

# X-cell WHIPLASH

## ASSEMBLY INSTRUCTIONS



730E  
ELECTRIC  
HELICOPTER KIT  
MA1034-1

miniature aircraft usa

STEP UP TO EXCELLENCE WITH X-CELL



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go to [www.miniatureaircraftusa.com](http://www.miniatureaircraftusa.com).*



## KIT INTRODUCTION

Thank you for purchasing the X-Cell Whiplash by Miniature Aircraft. 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 “730 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

- First of all take care to get the right insurance to R/C helicopters.
- 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 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](http://www.modelaircraft.org)





## KIT ASSEMBLY (1034-1)

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 - Loctite 243 Blue (MA3200-20)
2. Tri-Flow Oil (MA3200-12)
3. Synthetic Grease (MA3200-11)
4. Medium Cyanoacrylate (CA)
5. Retaining Compound - Loctite 648 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. Needle Nose Pliers
12. Phillips Screwdriver
13. Razor Knife (X-acto)

### 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. Engine
2. Battery
3. Cyclic servos (Miniature Aircraft recommends high quality digital cyclic servos with no less than 80 oz. in. of torque.)
4. Throttle servo (Miniature Aircraft recommends a high quality ball bearing servo)
4. R/C helicopter gyro (Miniature Aircraft recommends for Flybarless Kits a flybarless electronic unit with rudder gyro)
5. Rudder servo suitable for use with the gyro you choose. Digital servo is recommended.
6. R/C helicopter transmitter and receiver with at least 6 channels, and eCCPM capabilities.
7. 690-720mm Main Blades
8. 105mm /106mm Tail Blades
9. R/C helicopter engine governor is recommended

• Length	52.5" (1333mm)
• Height	16.5" (419mm)
• Rotor Span	1561-1601mm - 690-720mm 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
• Recommended Power	12S - 500-560KV



## 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.
- 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 recommends doing so prior to the assembly process. Carbon fiber edges can be 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 - Rotor Head FBL

Bag	Part No.	Part Description	Qty	Bag	Part No.	Part Description	Qty
1-A	0217	Swashplate - Factory	1	1-C	131-161	Main Blade Grip - Factory	2
1-Hardware	0051	M3x3 Set Screw	2	1-C	131-163	FBL Pitch Arm	2
1-Hardware	0107	M3x6 Threaded Steel Ball	3	1-C	131-187	Head Axle	1
1-Hardware	0109	M3x8 Threaded Steel Ball	4	1-Hardware	0107	M3x6 Threaded Steel Ball	2
1-Hardware	131-83	Anti-rotation Pin	1	1-Hardware	0061	M3x8 Socket Bolt	4
				1-Hardware	0086-1	M5x16 Flanged Socket Bolt	2
1-B	0869	Washout Link	2	1-Hardware	120-7-1	5x15 Safety Washer	2
1-B	128-176	Washout Pin	2	1-Hardware	131-183	Washer	2
1-B	128-195	Head Button	1				
1-B	128-314	Swashplate Follower - Factory	2	1-D	0133-1	M3x21.5 Ball Link	10
1-B	131-368	FBL Head Block	1	1-D	121-4	Servo To Swash Linkage Rod	3
1-Hardware	0067	M3x14 Socket Bolt	1	1-D	121-7	Swash To PA Linkage Rod	2
1-Hardware	0071	M3x18 Button Head Socket Bolt	2	1-D	131-408	FBL Main Shaft	1
1-Hardware	0447-1	M2 E-clip	2	1-Hardware	0021	M4 Lock Nut	1
				1-Hardware	0023	M5 Nut	2
				1-Hardware	0063	M3x10 Socket Bolt	2
				1-Hardware	0082-4	M5x32 Shouldered Socket Bolt	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-1	131-475	T/R Pitch Slider Assembly - Factory	1	2-B-2	134-472	C/F T/R Control Rod	1
2-Hardware	0107	M3x6 Threaded Steel Ball	1	2-B-2	134-58	C/F TT	1
				2-B-2	134-62	C/F Tail Boom	1
2-A-2	131-129	Tail Box Assembly - Factory	1	2-B-2	134-86	Tail Boom Support C/F Rod Assembly	2
2-A-3	131-130-B	Tail Pitch Control Bellcrank	1	2-B-3	0133-1	M3x21.5 Ball Link	2
2-A-3	131-131	C/F Bellcrank Bracket	1	2-B-3	0868-5	Plastic T/R Guide	2
2-A-3	131-132-B	Bellcrank Slider Cup	1	2-B-3	121-4	m3x30 Linkage Rod	1
2-Hardware	0019	M3 Lock Nut	1	2-B-3	121-7	m3x65 Linkage Rod	1
2-Hardware	0064-3	M3x6 Button Head Socket Bolt	2	2-B-3	128-80	Aluminum Front Boom Clamp	2
2-Hardware	0073	M3x20 Socket Bolt	1	2-B-3	128-144	T/R Control Rod Guide	4
2-Hardware	0107	M3x6 Threaded Steel Ball	1	2-B-3	128-149a	Upper Rear Boom Support Mount	1
				2-B-3	128-149b	Lower Rear Boom Support Mount	1
2-A-4	131-64	T/R Hub	1	2-B-3	134-128	C/F Boom Clamp Plate	1
2-A-4	131-112	T/R Blade Grip	2	2-Hardware	0001	2mm Washer	4
2-Hardware	0009	M3 Washer	2	2-Hardware	0016-2	4mm External Serrated Lockwasher	2
2-Hardware	0019	M3 Lock Nut	2	2-Hardware	0020-1	2mm Lock Nut	2
2-Hardware	0056	M3x5 Dog-Point Set Screw	2	2-Hardware	0049-1	M2x12 Socket Bolt	2
2-Hardware	0061	M3x8 Socket Bolt	2	2-Hardware	0060-1	M3x6 Socket Bolt	4
2-Hardware	0071	M3x18 Socket Bolt	2	2-Hardware	0063	M3x10 Socket Bolt	2
2-Hardware	0107	M3x6 Threaded Steel Ball	2	2-Hardware	0065	M3x12 Socket Bolt	3
				2-Hardware	0067	M3x14 Socket Bol	2
2-B-1	131-400	TT Ends	2	2-Hardware	0078	M4x12 Socket Bolt	2
2-B-1	131-480	TT Bearing Cup	3				
2-B-1	131-881	TT Bearing Cup O-Ring	6	2-Fin	131-60	C/F Vertical Tail Fin Painted	1
2-B-1	131-482	TT Sleeve	3				
2-B-1	131-485	TT Bearing	3				
2-Hardware	0015	2mm Hex Nut	2				
2-Hardware	0049-1	M2x12 Socket Bolt	2				



### Bag 3 - 730 Electro Frame Assembly (MA1034-1)

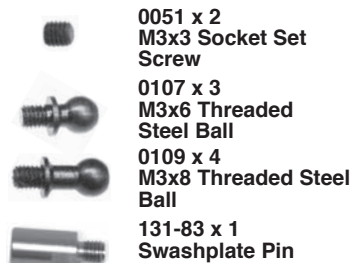
Bag	Part No.	Part Description	Qty	Bag	Part No.	Part Description	Qty
3-A	128-57	3mm Tray Mount	11	3-D	132-138	White Tuff Struts II	2
3-A	129-44	Battery Mount Rail Support	2	3-D	132-382	C/F Strut Spacer	2
3-A	131-52	Delrin Tray Mount	2	3-D	131-454	Tray Mount	2
3-A	131-53	C/F Gyro Plate	2	3-D	2500-39	Tuff Strut End Cup	4
3-A	131-382	C/F Spacer	3	3-Hardware	0003	3mm Washer	4
3-A	134-127	Front Battery Tray	1	3-Hardware	0058-1	M4x6 Socket Set Screw	4
3-A	134-129	Upper Battery Tray	1	3-Hardware	0073	M3x20 Socket Bolt	4
3-A	134-132	Bottom Battery Tray	1	3-Hardware	0078-5	M4x10 Socket Bolt	4
3-A	134-134	Battery Plate	1				
3-A	134-443	Battery Mount Rail	2	3-D-1	131-143	Red Skids	2
3-Hardware	0032-2	M3x8 Self Tapping Screw	4				
3-Hardware	0058-7	M4x10 Socket Set Screw	2	3-E	0390	Wire Retainers	5
3-Hardware	0062-2	M3x12 Tapered Socket Bolt	4	3-E	0875-1	10mm Split Main Shaft Collar	2
3-Hardware	0081	M4x16 Socket Bolt	2	3-E	131-424	Main Gear Hub	1
3-Hardware	0088	M3x8 Tapered Socket Bolt	6	3-E	131-440	Lower Main Bearing Block	1
3-Hardware	0088-2	M3x6 Tapered Socket Bolt	16	3-E	131-466	Auto Hub	1
				3-E	131-469-1	Gear Support	1
3-Frames	134-10	C/F Left Frame - Electro	1	3-E	131-470	70T Machined Crown Gear	1
3-Frames	134-11	C/F Right Frame - Electro	1	3-E	132-117-B	124T Main Gear	1
				3-E	3200-30	20" Spiral Band for Wire and Cable	1
3-Hardware	0003	3mm Washer	20	3-E	3200-48	20" 3/4 Hook and Loop Tape	1
3-Hardware	0009	3mm Washer small	10	3-E	3200-54	17" Adhesive Hook and Loop	1
3-Hardware	0032	2.9x9.5 Tapping Screw	4	3-Hardware	0021	4mm Lock Nut	1
3-Hardware	0060-1	M3x6 Socket Bolt	30	3-Hardware	0059-2	M2.5x8 Socket Bolt	2
3-Hardware	0061	M3x8 Socket Bolt	40	3-Hardware	0088	M3x8 Tapered Socket Bolt	13
3-Hardware	0063	M3x10 Socket Bolt	5	3-Hardware	0620-01	15x21x.10 Shim Washer	1
				3-Hardware	0620-02	15x21x.20 Shim Washer	1
3-B	128-58	Frame Spacer	11	3-Hardware	0620-03	15x21x.30 Shim Washer	2
3-B	131-21	Upper Main Bearing Block	1	3-Hardware	131-202	Jesus Bolt OWB V2	1
3-B	131-46	P/A Servo Rail	2				
3-B	131-47	C/F Servo Rail Spacer	2	3-E-1	106-22	Rubber Canopy Grommet	4
3-B	131-186	C/F Anti-rotation Bracket	1	3-E-1	128-59	M4 Front Boom Support Brace	1
3-B	131-420	Mid Main Bearing Block	1	3-E-1	131-150	Front Canopy Post	2
3-B	131-429	C/F X-Brace	1	3-E-1	131-151	Rear Canopy Post	2
3-B	134-122	Front Doubler	2	3-E-1	131-153	C/F Canopy Breakaway Tabs	4
3-B	134-123	Rear Doubler	2	3-E-1	131-154	Thumb Screw	4
3-Hardware	0060-1	M3x6 Socket Bolt	4	3-Hardware	0003	3mm Washer	2
3-Hardware	0063	M3x10 Socket Bolt	2	3-Hardware	0016-2	M4 Lock Washer	2
3-Hardware	0065	M3x12 Socket Bolt	2	3-Hardware	0015	2mm Hex Nut	1
				3-Hardware	0063	M3x10 Socket Bolt	4
3-S	0818-3	Mounting Block	2	3-Hardware	0081	M4x16 Socket Bolt	2
3-S	131-50	Elevator Servo Mount	2	3-Hardware	0103	2mm Threaded Steel Ball	1
3-S	131-148	C/F Servo Plates	14				
S-Hardware	0017-2	2.5mm Hex Nut	5	BOX	134-252	Whiplash Painted Canopy Neon	1
S-Hardware	0059-1	M2.5x6 Socket Bolt	4	BOX	134-230	730E Frame Assembly Manual	1
S-Hardware	0059-4	M2.5x12 Socket bolt	16	BOX	3000-73	MA Towel	1
S-Hardware	0059-7	M2.5x20 Socket Bolt	4	BOX	3700-160	Blade Holder	1
S-Hardware	0116	M2.5 Threaded Steel Ball	5				
3-C	134-100	Motor Mount	1				
3-C	134-101	Lower Pinion Bearing Block	1				
3-C	134-102	Motor Mount Support Left	1				
3-C	134-103	Motor Mount Support Right	1				
3-C	134-104	T/R Drive Support	2				
3-C	134-112	Helical Pinion	1				
3-Hardware	0061	M3x8 Socket Bolt	8				
3-Hardware	0063	M3x10 Socket Bolt	2				
3-Hardware	0078-4	M4x8 Socket Bolt	4				



# Whiplash - Flybarless Head Assembly Parts

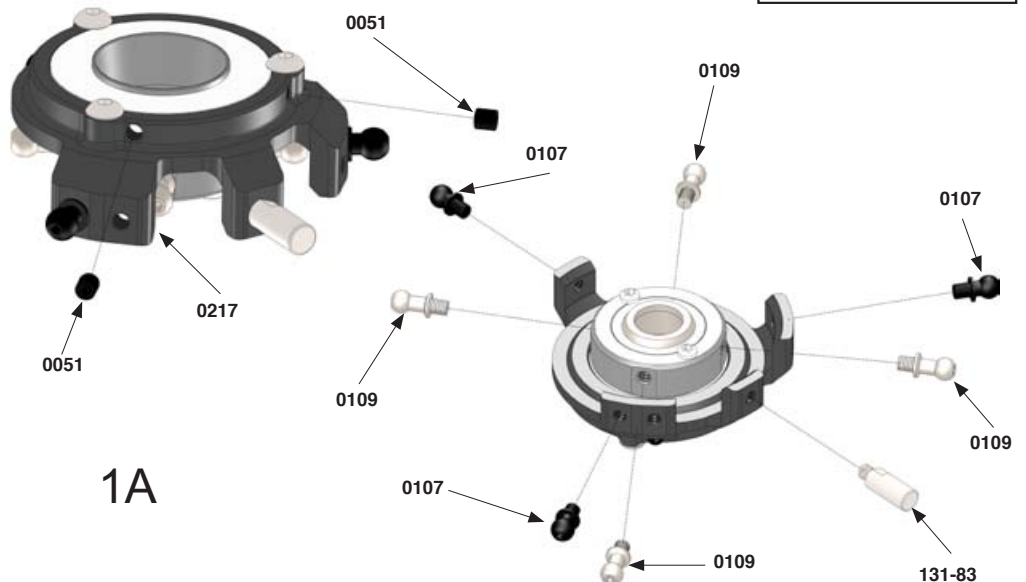


## Hardware for this assembly



## Assembly Tip

- Install MA0051 M3x3 Socket Set Screws only until they bottom out against the lower bearing. Do not overtighten or damage to swashplate bearing will occur. *Note: these are used to adjust the bearing tolerance if it develops play over time.*



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

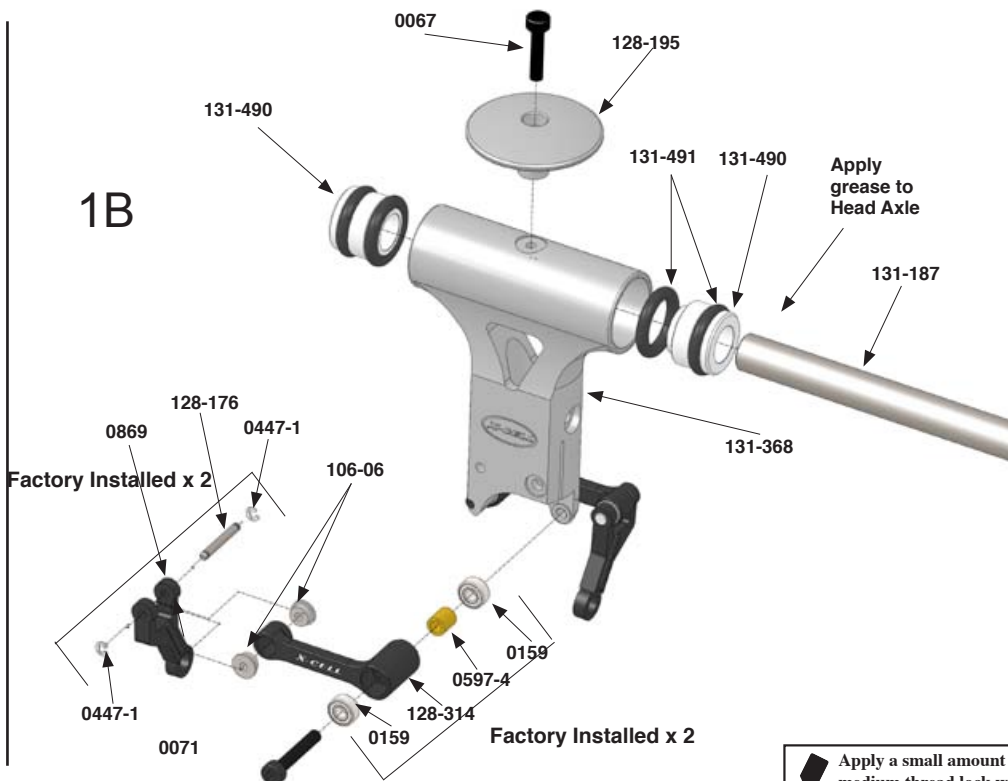
1A


## Hardware for this assembly

-  0067 x 1  
M3x14 Socket Bolt
-  0071 x 2  
M3x18 Socket Bolt

## Assembly Tip

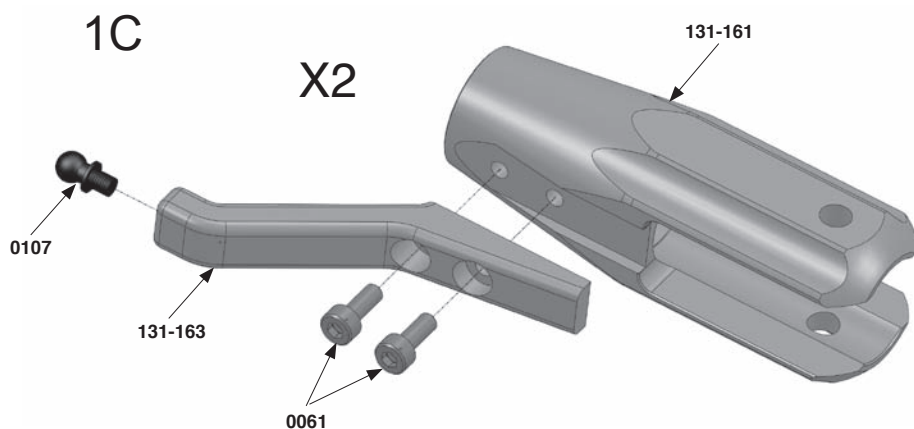
- The use of a light grease such as MA3200-06 Tri-Flow Synthetic Grease is required for damper/head axle lubrication and O-rings
- New damper system (131-490)



