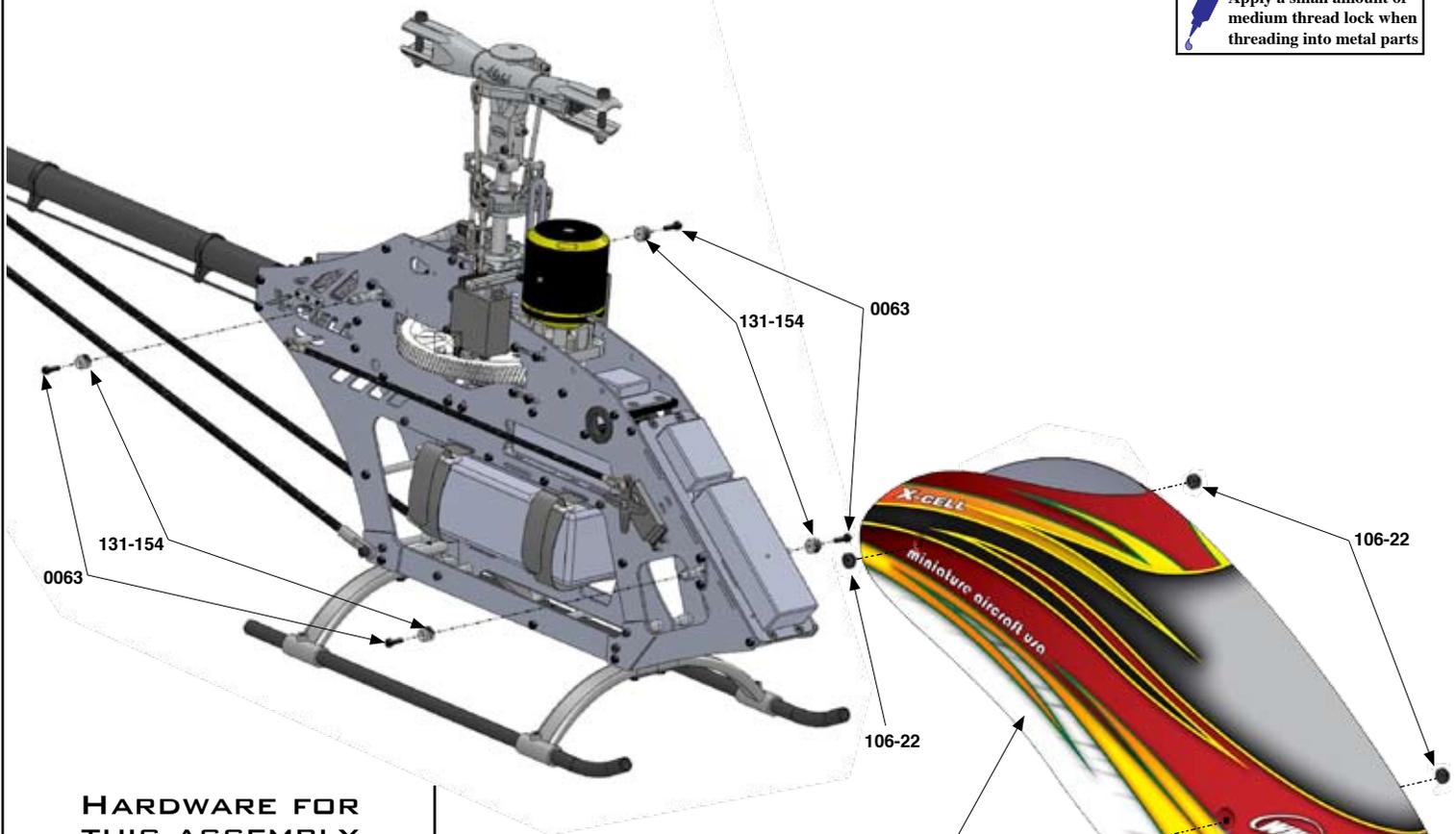


SUGGESTED ELECTRONIC SPEED CONTROL LOCATIONS





Apply a small amount of medium thread lock when threading into metal parts



HARDWARE FOR THIS ASSEMBLY



0063 x 4
M3x10 Socket Bolt



106-22 x 4
Rubber Canopy Grommet

ASSEMBLY TIPS

- The use of a hole reamer is recommended make the holes in the canopy for the canopy mounts. Final hole size should be 0.300" or 7.6mm
- Use CA glue to secure the grommets into the canopy



BASIC MODEL/RADIO SET UP

The X-Cell Whiplash is an eCCPM model. This means that the servos that are connected to the swashplate move together to achieve the function requested from the transmitter input. The transmitter mixes the channels required to achieve the correct movement of the swashplate. The X-Cell Whiplash uses a very simple “direct” servo to swashplate system that decreases the overall parts count and complexity of the model.