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

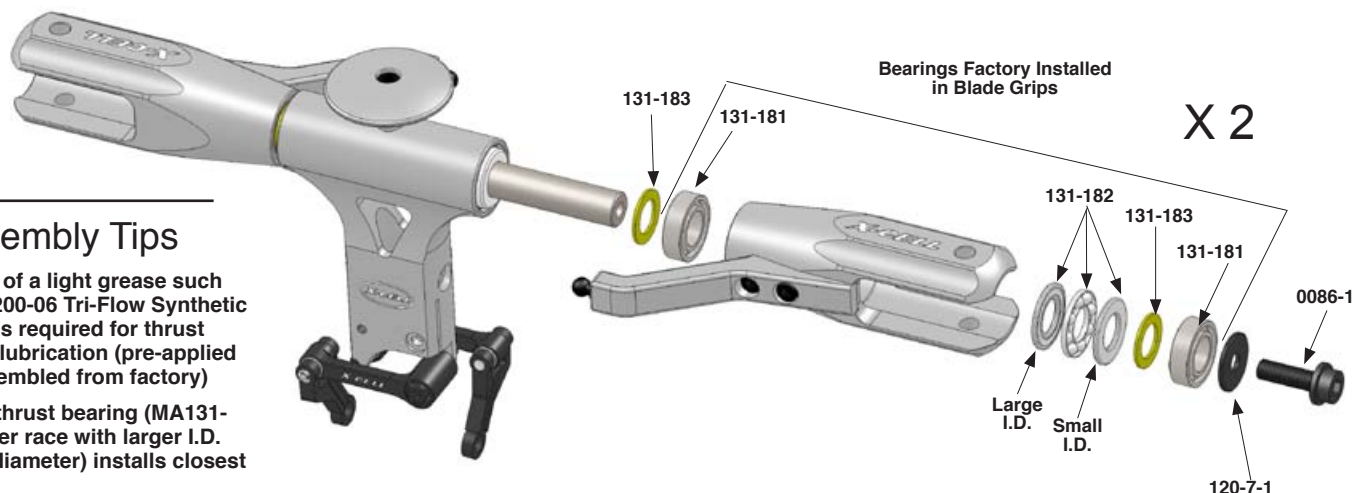
## Hardware for this assembly

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

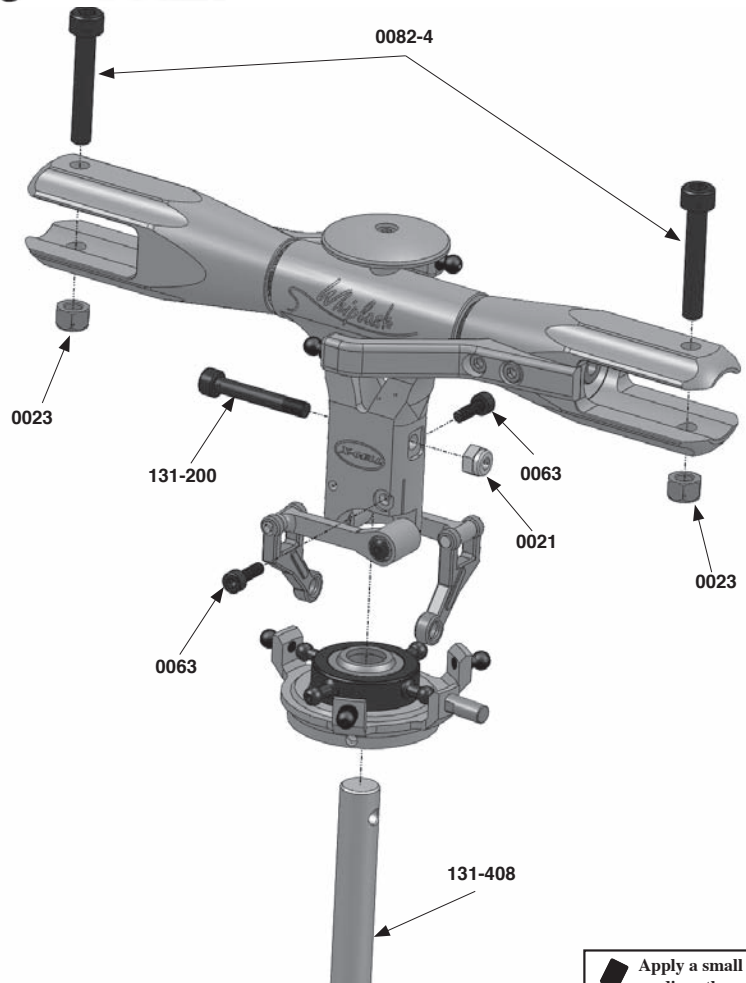


## Hardware for this assembly



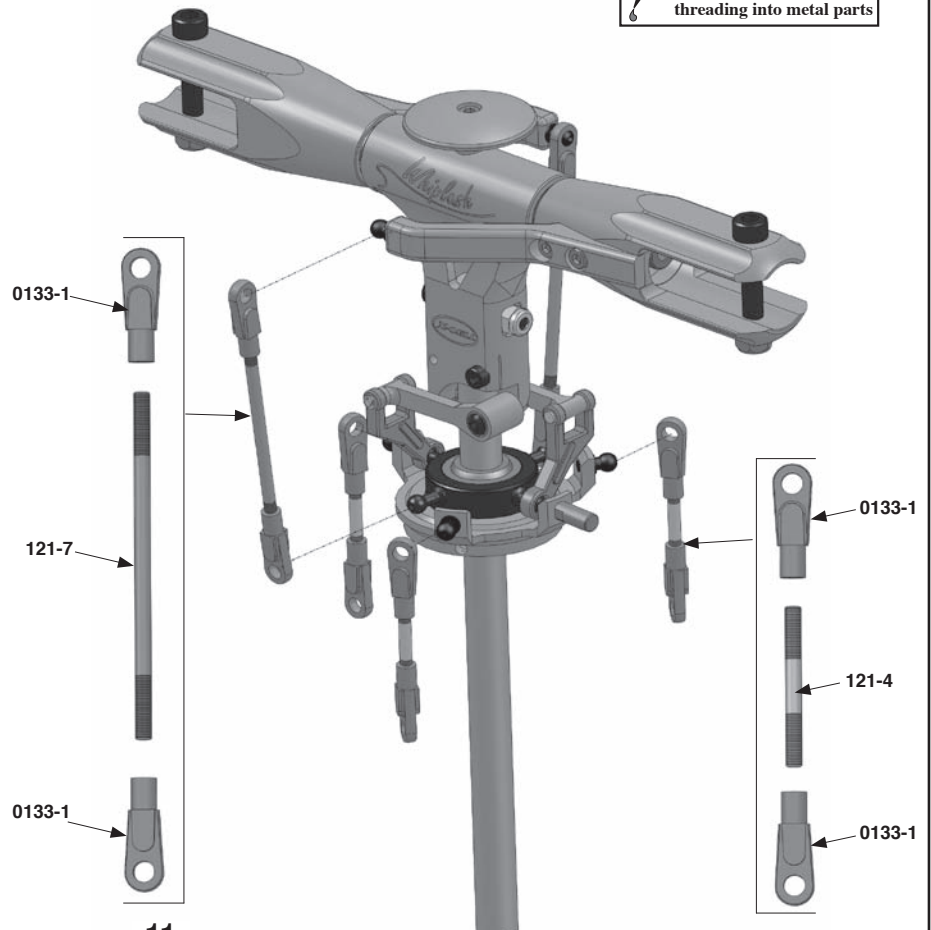
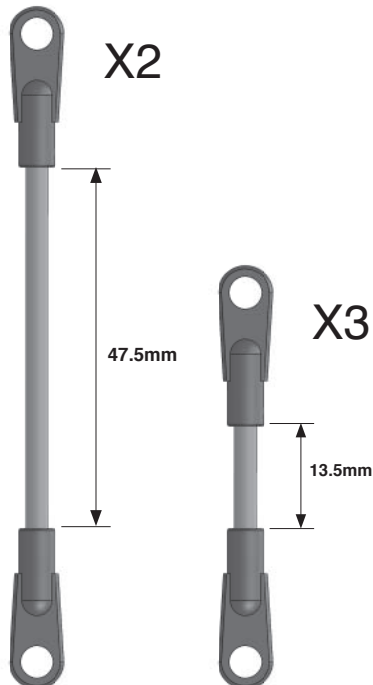
## Assembly Tips

- Head, Swashplate and Main Shaft can be assembled now, or you can assemble the parts later step by step installing them to the frame.



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

## Link Arm Lengths and Installation



# Tail Assembly Parts



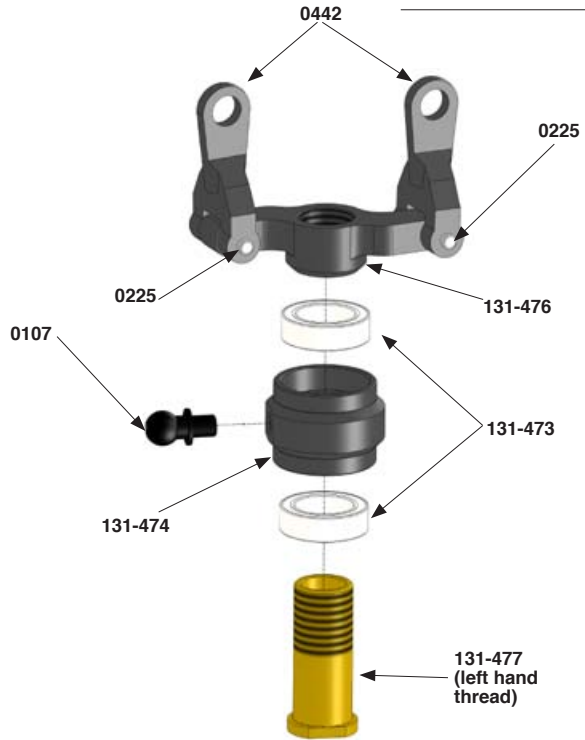


## Hardware for this assembly



0107 x 1  
M3x6 Threaded  
Steel Ball

2-A-1



Factory  
Assembled



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 Set Screw

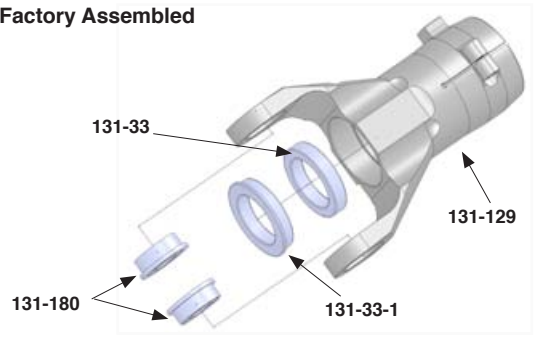


0273 x 1  
m6x10x.11" Steel  
Shim Washer



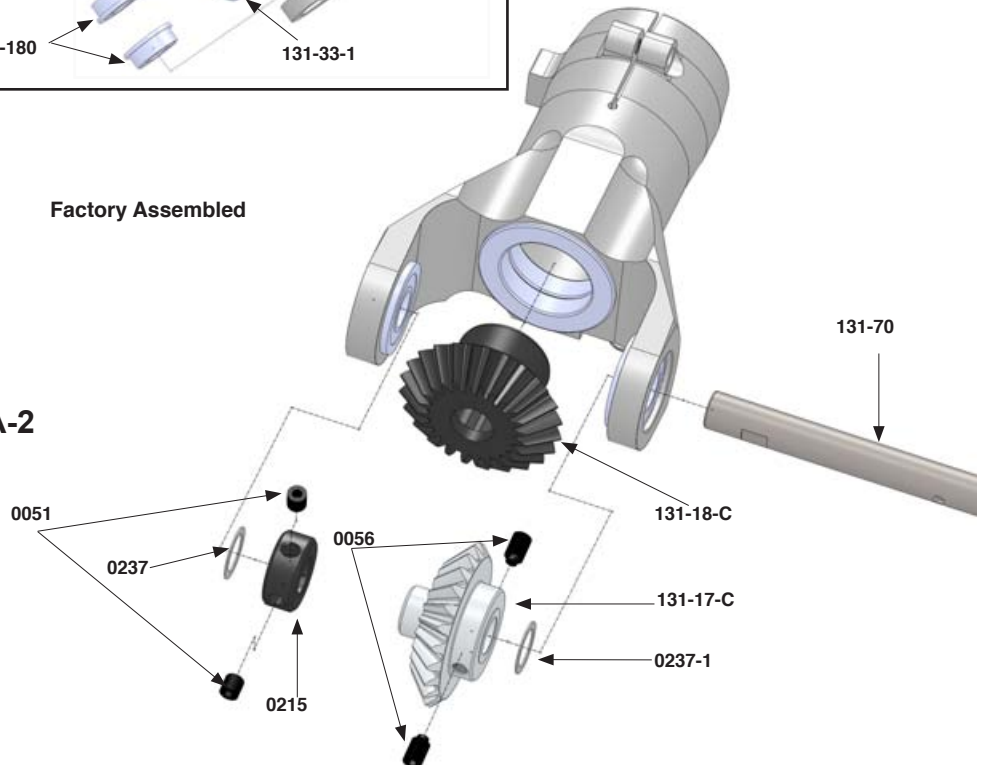
0273-1 x 1  
m6x10x.004" Steel  
Shim Washer

Factory Assembled



Factory Assembled

2-A-2



## Assembly Tip

- Make sure to include MA0273-1 Shim Washer between MA131-17-C Output Gear and transmission case bearing.



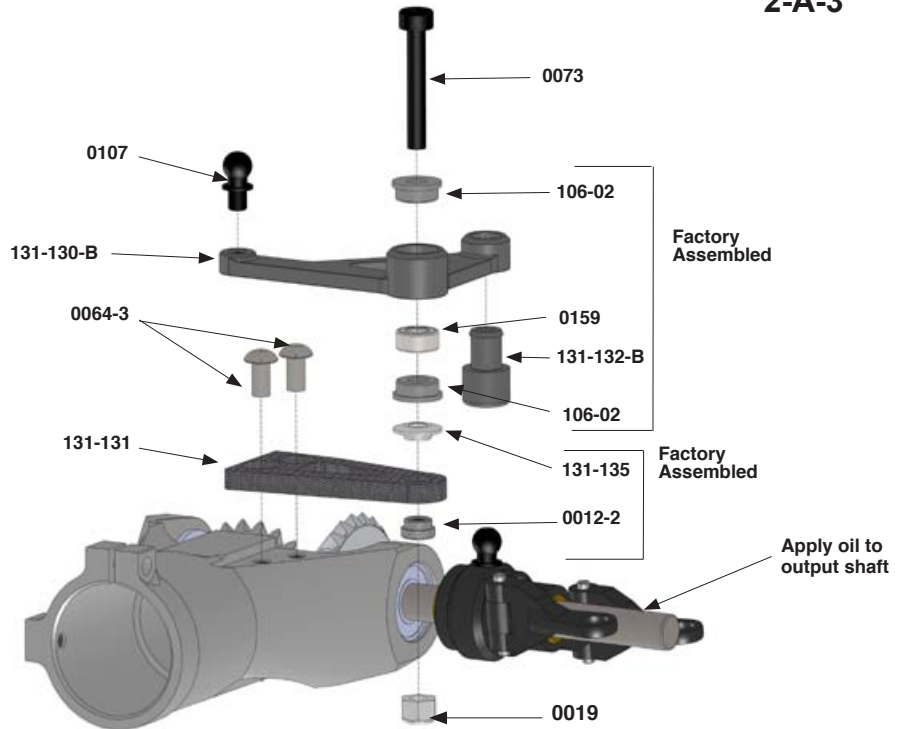
## Hardware for this assembly



## 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

2-A-3



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

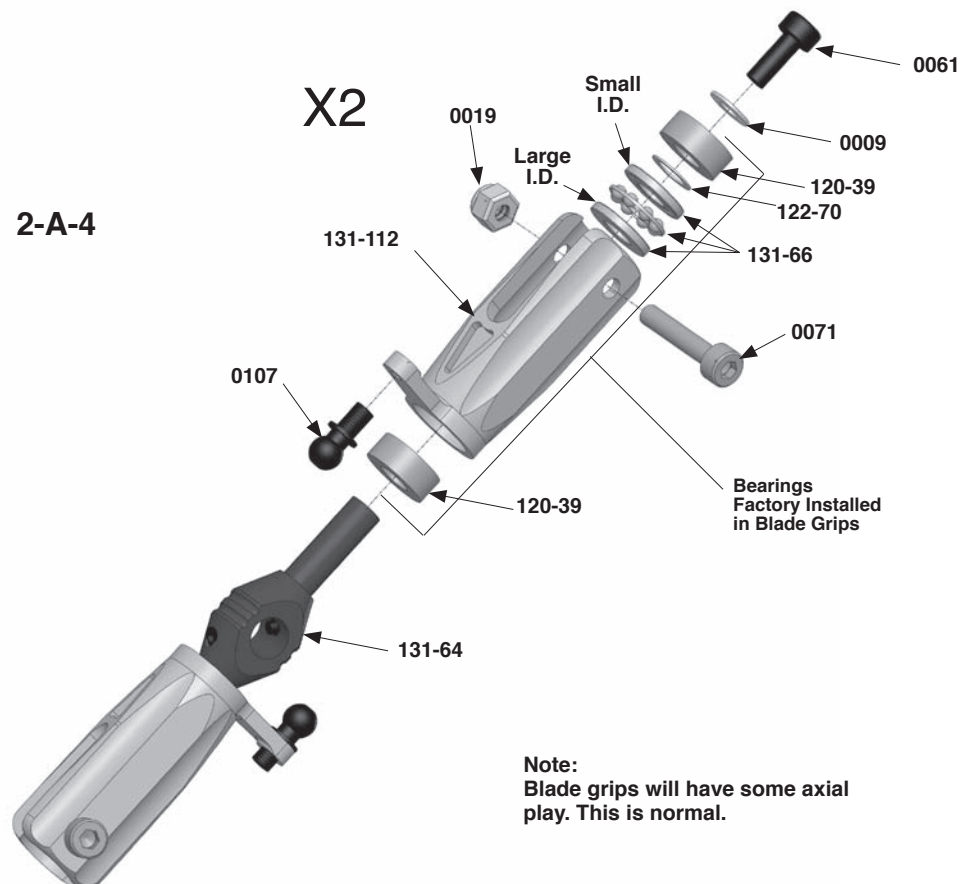
## Hardware for this assembly



## 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.

2-A-4



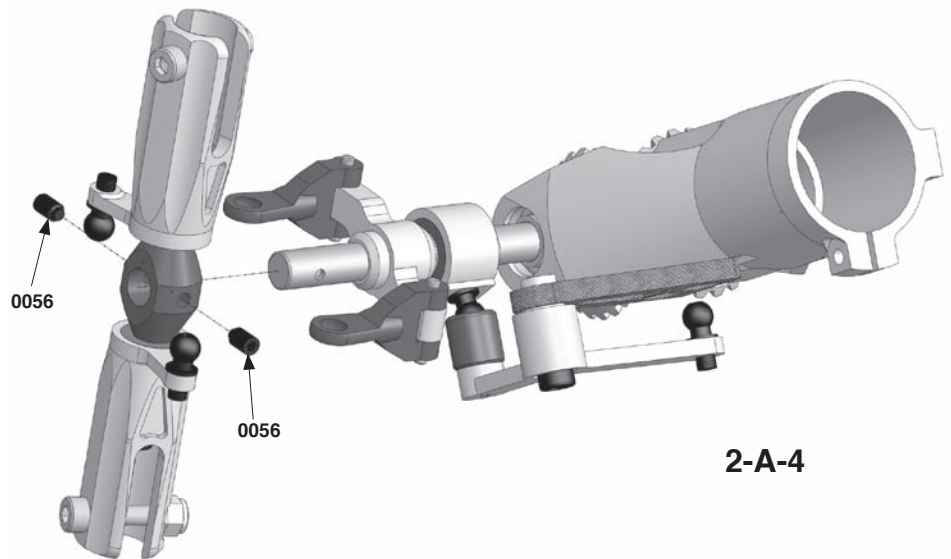
Note:  
Blade grips will have some axial play. This is normal.

## Hardware for this assembly

0056 x 2  
M3x5 Dog Point  
Socket Screw

## Assembly Tip

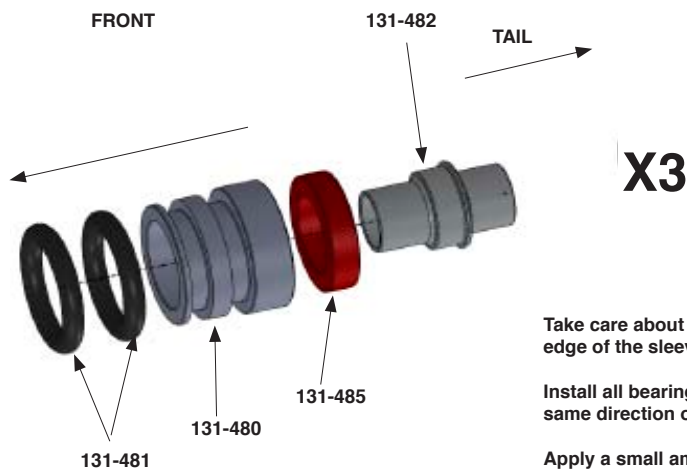
- Ensure the dog point tip is seated into the dimples on the tail rotor shaft.



2-A-4

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

## Assembly Tip



2-B-1

X3

Take care about the orientation of guide edge of the sleeves, all facing to the tail.

Install all bearing cup assemblies facing the same direction on torque tube.

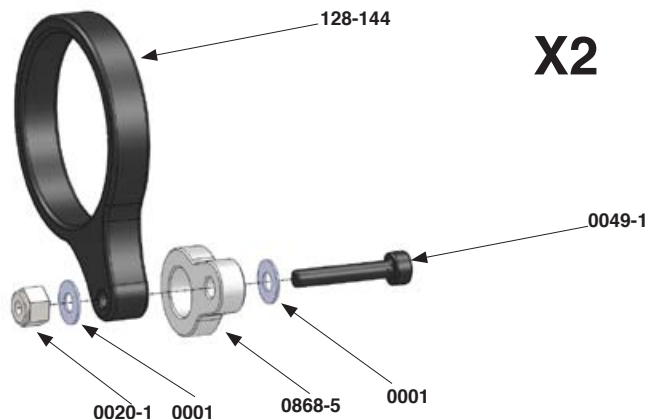
Apply a small amount of Loctite 648 when mounting the bearing cup assemblies at the torque tube.

## Hardware for this assembly

0001 x 4  
2mm Steel Washer

0020-1 2 x  
2mm Lock Nut

0049-1 x 2  
M2x12 Socket Bolt



X2

## Hardware for this assembly



0015 2 x  
2mm Hex Nut

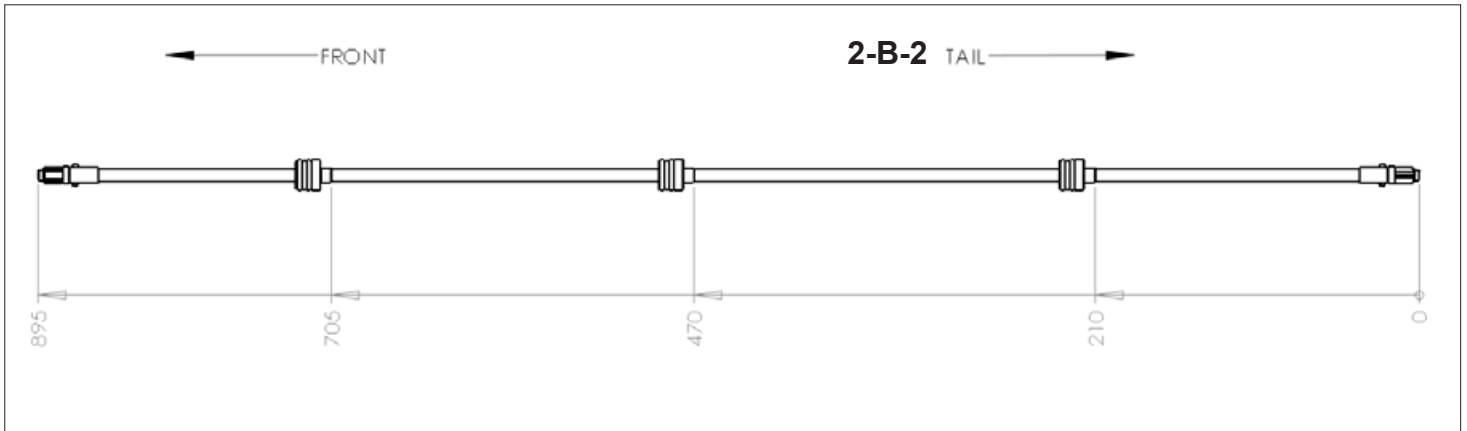
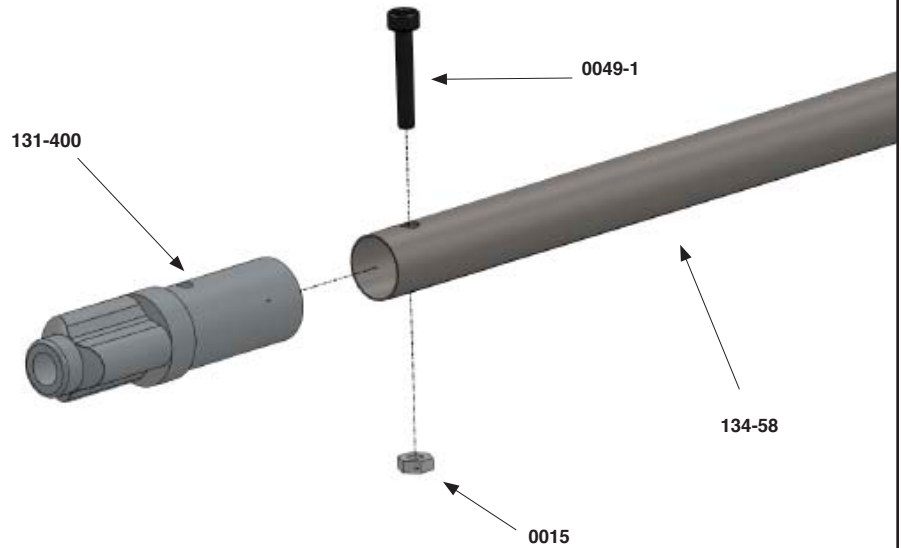


0049-1 x 2  
M2x12 Socket Bolt

## Assembly Tip

- Use only Loctite green #648 to glue TT ends to tube.
- Do not overtighten 0049-1 socket bolts as it is possible to crush torque tube.

Apply Loctite 648 at the torque tube and at the TT end 131-400 when assembling these parts.  
Use Loctite 243 to secure M2 screw and nut



NOTE: Carefully glue bearing assemblies to torque tube making sure bearing locations are NOT equal distances from torque tube ends. Allow Loctite 648 to dry (about 2 hours) before installing into tail boom.

## Hardware for this assembly



0060-1 x 3  
M3x6 Socket Bolt

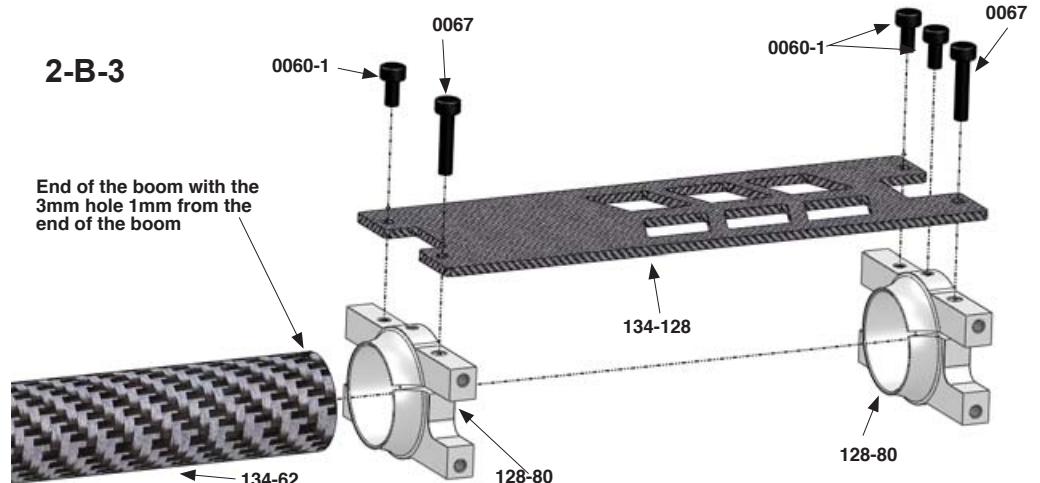


0067 x 2  
M3x14 Socket Bolt




## 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.

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

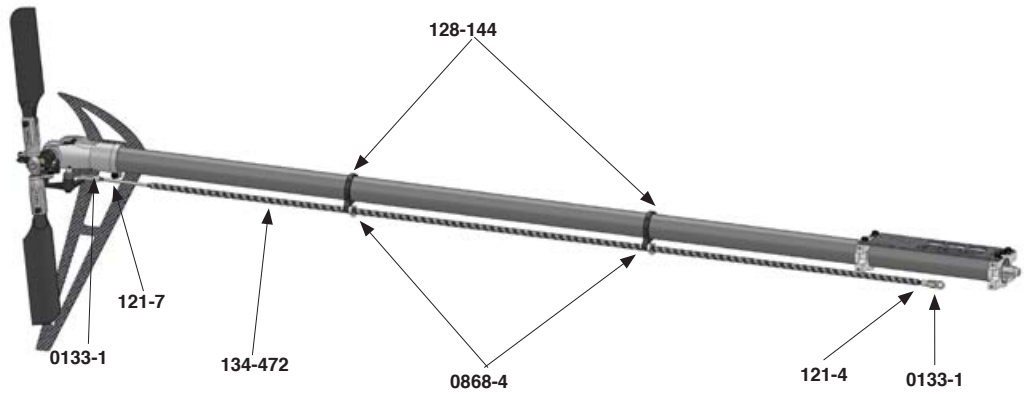


## Hardware for this assembly

-  0001 x 4  
2mm Washer
-  0020-1 x 2  
Hex Nut
-  0049-1 x 2  
M2x12 Socket Bolt

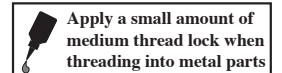
## Assembly Tips

- Please use some grease or vaseline or tallow to grease the tail boom from the inner side and the o-rings of the torque tube. So the tube will slide in smooth. If it stops before it is at the correct position so remove the torque tube again and apply some more grease.
- Install orque tube from the tail side into the boom. It is normally that the tube goes in strong into the boom.
- The torque tube is at the correct position inside the boom if at the tail side the end of the boom 'cuts' the head of the m2 socketbolt in half (top view at the socket bolt) .