The very first thing to do, is center the swashplate servos. Simply align the servo horns so they are 90 degrees to the servo, and the linkage is 90 degrees to the servo horn. Ideally, you rotate the servo horn until the servo is centered, eliminating the the need for using sub-trim.

FOR THE PITCH, AILERON, AND ELEVATOR SERVOS:

In your radio

- ATV (servo endpoints) should be at 100%.
- Set all trims and sub-trims to center or zero.
- Set an initial linear pitch curve as a straight line (sample points: 0%, 25%, 50%, 75%, and 100%).
- Make sure there is no mixing enabled for cyclic channels at this point.
- Center the collective stick and make sure all the cyclic channels are centered.

On your model

- Mount each ball into a servo arm hole approximately 19-20mm from the center of each arm.
- Slide the servo horns for each channel onto each servo exactly in the middle of its travel.
- Failing to get them set at center will create interaction in your swash plate travel.
- If possible, center the horns on the servos without using any sub trim. As a last resort, use the sub trim function to precisely center each servo.
- Make sure you install hex nuts on the ball retainer bolts using thread locking compound.
- Make sure you install servo arm retainer screws.

FOR THE RUDDER SERVO:

In your radio

- Make sure the gyro is in non-heading hold mode. Refer to your gyro manufacturer as to how to enable this.
- Rudder servo endpoints (ATV) should be at 100%.
- Make sure there is no mixing enabled for rudder channel at this point (some radios mix throttle to rudder by default).

On your model

- The ball should go into a hole approx 13-15mm from the center of the servo wheel.
- With your rudder stick centered, rotate the servo wheel until you find a spot that aligns properly and then slide the servo wheel onto the servo exactly in the middle of its travel. Do not use any sub-trim.
- Now make sure that the T/R bell crank is aligned. The 90 degree pitch slider on the tail case should be in the center of its travel. Adjust the links as necessary to ensure this is correct.
- Make sure you install hex nuts on the ball retainer bolts using thread lock.
- Make sure you install servo arm retainer screws.
- Set up the gyro according to the manufacturers specification in the manual included with the gyro.



SWASHPLATE eCCPM SET UP:

Now that you've built your new Whiplash helicopter, you have to make the servos work together. The Whiplash is an eCCPM model, and requires a specific radio program for the servos that control the swashplate. eCCPM is a mix that is already programmed in your transmitter, you just have to fine tune it to your Whiplash and here's how:

The very first thing you need to do is tell your radio that a 120 degree eCCPM mix must be used. All modern transmitters should have 120 degree eCCPM built programmed from the factory. Consult the manual that came with your radio! Before you turn on your Transmitter and power up your servos, you need to make sure they are centered. With your transmitter and receiver powered on, put collective stick in the exact center with all three swashplate servo horns removed. Then put the horns on so they are 90 degrees to the linkage. This centers the servo horn on the servo and assures that there will be equal travel on either side of the servo's center point. If you find that you cannot get the servo horn exactly at center, you have two choices. You can flip the horn 180 degrees, sometimes the splines will line up perfect, this is the preferred method. You can also use a bit of "sub-trim" to center the servo. You really want to avoid using subtrim because it makes leveling the swashplate a little more involved.

Now you need to make sure that your servos are all working together. What we mean is the three collective servos need to be plugged into the appropriate channels, i.e. the elevator (which is the servo that controls the center ball on the swash) needs to be plugged in to channel 3, the aileron and pitch servo (the ones that control the sides of the swashplate) need to be plugged into channels 2 and 6 (it doesn't matter which channel just either servo, into either 2 or 6 on the RX).