The gaps between rod and link are as follows:

39 mm on the back  
9 mm on the front



## Hardware for this assembly

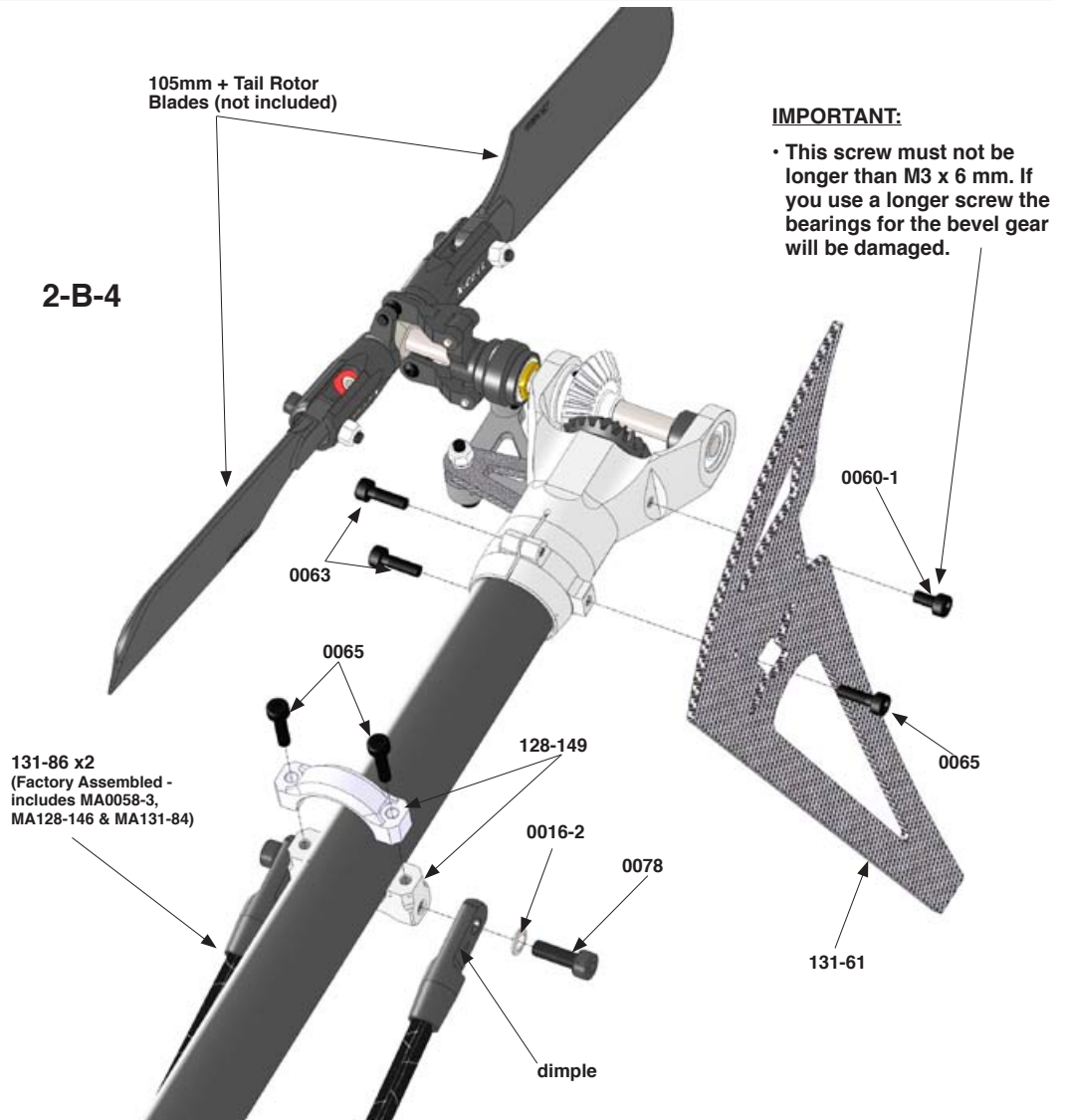
-  0016-2 x 2  
4mm External Serrated Lockwasher
-  0060-1 x 1  
M3x6 Socket Bolt
-  0063 x 2  
M3x10 Socket Bolt
-  0065 x 3  
M3x12 Socket Bolt
-  0078 x 2  
M4x12 Socket Bolt

## Assembly Tips

- The use of thread lock MA3200-20 (loctite #243) is recommended on MA0078 Socket Bolts.
- Do not overtighten MA0065 Socket Bolts on the Rear Boom Support Mounts.

### IMPORTANT:

- 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."



### IMPORTANT:

- This screw must not be longer than M3 x 6 mm. If you use a longer screw the bearings for the bevel gear will be damaged.



# Electric Frame Assembly Parts





## Hardware for this assembly



0003 x 4  
3mm Washer



0032-2 x 4  
M3 x 8 Self Tapping  
Screw



0073 x 4  
M3x20 Socket Bolt



0088 x 6  
M3x8 Tapered Socket  
Bolt



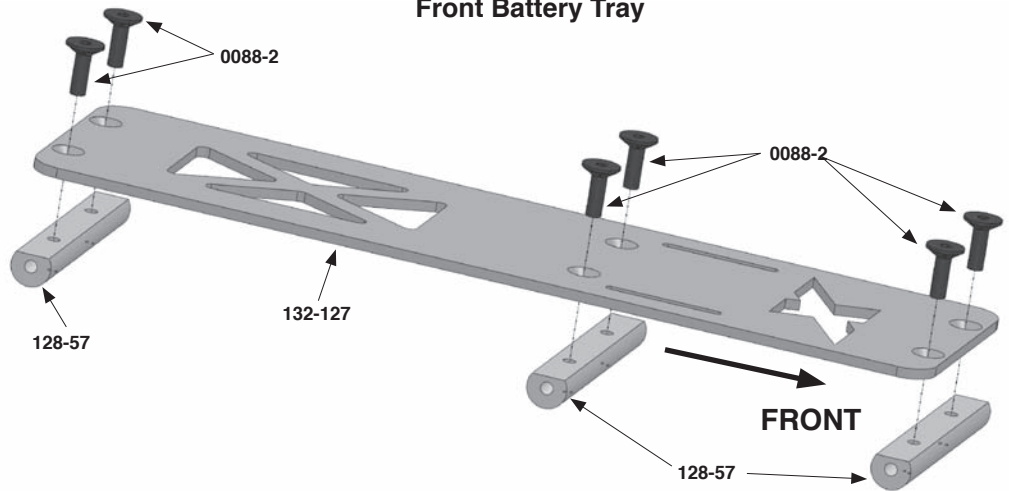
0088-2 x 10  
M3x6 Tapered Socket  
Bolt

## Assembly Tips

- Do not overtighten MA0032-2 Self Tapping Screw into MA131-52 Delrin Tray Mount. Secure screws with a small amount of CA glue.

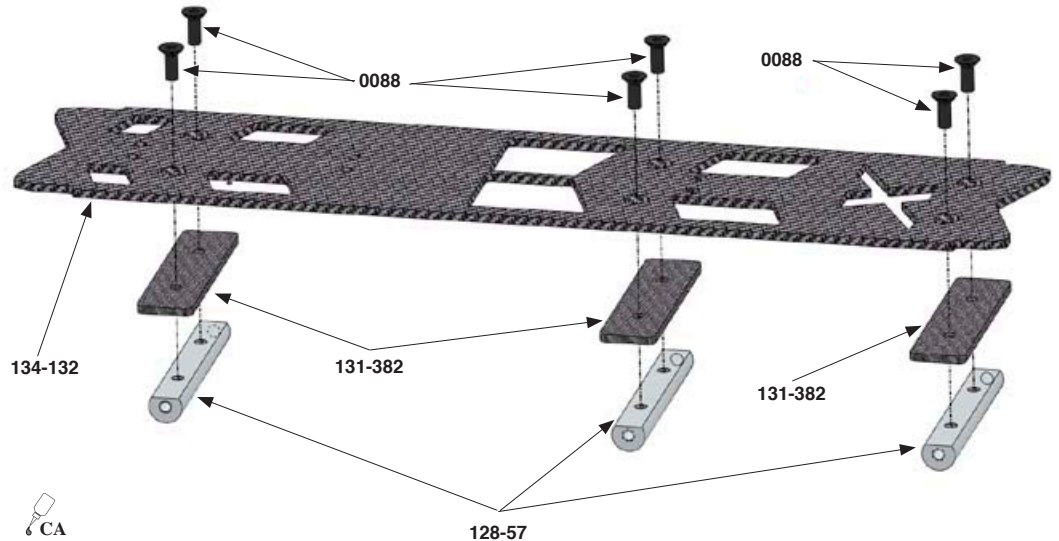
Apply a small amount of medium thread lock when threading into metal parts

### Front Battery Tray

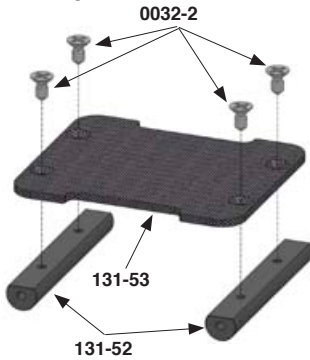


### Bottom Battery Tray

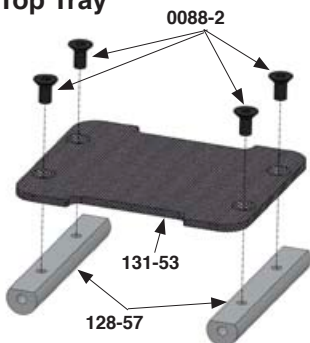
FRONT



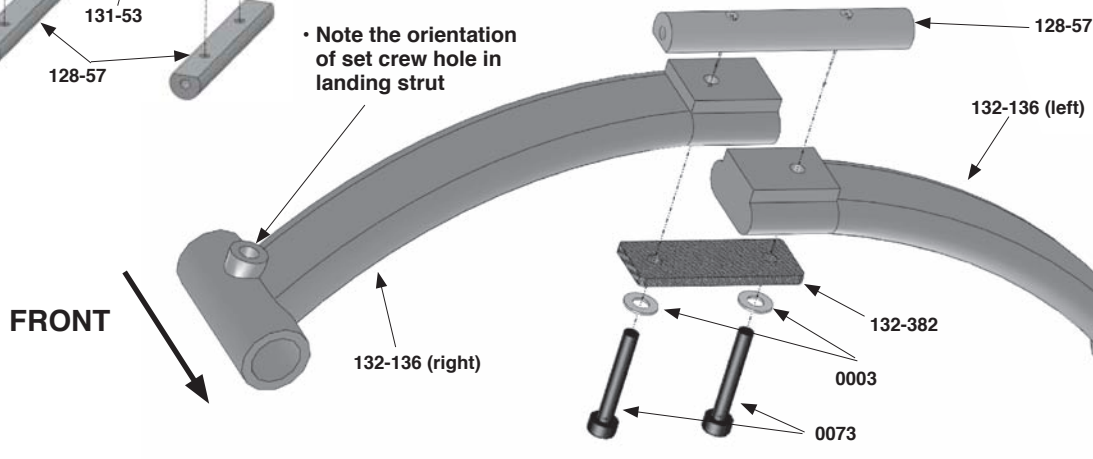
### Gyro Tray



### Top Tray



Note the orientation of set crew hole in landing strut



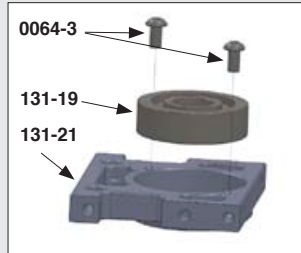
Landing Struts  
**X2**

## Hardware for this assembly

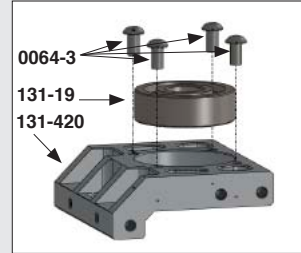


Apply a small amount of medium thread lock when threading into metal parts

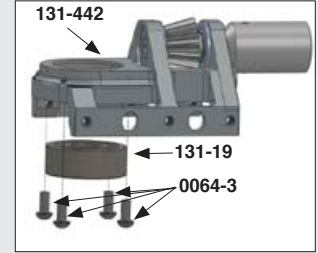
### Upper Main Shaft Bearing Block (Factory Assembled)



### Middle Main Shaft Bearing Block (Factory Assembled)



### Bottom Main Shaft Bearing Block (Factory Assembled)

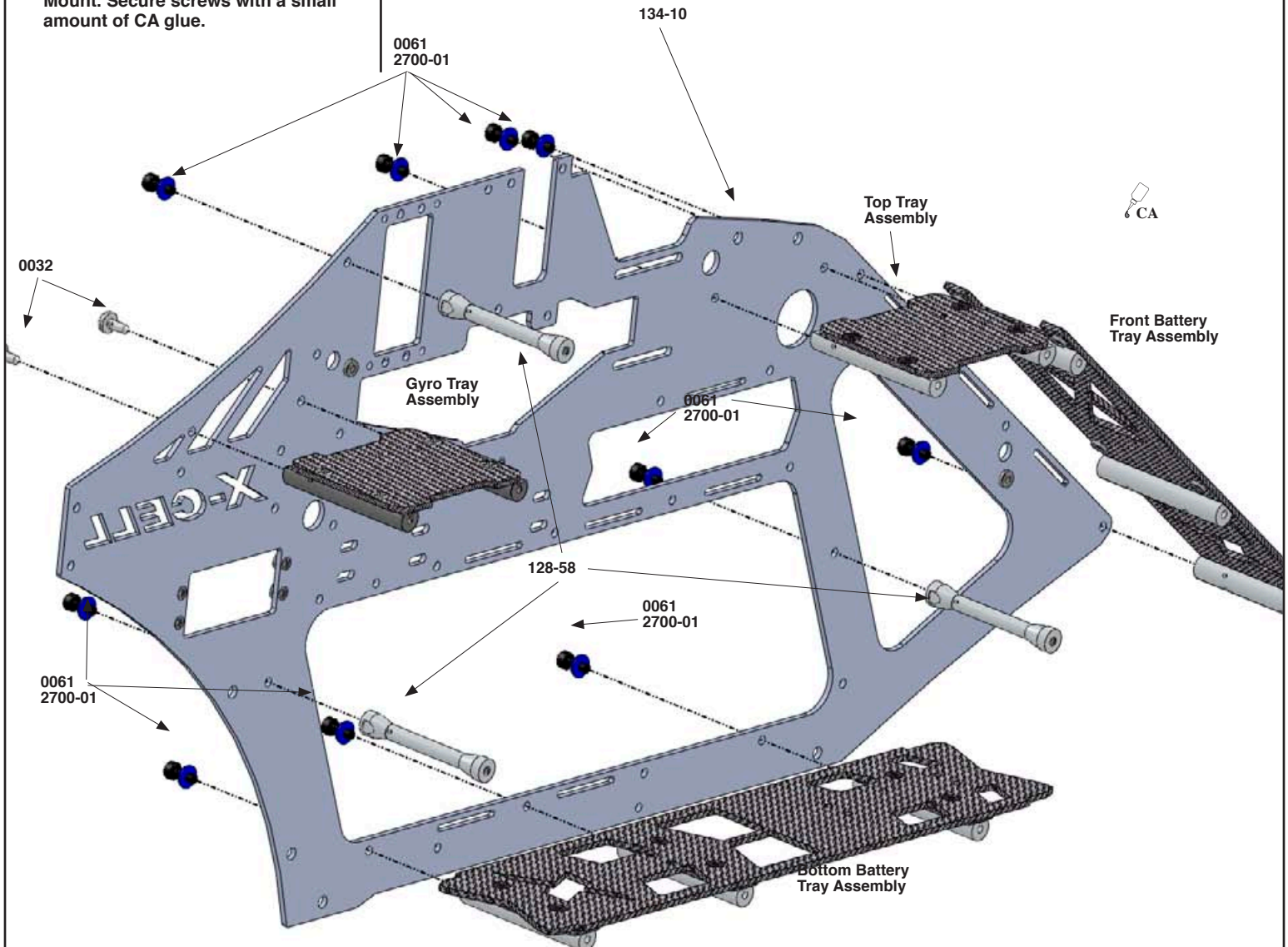


NOTE: Upper bearing block features smooth, wrench access holes


NOTE: Middle and bottom bearing blocks features threaded holes.

## 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

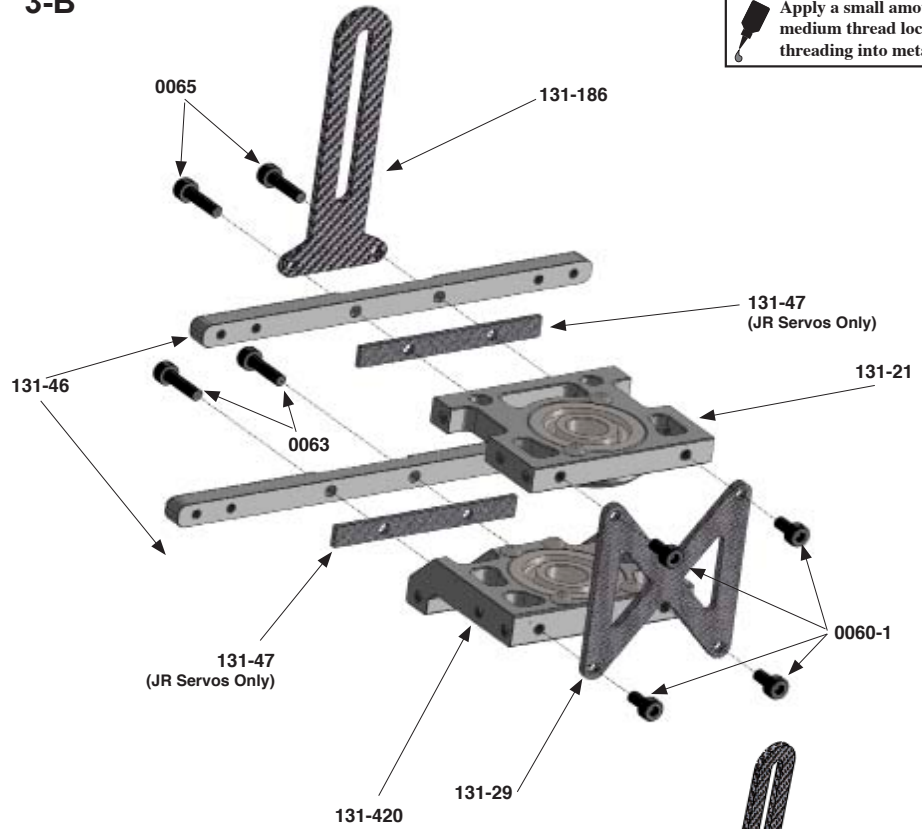
-  0060-1 x 10  
M3x6 Socket Bolt
-  0063 x 2  
M3x10 Socket Bolt
-  0065 x 2  
M3x12 Socket Bolt

## Assembly Tip

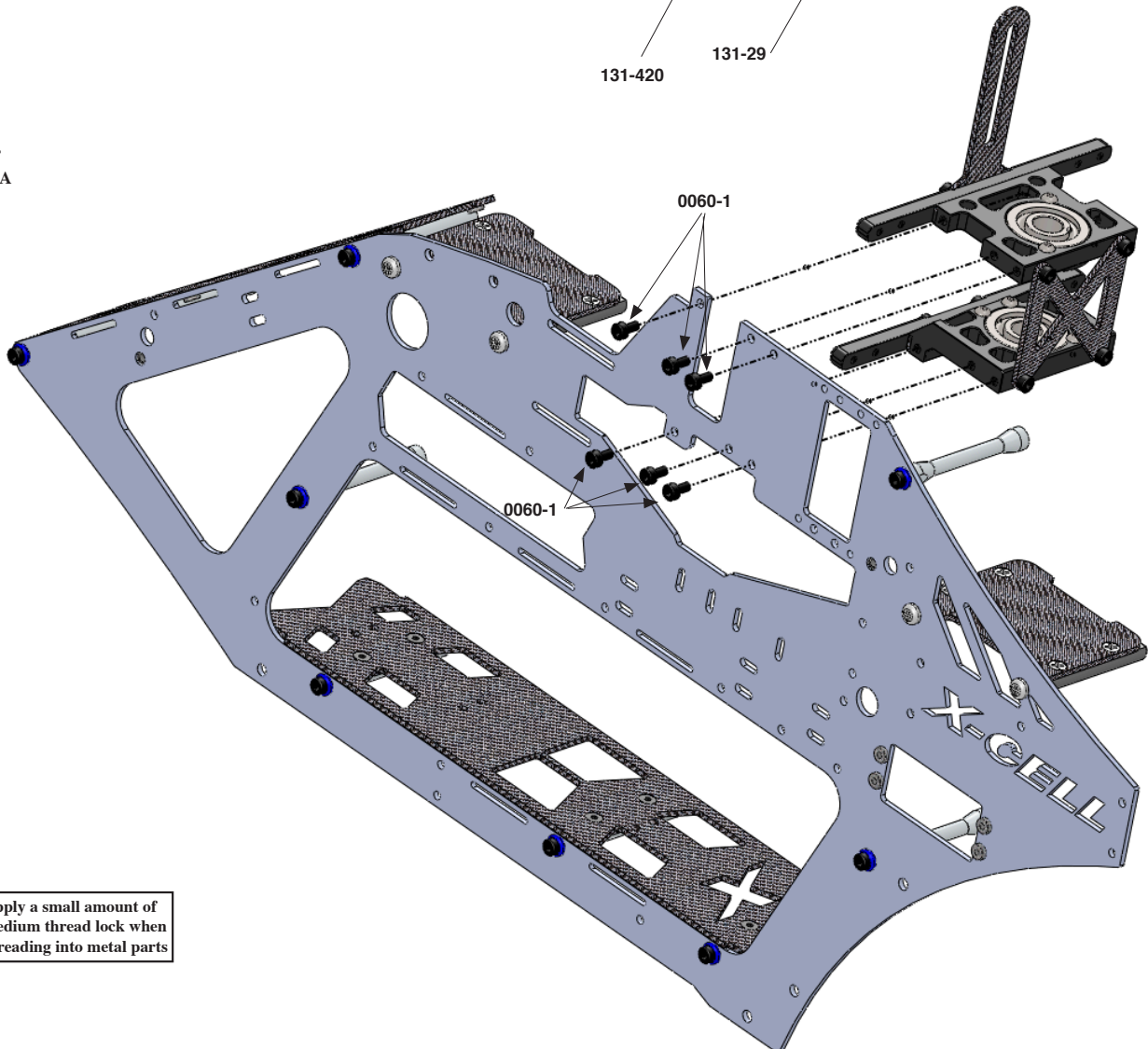
- If using JR brand servos or other "tall" servos, the use of MA131-47 Servo Rail Spacer included in this kit may be required.


### 3-B

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



 CA




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



## Hardware for this assembly

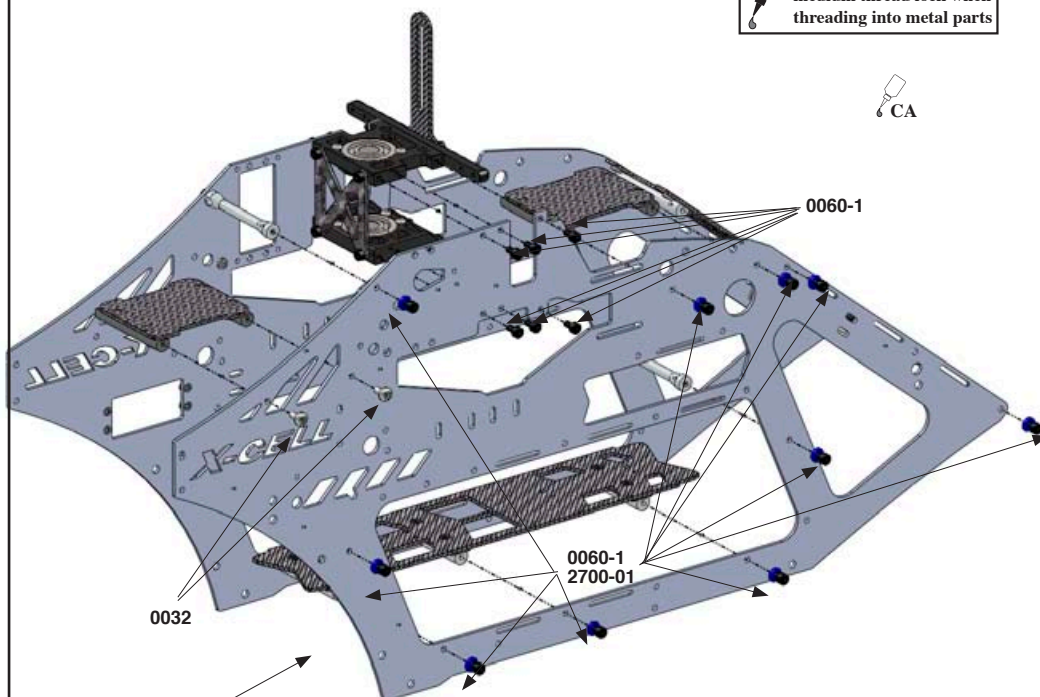
-  0032 x 2  
M3 Self Tapping Screw
-  0060-1 x 6  
M3x6 Socket Bolt
-  0061 x 10  
M3x8 Socket Bolt
-  0063 x 2  
M3x10 Socket Bolt
-  0078-4 x 4  
M4x8 Socket Bolt
-  2700-01 x 10  
3mm Blue Washer

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

 CA

## Assembly Tip

- Motor mounting screws will vary depend on individual motor choice. Four MA0061 M3x8 bolts are also included.
- Slide Motor Assembly as far as possible onto motor shaft. Tighten MA0057 Set Screw later. Final Pinion position set on page 23.



134-11

0063

Brushless Motor  
(not included)

134-100 Motor Mount installs on top of 131-420 Middle Bearing Block with 0063 M3x10 Socket Bolts

134-102

0061

134-100

0078-4

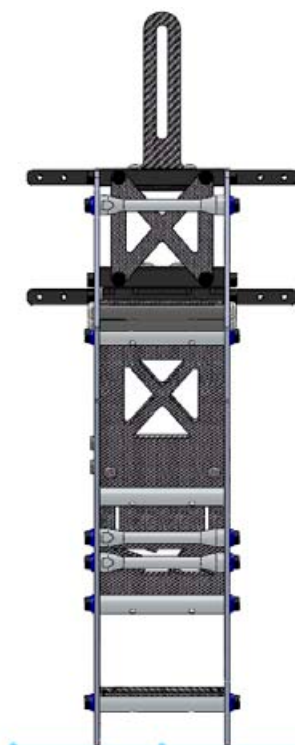
0078-4

134-112

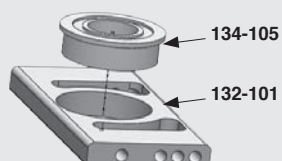
134-101

134-103

0061




Lower Pinion Bearing Block  
(Factory Assembled)



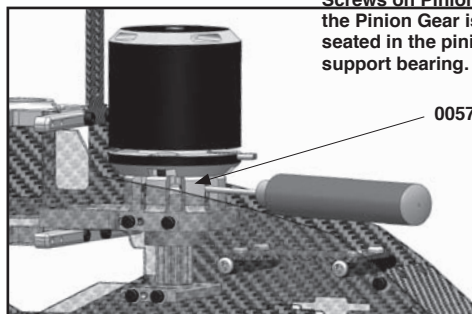
If motor does not have flat spot on motor shaft, grind a 5mm flat spot on motor shaft 3.5mm to 8.5mm from motor can.

## Hardware for this assembly

-  0057 x 3  
M4x4 Set Screw
-  0058-1 x 4  
M4x6 Set Screw
-  0061 x 8  
M3x8 Socket Bolt
-  2700-01 x 10  
3mm Blue Washer

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


Loosen MA0057 Set Screws on Pinion so the Pinion Gear is fully seated in the pinion support bearing.

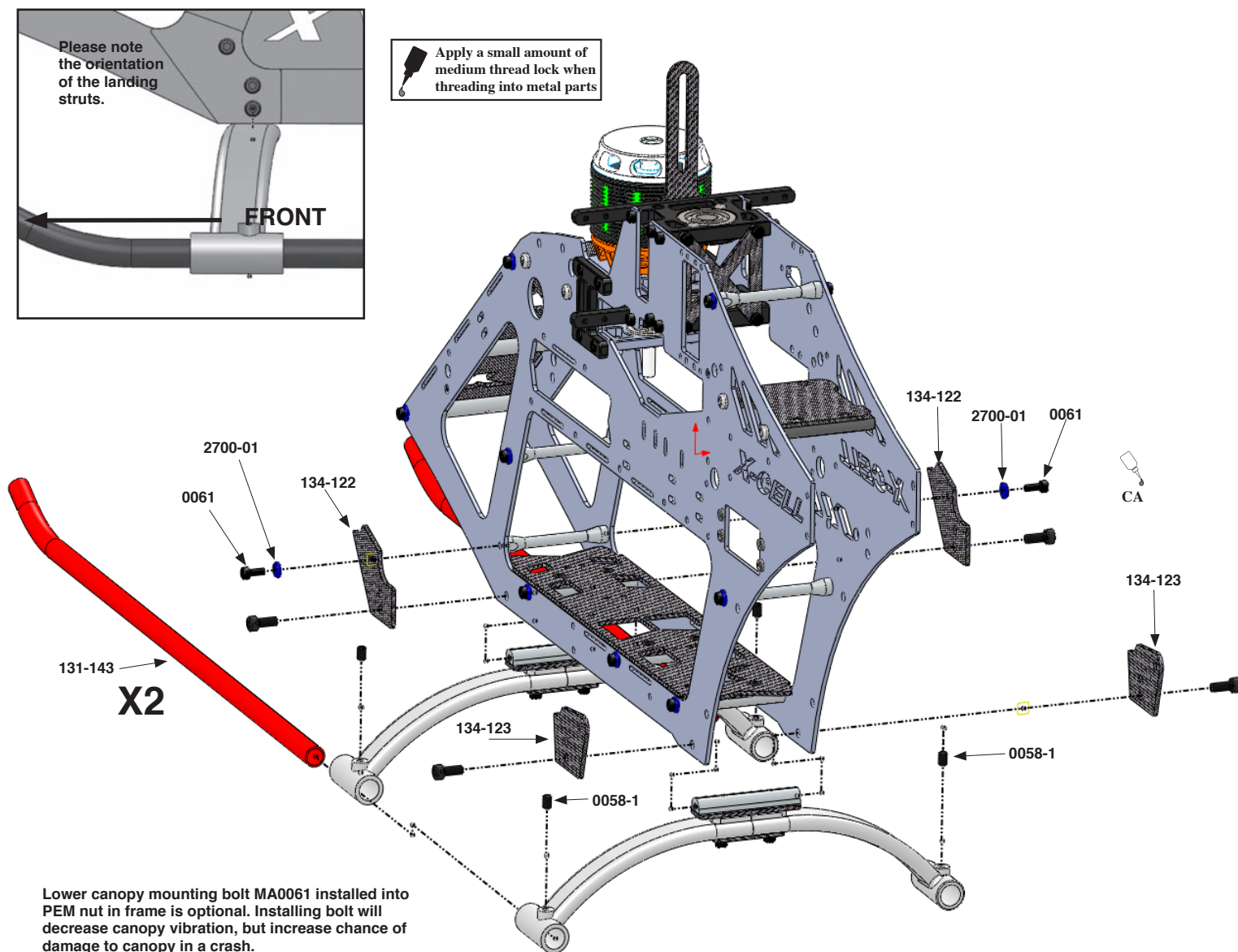


0057

Please note the orientation of the landing struts.

FRONT

 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.