IF you use a Futaba or Hitec transmitter, the channel assignments are a little different. For Futaba, Elevator is channel 2, Aileron is Channel 1, and Pitch is Channel is 6.

Then, using the servo reverse screen, you need to make sure that the servos are doing the proper function. All the servos need to move up (or down) when the collective stick is moved up or down (it doesn't matter if the collective is reversed, we'll fix that later). If it doesn't, you need to (one at a time) reverse the channels on the servo reverse screen until all the servos move in the same direction when the collective stick is moved.

Now the aileron and elevator functions need to be sorted out. When you move the right stick right and left, the swashplate should tilt to the right and left (it doesn't matter if it moves right when you push the stick left, we'll fix that later). Also, when you move the right stick forwards and aft, the elevator should tilt forward or back (at this point it doesn't matter if the function is reversed, proper direction will be addressed in the next step).

Now that the SERVOS are all moving in together, we need to be sure that the SWASHPLATE is moving correctly for a given command. Pull up the Swash Mix screen. Futaba calls it "Swash AFR" There should be 3 functions and they'll look like this:

AILERON: 60%
ELEVATOR: 60%
PITCH: 60%

So, if the the swashplate tilts left when you move the cyclic (right) stick TO the right, make the value of 60% for Aileron NEGATIVE or -60%, and likewise for the elevator, so if the swash tilts forward when you pull the cyclic stick BACK, make the value of 60% NEGATIVE or -60% to correct it.

The swashplate should move up and down with the collective stick, and if you RAISE the collective stick, the blades should show POSITIVE PITCH. And if you LOWER the collective stick, the blades should show NEGATIVE pitch. IF that function is reversed, again, make the value of 60%, NEGATIVE 60% or -60%.

To ensure that your Whiplash is set up as precise as possible it is very important that you follow the pitch curve set up guide, and you properly level the swashplate. There are several different tools for determining if your swashplate is level. We recommend the MA3000-10 Swashplate Leveling Tool.

Place the swashplate leveler on the swashplate and ensure that it is level. The collective stick should be at the center with zero degrees pitch on the blades. At this same time as described in the pitch curve set up guide, the swashplate should then be in the center of its travel, and the midpoint of the pitch curve should read 50%. If the swashplate is not level, you can use subtrim to level it, but the preferred method would be adjusting the linkages that connect the swashplate to the servos! If you find that you have to use more than a couple of clicks of subtrim on any channel, you should put it back to zero, and adjust mechanically by adjusting the linkages to the swashplate. After the swashplate is perfectly level at center stick, you need to level it at the extreme pitch range, i.e. full positive pitch and full negative pitch.

Place the Collective stick at full positive stick with the swash leveling tool attached. If the swashplate is not level, you will use the End Point screen or Travel Adjust screen. For instance, if the swashplate tilts slightly to the right at full positive pitch, then you will need to increase the travel for the servo that controls that swashplate ball. Now put the collective stick at full negative, repeat the same procedure with the end points. You do have to be careful that you don't create any binding at the extremes of the swashplate's travel.



PITCH CURVE SET UP:

It is important that you build your model to exactly the way described in this manual. Make sure all your linkage rods are exactly the length determined in the manual included with your helicopter kit.

First, go to the pitch curve menu in your radio for Idle up 1, or Stunt mode 1. You'll see numbers, a graph or both. There will generally be 5 points you can adjust. You'll have to imagine the points (1,2,3,4,5) as representing points on the collective stick, where point 1 represents full bottom stick, and 5 represents full top stick. Obviously that makes point 3 center stick and that's where we start.

Ensure that point 3 on the pitch curve (center stick) to equal 50% of the swashplate's up and down travel, meaning the in the middle of it's available travel. So, turn on your transmitter, and receiver, flip the flight mode switch to idle-up 1 or Stunt mode, and scroll to the pitch curve menu. Now place the left stick in the center.

Use a pitch gauge, (we recommend the Mavrikk 3802) ensure that there is 0 degrees pitch on both rotor blades and that the mixing arms, and washout arms are perpendicular to the mainshaft. If any of this is untrue, you'll need to make it so, by adjusting slightly the length of the pushrods.