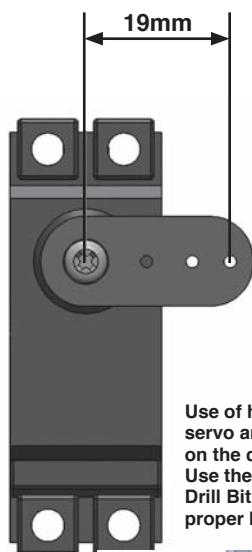
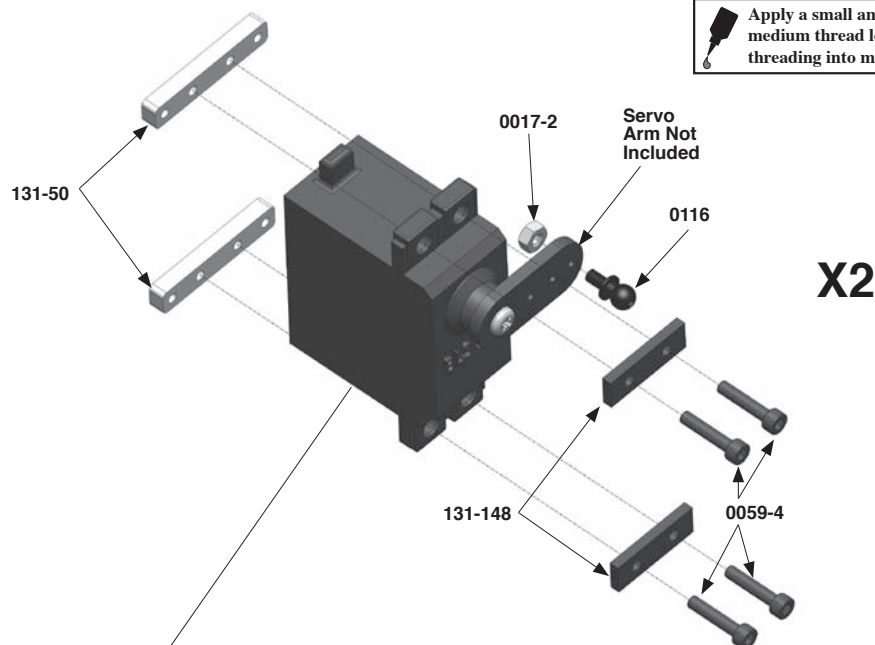
## Hardware for this assembly

-  0017-2 x 3  
2.5mm Hex Nut
-  0059-1 x 4  
M2.5x6 Socket Bolt
-  0059-4 x 12  
M2.5x12 Socket Bolt
-  0116 x 3  
2.5mm Threaded Steel Ball

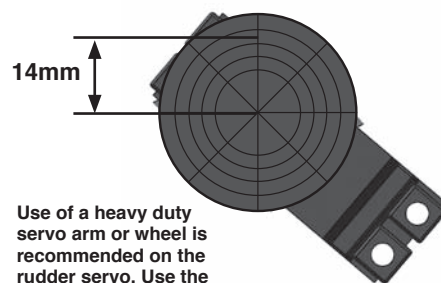
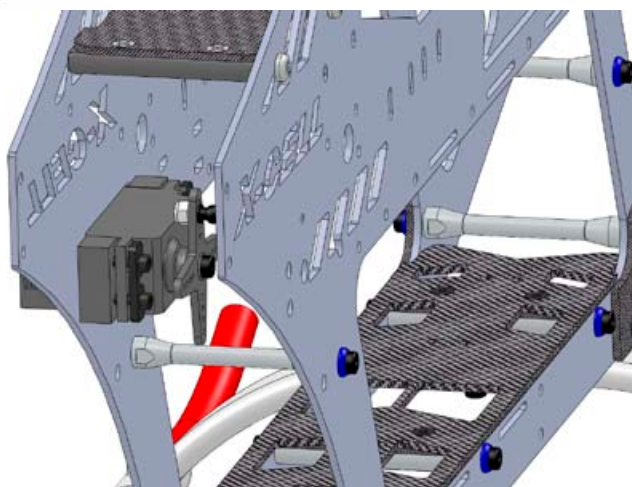
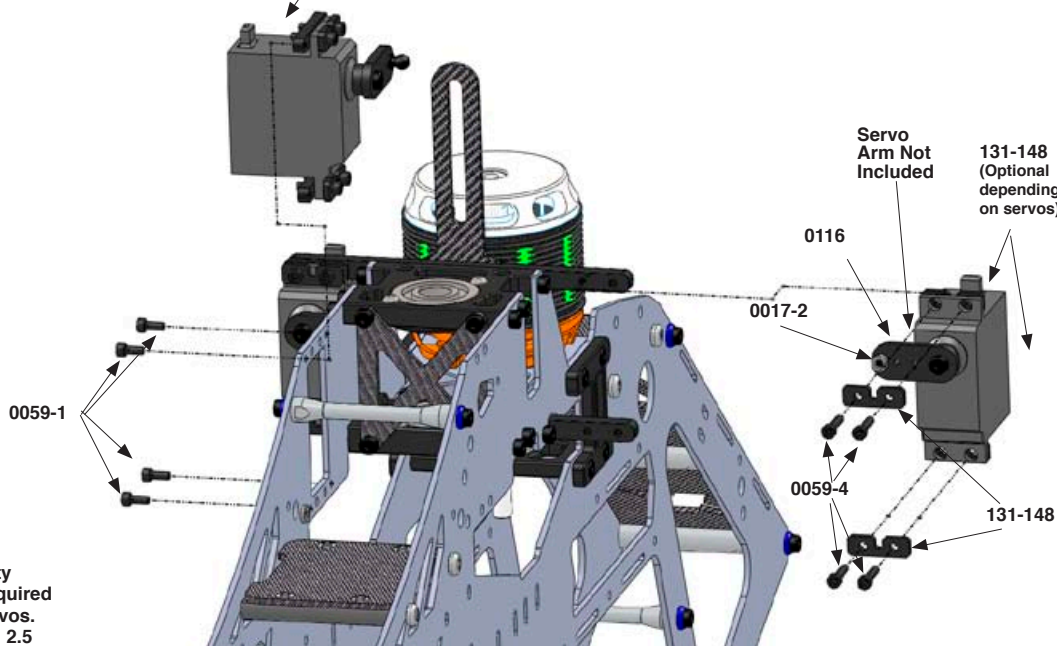
## Assembly Tip

- 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.



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.

## Hardware for these assemblies



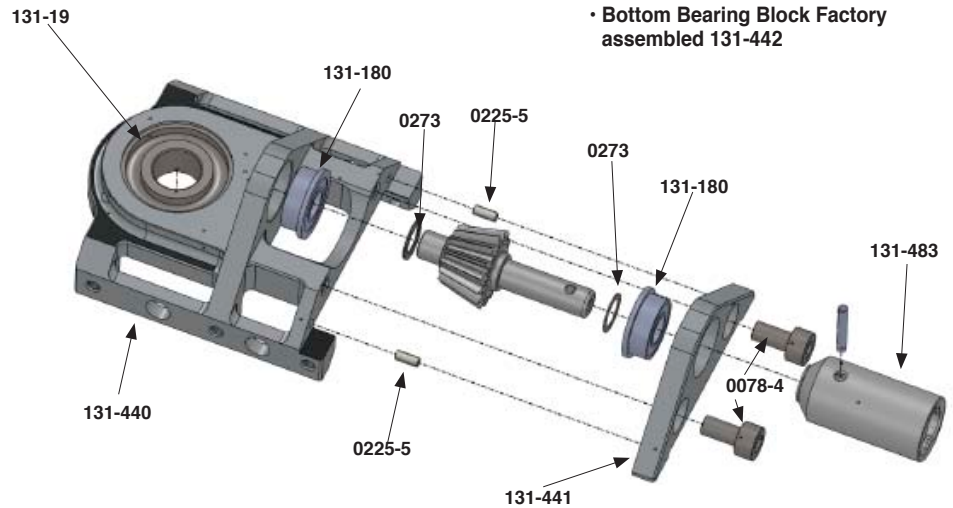
0061 x 32  
M3x8 Socket Bolt

## Assembly Tip

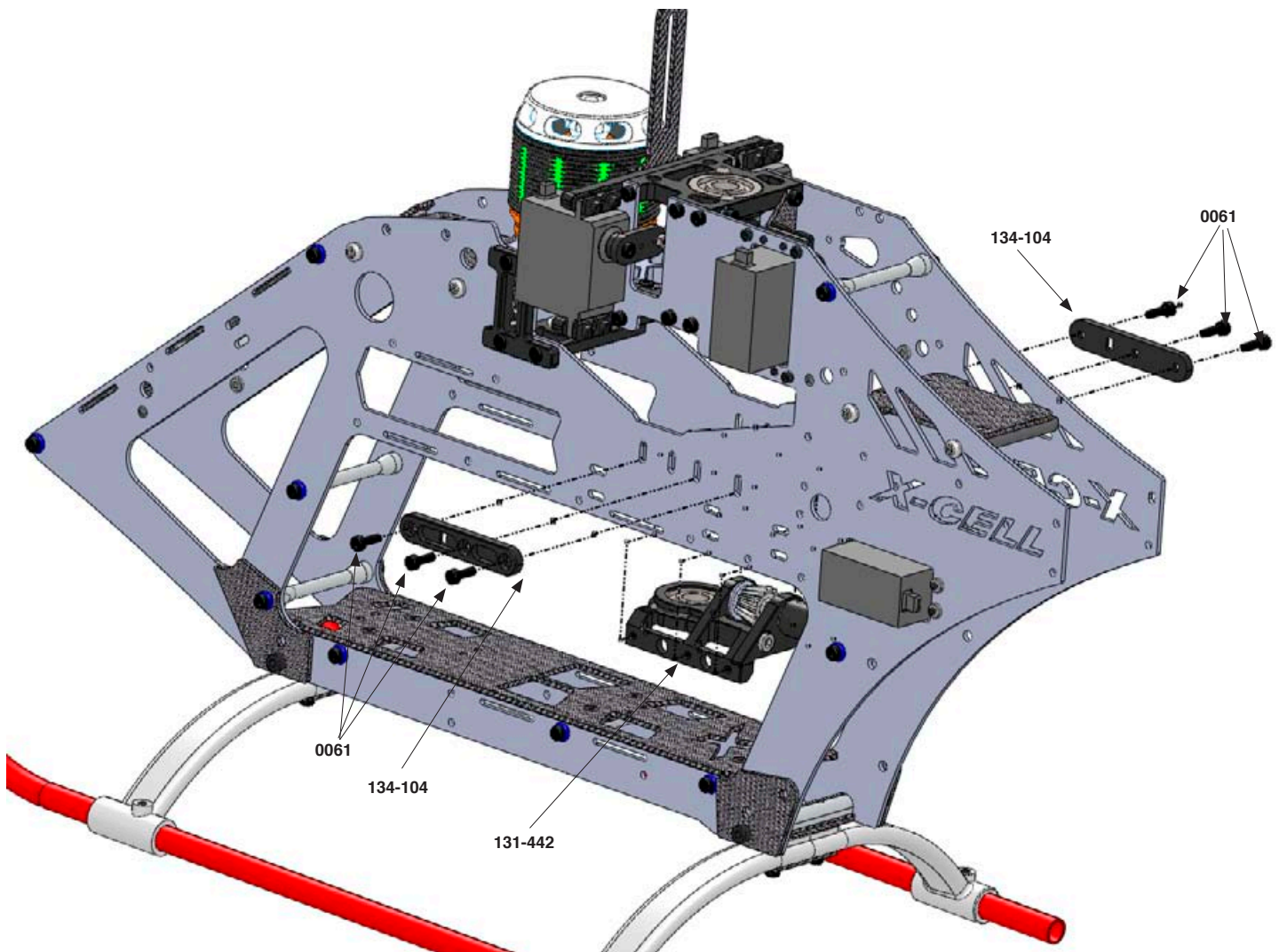
- Do not tighten the screws for the bottom bearing block by now.

## ASSEMBLY DETAIL

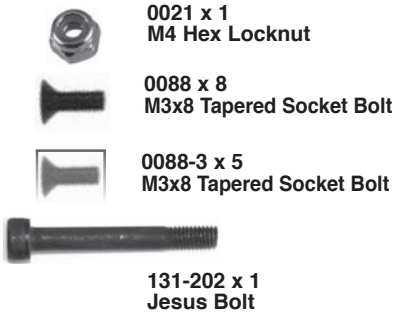
- Bottom Bearing Block Factory assembled 131-442



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



## Hardware for this assembly

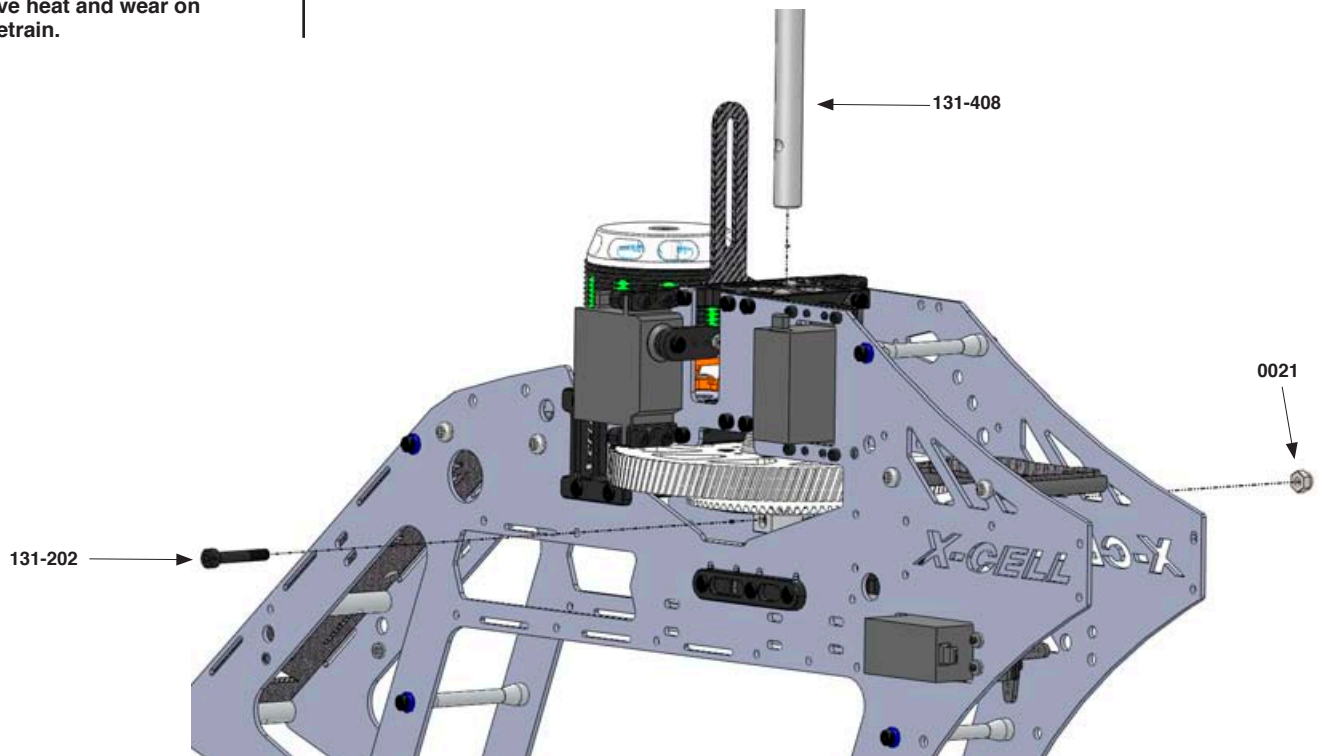
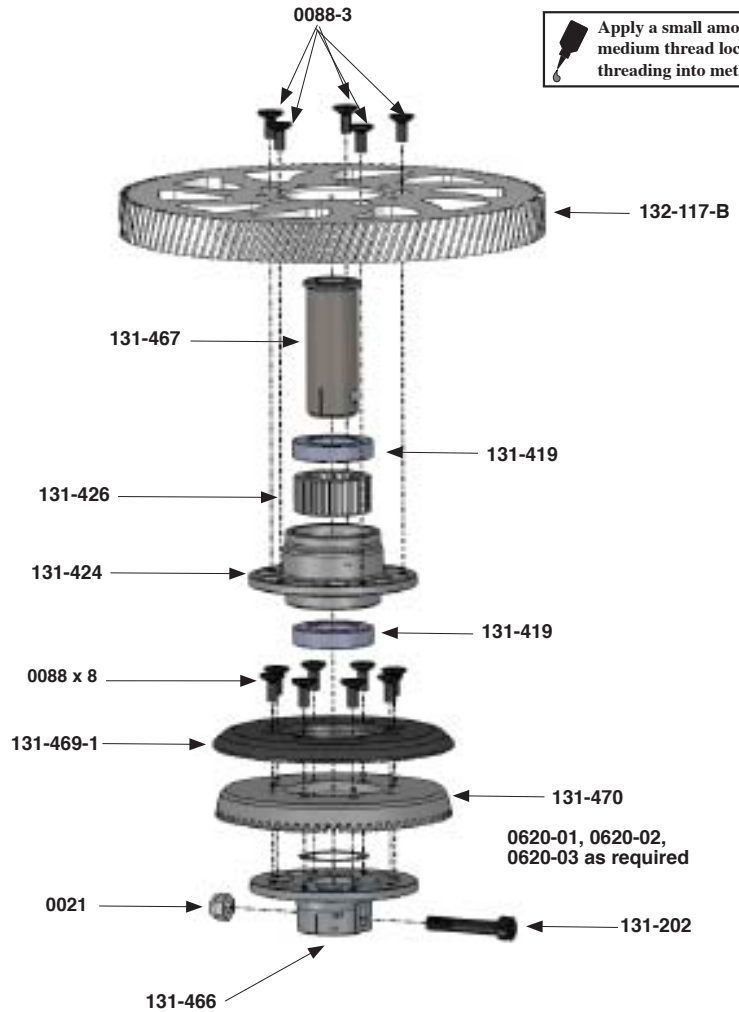


## Assembly Tip

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.

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





## Hardware for this assembly



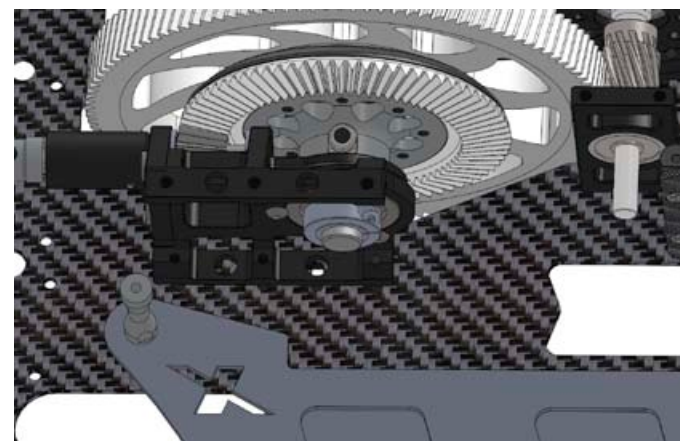
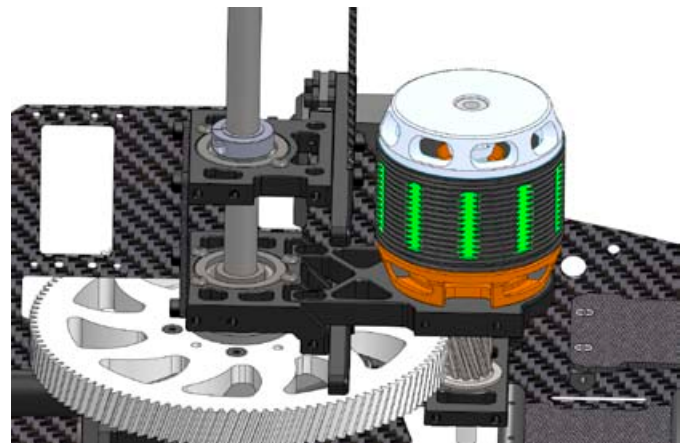
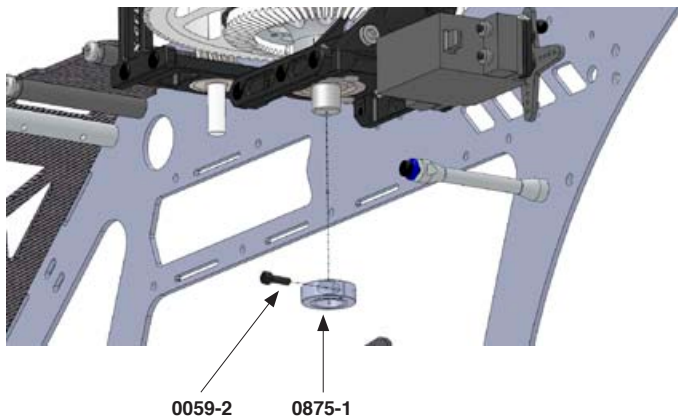
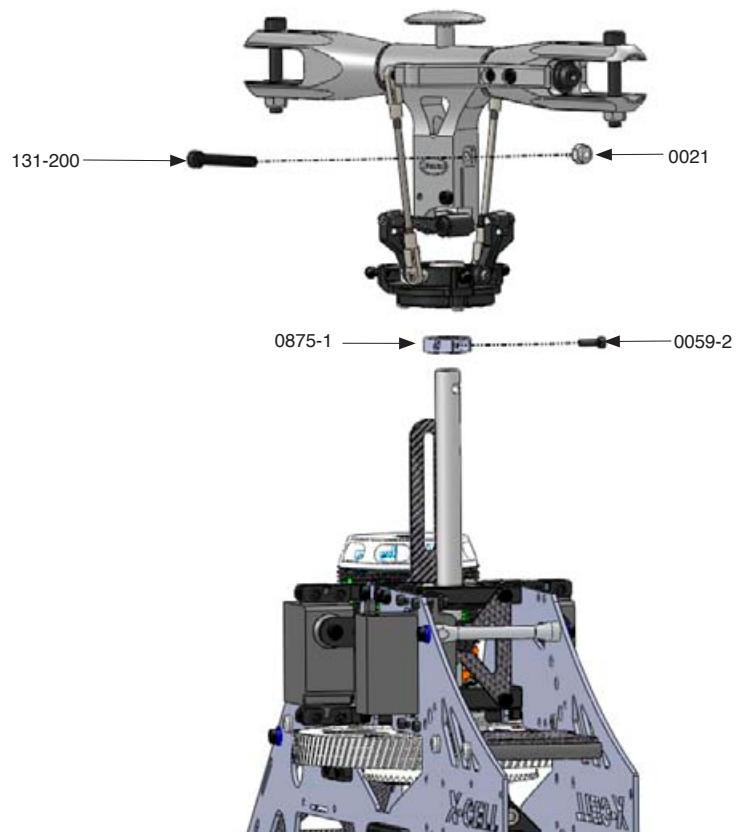
0021 x 1  
M4 Hex Locknut




0059-2 x 2  
M2.5x8 Socket Bolt





131-200 x 1  
Jesus Bolt



## Hardware for this assembly

 0058-7 x 2  
4x10 Socket Set Screw

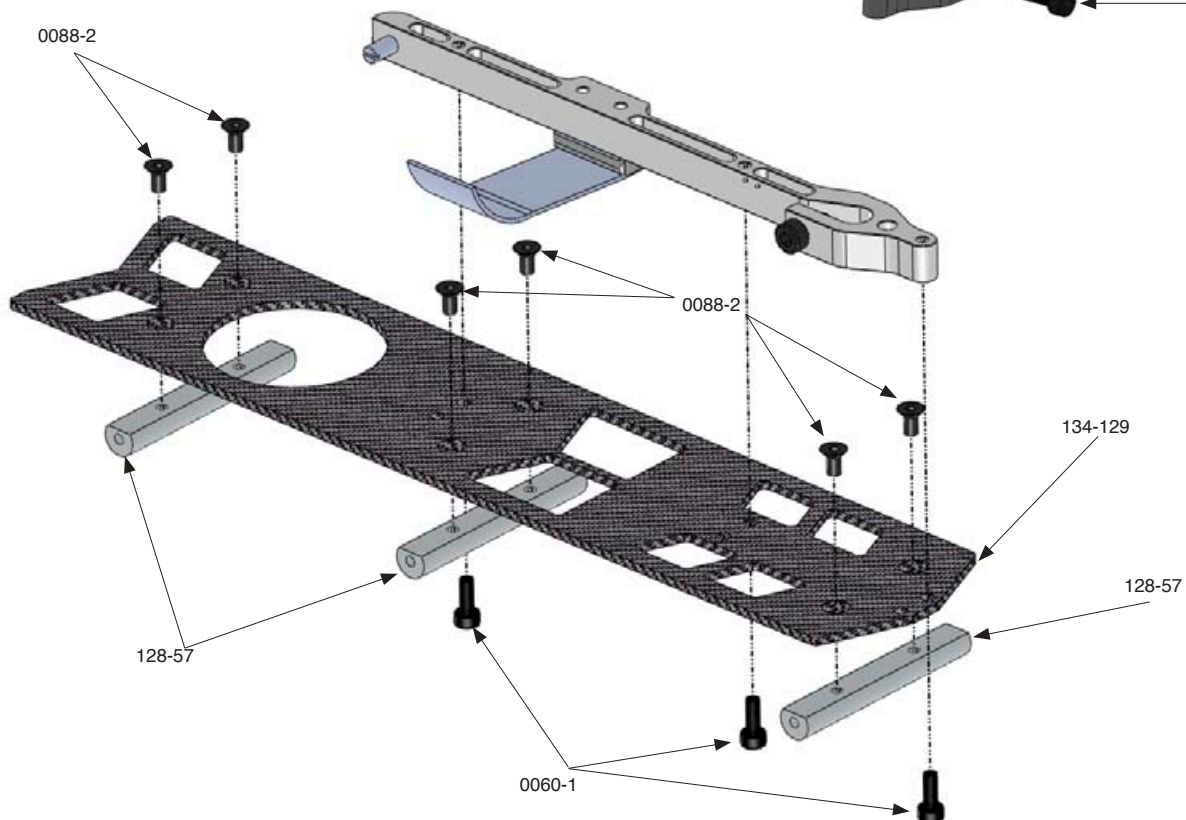
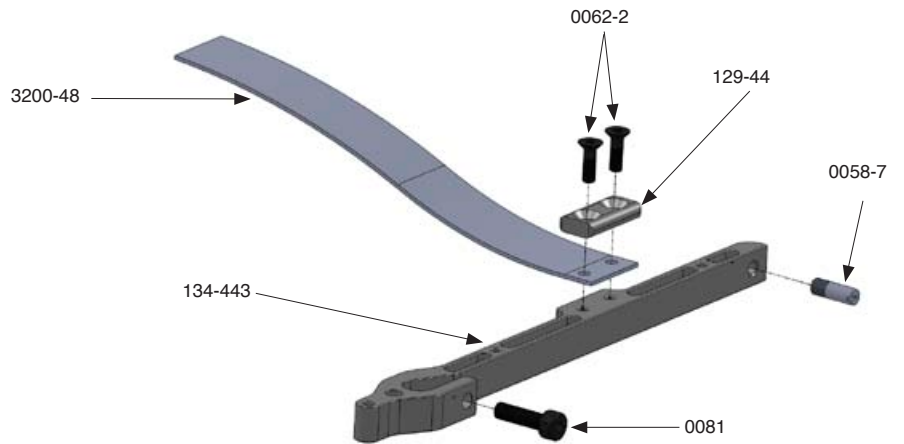
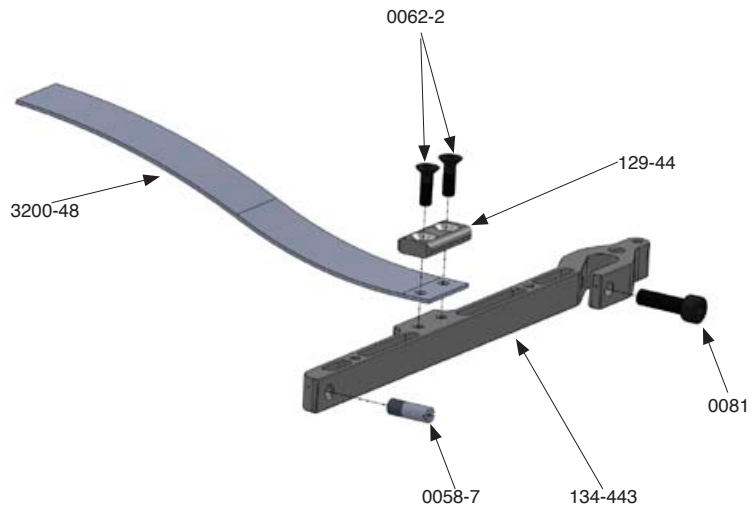
 0060-1 x 3  
M3x6 Socket Bolt

 0062-2 x 4  
M3 x 12mm Tapered  
Socket Bolt

 0081 x 2  
M4x16 Socket Bolt

 0088-2 x 6  
M3 x 6mm Tapered  
Socket Bolt

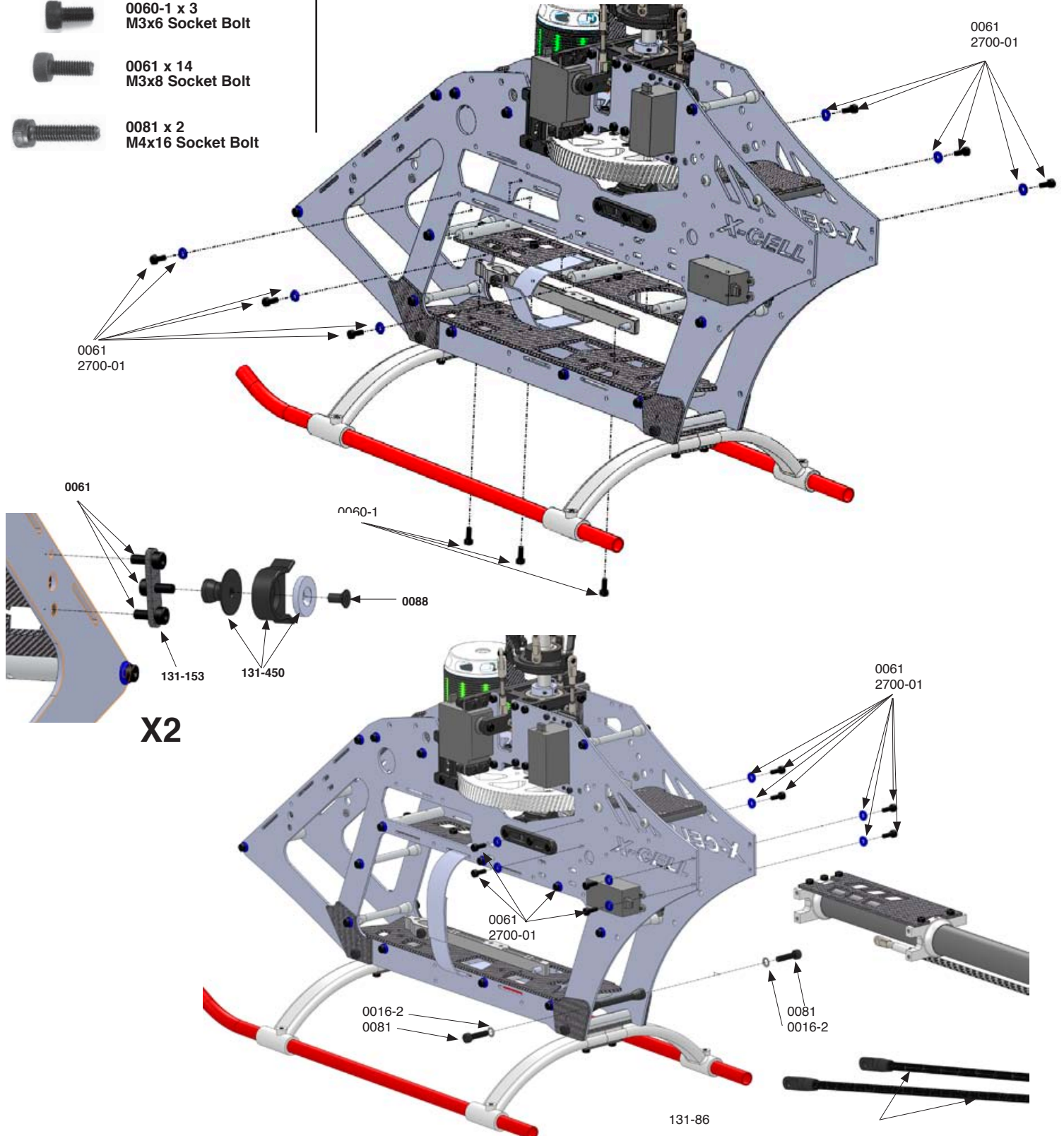
## Assembly Tip





## Hardware for this assembly

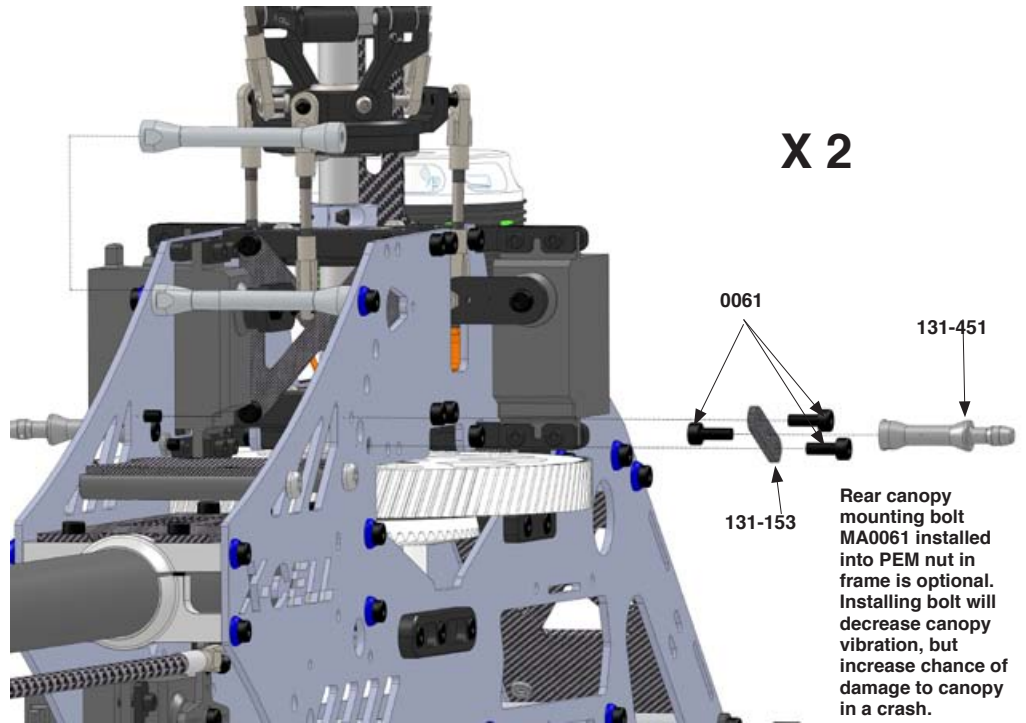
-  2700-01 x 14  
Blue M3 Washer
-  0016-2 x 2  
4mm External Serrated Lockwasher
-  0060-1 x 3  
M3x6 Socket Bolt
-  0061 x 14  
M3x8 Socket Bolt
-  0081 x 2  
M4x16 Socket Bolt