Now that you've got 0 degrees at center stick, and point 3 on the pitch curve has a value of 50% (don't deviate here!) We can adjust the pitch at full top and bottom collective stick positions. Generally we want to have the same amount of pitch on the bottom stick position as we do on the top stick position in idle up or stunt mode. That means positive 10 degrees on top stick, and negative 10 degrees on bottom stick (some pilots are now using more pitch 12, 13 or even 14 degrees, but most people find 10 degrees to be an acceptable initial setting to learn 3D flying).

With the transmitter still in idle up, or stunt mode place the collective stick at the top of it's travel, and take a reading of the pitch gauge and remember that number. It should be a positive pitch value and 10 degrees is a good place to start. Now place the collective stick at the full bottom of it's travel. It should be a negative pitch value and again -10 degrees is a good place to start. If the value is not close to 10 degrees then making it so is a simple adjustment of the swash mix function in your transmitter. In this menu, "swash mix" or "swash AFR", there are three options. Elevator, Aileron, and Pitch. Adjusting the pitch value, adjusts the total up and down travel of the swashplate. Making the number higher gives you a greater pitch range, and making the number lower gives you a smaller pitch range.

If you find that at full top stick, you get a negative pitch value, and at bottom stick you get a positive pitch value, you would go back to that "swash mix" menu, and make the value the opposite, Meaning if it was 60%, make the number -60%. That will change the direction of the swash travel.

Now, You'll notice that your pitch "curve" isn't really a curve at all, it's a straight line. You can adjust this if you wish by changing points 2 and 4. Right now, point 2 is 25%, and point 4 is 75%. You can change those values and it will affect how "jumpy" or responsive the collective is. Usually leaving it a straight line is best until you really get the "feel" for 3D flying.

If you're a beginner chances are you'll want to fly your model around in "normal" mode. Normal mode means that at full bottom stick the engine is at idle and the blades are not turning. You also don't have any need for there to be negative 10 degrees of pitch, usually more like -4 or degrees is best.

This can easily be achieved by raising points 1 and 2. Scroll in the transmitter menu to pitch curve for normal mode, and increase point 1 from 0% to about 35%, and then you can usually inhibit point 2, so it makes a straight line from point 1 to point 3, which should still be 50%.

The Pitch Curve for throttle should usually look real similar to stunt mode. Throttle hold is generally used for performing autorotations.



THROTTLE CURVE SET UP:

Turn on your transmitter. Scroll to the “throttle curve” screen and notice that there are points, usually 5, and all have an assignable percentage. For example, point 1 is 0%, and point 5 is 100%. This will be the starting point for “normal” mode, and will get the model in the air. Once you have this set up in normal mode, you’ll have to fly the helicopter to determine whether you need more or less headspeed. This is usually a good starting point for hovering.

The method you set up the throttle curve for “idle up” or “stunt” mode will vary with personal preference and the model ESC you’re using. Some ESC’s have a “governor” mode, and their set up will be specific to the model ESC you’re using.

It is possible to use a simple “v” curve for throttle on an electric model. A starting point would be to make point 1, 100%, mid point 65%, and point 5 100%. This way you are asking the ESC to go to full throttle at the extremes of the pitch range, and to cut throttle down to 65% when the blades have 0 degrees of pitch. To complete the set up, you’ll need a friend and an Optical Tachometer (we recommend MA3000-50 Optical Heli Tachometer) to observe the head speed of your helicopter. Make sure to follow the rotor speed recommendations given by the manufacturer of the rotor blades you are using. If the head speed is too low, then increase the value of the mid point of the throttle curve by 5% increments until you get the head speed you desire.

CHOOSING YOUR POWER SYSTEM:

Outfitting your Whiplash with a power system is really easy if you follow Miniature Aircraft USA’s recommendations. A brushless electric motor KV Range approx 500-530kv suitable for use with a “.90”/700 size model, with 6mm shaft is recommended. Higher KV motors like 560KV will work, but you will have to back down on the governor mode and possibly consider the optional 13 tooth pinion. We have had great success throughout the prototype and design phase with the Scorpion Hand-Wound Limited Edition 4525-520KV motor and the HKIII 4035-530KV Motor.

For battery power, we recommend using two, 6s 5000mah packs with at least a 25c discharge rating. It is possible to use a 12s “stick” style battery as well, but they are less common. You’ll need to prepare some type of harness to wire the two 6s packs in “series”, which adds the voltage of the two packs together, while the capacity remains constant.

FLYBARLESS STABILIZATION ELECTRONICS:

If you have chosen a Flybarless model, it is possible to fly your model without additional stabilization electronics, but Miniature Aircraft USA highly recommends using Flybarless Stabilization Electronics. There are several that are commercially available, and while they all generally accomplish the same thing, they all are set up and programmed differently. Contact your favorite R/C helicopter retailer and/or talk to your friends to decide which one will be the best for you.



WHIPLASH KIT PARTS & HARDWARE

0003	M3 Washer	120-7	5x15 C/F Safety Washer	131-107	T/R Bellcrank Swing Arm
0004	M4 Washer	120-39	5x10x4 Ball Bearing	131-109	Swing Arm Pivot Mount
0009	M3 Washer Small	121-4	Servo To Swash Linkage Rod	131-112	T/R Blade Grip
0012-1	2.5mm Pem Nut	121-7	Swash To PA Linkage Rod	131-128	C/F Boom Clamp Plate
0012-2	3mm Pem Nut	122-70	M5x.25 S/S Shim Washer	131-130	Tail Pitch Control Bellcrank
0016-1	M4 External Serrated Lock Washer	127-37	10x19x5 Flanged Bearing	131-131	C/F Tail Bellcrank Bracket
0017-2	M2.5 Hex Nut	127-86	M6x9.7x1.0 Shim Washer	131-132	Bellcrank Slider Cup
0019	M3 Lock Nut	128-57	Tray Mount	131-135	Bracket Washer
0021	M4 Lock Nut	128-58	Main Frame Spacer	131-139	Skid Tube
0023	M5 Nut	128-59	M4 Frame Spacer	131-148	Servo Plates
0051	M3x3 Set Screw	128-80	Front Boom Clamp	131-150	Front Canopy Post
0053-5	M3x16 Socket Set Screw	128-144	T/R Control Rod Guide	131-151	Rear Canopy Post
0056	M3x5 Dog-Point Set Screw	128-146	Boom Support End	131-153	C/F Breakaway Tab
0057	M4x4 Set Screw	128-149a	Upper Rear Boom Support Mount	131-154	Thumb Screw
0058-1	M4x6 Set Screw	128-149b	Lower Rear Boom Support Mount	131-161	Main Blade Grip
0058-3	M4x16 Set Screw	128-176	Washout Pin	131-163	FBL Pitch Arm
0059-0	M2.5x4 Socket Bolt	128-195	Head Button	131-181	9x17x5 Radial Bearing
0059-1	M2.5x6 Socket Bolt	128-314	Swashplate Follower Arm	131-182	9x17x5 Thrust Bearing (F9-17)
0059-3	M2.5x10 Socket Bolt	129-49	9/16" Rubber Wire Grommet	131-183	9x14x.030 Washer
0060-1	M3x6 Socket Bolt	131-17B	Bevel Gear Shaft Side	131-184	9x14x.080 C/F Damper Washer
0061	M3x8 Socket Bolt	131-18B	Tail Bevel Gear TT Side	131-186	Anti Rotation Bracket
0062	M3x10 Tapered Socket Bolt	131-19	10x26x8 Main Shaft Bearing	131-187	Head Axle
0063	M3x10 Socket Bolt	131-20	Middle Main Shaft Bearing Block	131-190	Damper (80D)
0064-3	M3x6 Button Head Socket Bolt	131-21	Upper Main Shaft Bearing Block	131-200	M4x33 Shouldered Socket Bolt
0064-4	M3x16 Button Head Socket Bolt	131-23	6x13x5 Flanged Bearing - Tail Shaft	131-201	M4x25 Shouldered Socket Bolt
0065	M3x12 Socket Bolt	131-24	Main Gear Hub	131-254	700EX Painted Canopy
0067	M3x14 Socket Bolt	131-29	C/F X-Brace	131-260	RC Booya Canopy Mount Set
0069	M3x16 Socket Bolt	131-33	15x21x4 Bearing - Tail Gear	131-308	FBL Main Shaft
0073	M3x20 Socket Bolt	131-35	Boom Clamp W/TX Holes	131-368	FBL Head Block
0078	M4x12 Socket Bolt	131-40	Main Shaft Bearing Block Bottom	131-382	C/F Strut Spacer
0078-4	M4x8 Socket Bolt	131-46	P/A Servo Rail	132-101	Lower Pinion Bearing Block
0082-4	M5x32 Shouldered Socket Bolt	131-47	C/F Servo Rail Spacer	132-105	One-Way Radial Bearing
0086-1	M5x16 Flanged Socket Bolt	131-50	Elevator Servo Mount	132-106	One-Way Bearing Housing
0081	M4x16 Socket Bolt	131-51	Jack Shaft	132-107	One-Way Assembly w/12T Pinion
0088	M3x8 Tapered Socket Bolt	131-52	Delrin Tray Mount	132-112	12T Helical Pinion Gear
0107	M3x6 Threaded Steel Ball	131-53	Gyro Plate	132-113	13T Helical Pinion Gear (optional)
0109	M3x8 Threaded Steel Ball	131-57	Torque Tube End	132-117	117T Helical Main Gear
0116	M2.5 Threaded Steel Ball	131-58	Torque Tube	132-118	Front Tail Drive Transmission
0133	M2x21.2 Ball Link	131-60	C/F Tail Fin	132-119	Tail Box Assembly
0133-1	M3x21.2 Ball Link	131-62	Tail Boom	132-120	700EX C/F Frame (L)
0159	3x7x3 Bearing	131-64	Tail Hub	132-121	700EX C/F Frame (R)
0214	Upper Swash Ring	131-66	4x10 Thrust Bearings - Tail Grips	132-122	700EX C/F Front Frame Doubler
0214-1	Lower Swash Ring	131-69	2x315 Linkage Rod	132-123	700EX C/F Rear Frame Doubler
0215	M6 Tail Shaft Collar	131-69-1	T/R Push Rod	132-126	26T Helical Tail Drive Gear
0216	Heim Ball	131-70	Tail Output Shaft	132-128	700EX C/F Front Battery Tray
0217	Swash Plate Assembled	131-73	7x11x3 Bearing - Control Ring	132-129	700EX C/F Upper Battery Tray
0218	20x32x7 Swash Bearing	131-74	Control Ring	132-130	700EX C/F Vertical Battery Tray
0225	Link Pin	131-75	T/R Pitch Slider Assembly	132-131	700EX Battery Tray Spacer
0273	6x10x.011" Steel Washer	131-76	Tail Pitch Yoke	132-136	Landing Strut
0319	8x16x5 Bearing	131-77	Brass Slider	132-140	700EX Motor Mount
0390	Large Wire Lead Retainer	131-78	7mm Retaining Clip	132-230	Whiplash Manual
0442	T/R Pitch Link	131-80	Delrin TT Bearing Cup	132-231	Whiplash 700EX Frame Manual
0447-1	M2 E Clip	131-81	TT Bearing Cup O Ring	3000-73	MA Bench Towel
0597-1	M3x4.75x.126" Brass Spacer	131-83	Anti Rotation Pin	3200-48	3/4" Hook & Loop Tape
0597-4	Brass Spacer	131-84	Boom Support Rod	3200-54	Adhesive Back Hook & Loop Tape
0869	Washout Link	131-85	Carbon Pushrod Sleeve	3200-57	15" Hook & Loop Battery Strap
106-22	5x11 Grommet	131-86	Assembled Boom Support		



WARRANTY

The warranty covers defects in material or workmanship or missing components to the original purchaser for 30 days from the date of purchase. Miniature Aircraft, USA will replace or repair, at our discretion, the defective or missing component. Defective components **MUST BE** returned to us prior to replacement.

Any part, which has been improperly installed, abused, crash damaged or altered by unauthorized agencies, is not covered. Under no circumstances will the buyer be entitled to consequential or incidental damages. The components used in this kit are made from special materials designed for special applications and design strengths. We recommend that all replacement parts be original parts manufactured by Miniature Aircraft, USA, to ensure proper and safe operation of your model. Any part used which was manufactured by any firm other than Miniature Aircraft USA, **VOIDS** all warranties of this product by Miniature Aircraft USA.

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X-cell
**WHIPLASH
700EX**



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