## Hardware for this assembly



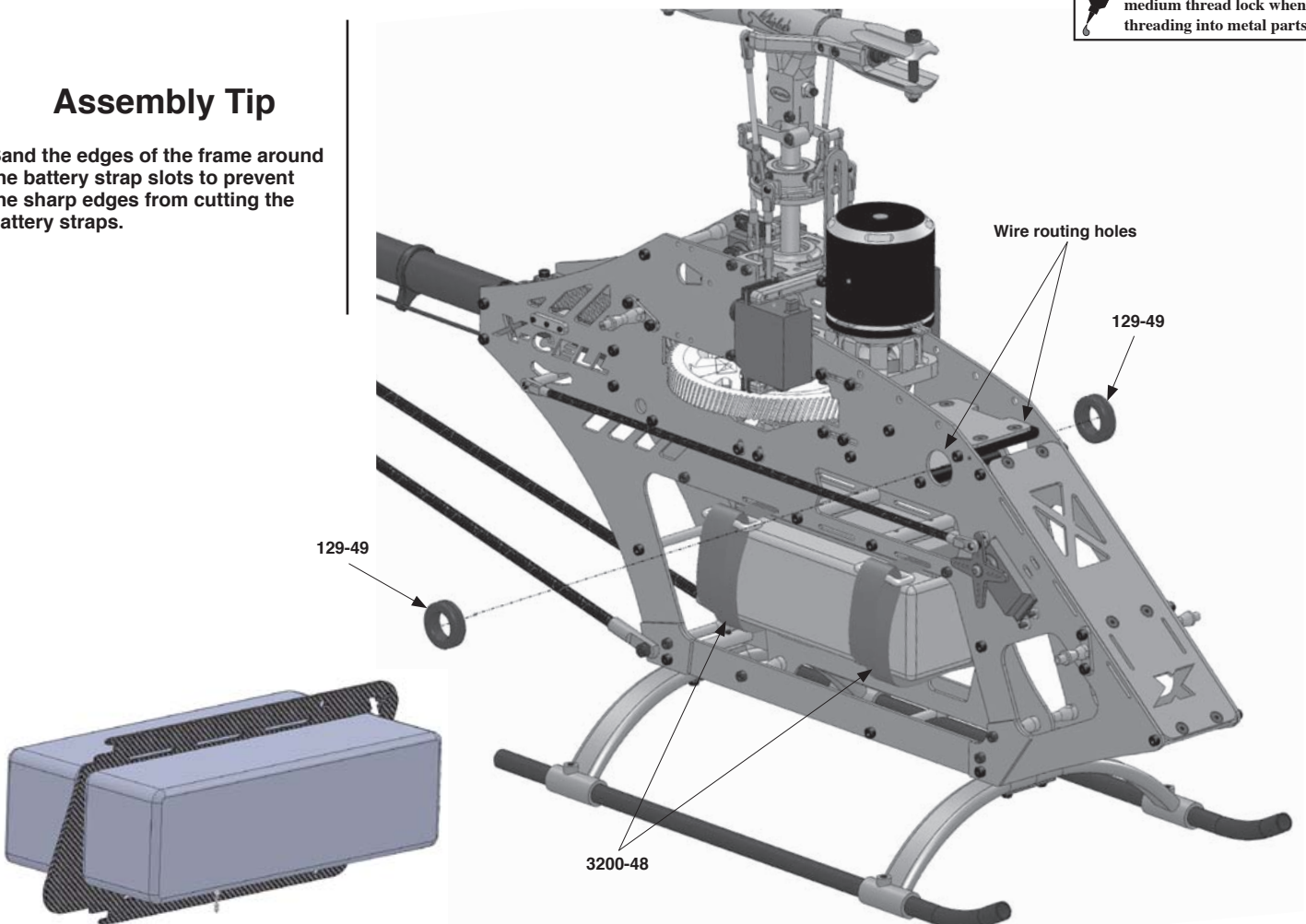
0061 x 6  
M3x8 Socket Bolt



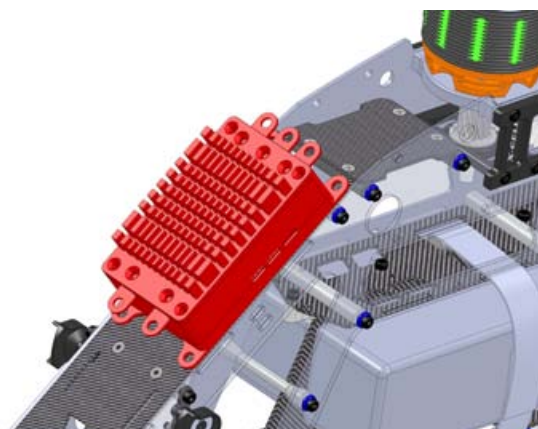
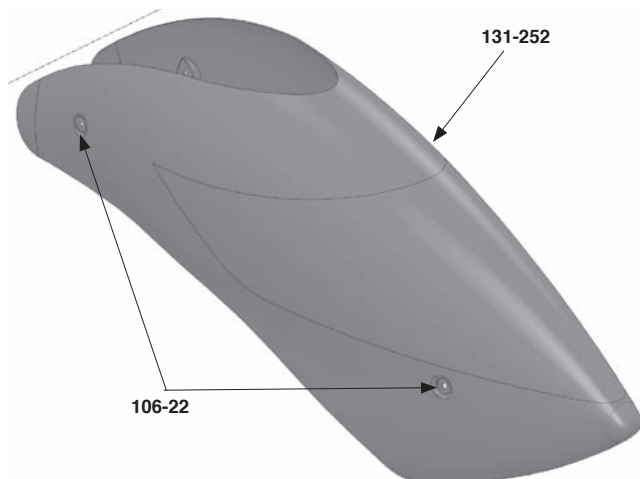
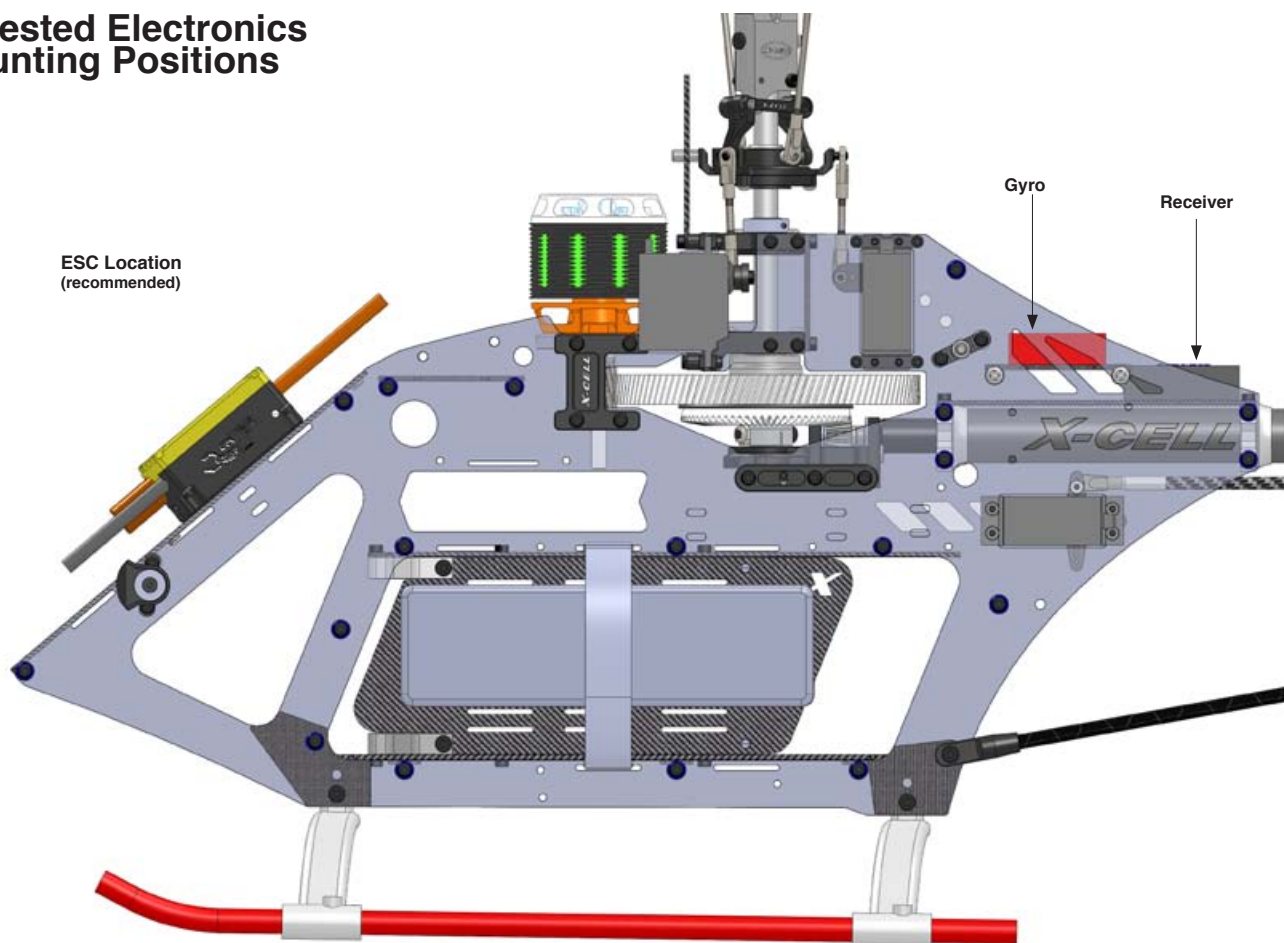
Apply a small amount of medium thread lock when threading into metal parts

## Assembly Tip

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

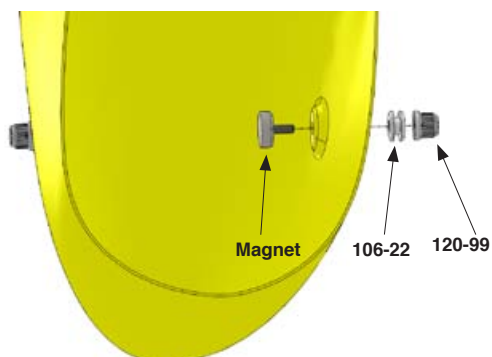


## Suggested Electronics Mounting Positions



### 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
- At the front tray there are 4 bores to mount the Kosmik ESC. Press in the 4 PEM nuts (in the hardware bag) from the bottom of the plate







## Whiplash Kit Parts & Hardware

0001	M3 Washer	0597-1	M3x4.75x.126" Brass Spacer	131-84	Boom Support Rod
0003	M3 Washer	0597-4	Brass Spacer	131-86	Assembled Boom Support
0004	M4 Washer	0869	Washout Link	131-112	T/R Blade Grip
0009	M3 Washer Small	106-22	5x11 Grommet	131-129	Tail Box Assembly
0012-1	2.5mm Pem Nut	120-7-1	5x15 C/F Safety Washer	131-130-B	Tail Pitch Control Bellcrank
0012-2	3mm Pem Nut	120-39	5x10x4 Ball Bearing	131-131	C/F Tail Bellcrank Bracket
0016-2	M4 External Serrated Lock Washer	120-99	Thumb Screw	131-132-B	Bellcrank Slider Cup
0017-2	M2.5 Hex Nut	121-4	Servo To Swash Linkage Rod	131-135	Bracket Washer
0019	M3 Lock Nut	121-7	Swash To PA Linkage Rod	131-139	Skid Tube
0020-1	M2 Lock Nut	122-70	M5x.25 S/S Shim Washer	131-148	Servo Plates
0021	M4 Lock Nut	127-37	10x19x5 Flanged Bearing	131-153	C/F Breakaway Tab
0023	M5 Nut	127-86	M6x9.7x1.0 Shim Washer	131-161	Main Blade Grip
0051	M3x3 Set Screw	128-57	Tray Mount	131-163	FBL Pitch Arm
0056	M3x5 Dog-Point Set Screw	128-58	Main Frame Spacer	131-181	9x17x5 Radial Bearing
0057	M4x4 Set Screw	128-59	M4 Frame Spacer	131-182	9x17x5 Thrust Bearing (F9-17)
0058-1	M4x6 Set Screw	128-80	Front Boom Clamp	131-183	9x14x.030 Washer
0058-3	M4x16 Socket Set Screw	128-144	T/R Control Rod Guide	131-184	9x14x.080 C/F Damper Washer
0058-3	M4x16 Set Screw	128-146	Boom Support End	131-186	Anti Rotation Bracket
0059-0	M2.5x4 Socket Bolt	128-149a	Upper Rear Boom Support Mount	131-187	Head Axle
0059-1	M2.5x6 Socket Bolt	128-149b	Lower Rear Boom Support Mount	131-490	Damper (80D)
0059-3	M2.5x10 Socket Bolt	128-176	Washout Pin	131-200	M4x33 Shouldered Socket Bolt
0060-1	M3x6 Socket Bolt	128-195	Head Button	131-202	M4x25 Shouldered Socket Bolt
0061	M3x8 Socket Bolt	128-314	Swashplate Follower Arm	134-254	Painted Canopy
0062	M3x10 Tapered Socket Bolt	129-49	9/16" Rubber Wire Grommet	131-408	FBL Main Shaft
0063	M3x10 Socket Bolt	131-17C	Bevel Gear Shaft Side	131-368	FBL Head Block
0064-3	M3x6 Button Head Socket Bolt	131-18C	Tail Bevel Gear TT Side	131-382	C/F Strut Spacer
0064-4	M3x16 Button Head Socket Bolt	131-19	10x26x8 Main Shaft Bearing	134-100	Motor Mount
0065	M3x12 Socket Bolt	131-420	Middle Main Shaft Bearing Block	134-102	Block
0067	M3x14 Socket Bolt	131-421	Upper Main Shaft Bearing Block	134-103	
0069	M3x16 Socket Bolt	131-23	6x13x5 Flanged Bearing - Tail Shaft	134-104	
0073	M3x20 Socket Bolt	131-424	Main Gear Hub	134-112	12T Helical Pinion Gear
0078	M4x12 Socket Bolt	131-429	C/F X-Brace	134-113	13T Helical Pinion Gear (optional)
0078-4	M4x8 Socket Bolt	131-33	15x21x4 Bearing - Tail Gear	132-117B	117T Helical Main Gear
0082-4	M5x32 Shouldered Socket Bolt	131-440	Main Shaft Bearing Block Bottom	134-10	C/F Frame (L)
0086-1	M5x16 Flanged Socket Bolt	131-450	Front Canopy Mount	134-11	C/F Frame (R)
0081	M4x16 Socket Bolt	131-451	Rear Canopy Post	134-122	C/F Front Frame Doubler
0088	M3x8 Tapered Socket Bolt	131-46	P/A Servo Rail	134-123	C/F Rear Frame Doubler
0088-2	M3x6 Tapered Socket Bolt	131-47	C/F Servo Rail Spacer	134-127	C/F Front Battery Tray
0088-3	M3x7 Tapered Socket Bolt	131-50	Elevator Servo Mount	134-128	C/F Boom Clamp Plate
0107	M3x6 Threaded Steel Ball	131-52	Delrin Tray Mount	134-129	C/F Upper Battery Tray
0109	M3x8 Threaded Steel Ball	131-53	Gyro Plate	134-132	C/F Bottom Battery Tray
0116	M2.5 Threaded Steel Ball	131-400	Torque Tube End	134-134	Battery Tray
0133	M2x21.2 Ball Link	134-58	Torque Tube	132-136	Landing Strut
0133-1	M3x21.2 Ball Link	131-60	C/F Tail Fin	134-230	Whiplash Manual
0159	3x7x3 Bearing	134-62	CF Tail Boom	2700-01	Blue Washer
0214	Upper Swash Ring	131-64	Tail Hub	3000-73	MA Bench Towel
0214-1	Lower Swash Ring	131-66	4x10 Thrust Bearings - Tail Grips	3200-48	3/4" Hook & Loop Tape
0215	M6 Tail Shaft Collar	131-69	2x315 Linkage Rod	3200-54	Adhesive Back Hook & Loop Tape
0216	Heim Ball	131-69-1	T/R Push Rod	3700-160	Foam Blade Holder
0217	Swash Plate Assembled	131-70	Tail Output Shaft		
0218	20x32x7 Swash Bearing	131-473	7x11x3 Bearing - Control Ring		
0225	Link Pin	131-474	Control Ring		
0273	6x10x.011" Steel Washer	131-475	T/R Pitch Slider Assembly		
0319	8x16x5 Bearing	131-476	Tail Pitch Yoke		
0390	Large Wire Lead Retainer	131-477	Brass Slider		
0442	T/R Pitch Link	131-78	7mm Retaining Clip		
0447-1	M2 E Clip	131-83	Anti Rotation Pin		



X-cell

WHIPLASH



## MINIATURE AIRCRAFT

MOSER SAEGE 5 • GAISSACH • BY • 83674 • DE  
PHONE: +49.8042.5079.239

WEBSITE: [HTTP://WWW.MINIATUREAIRCRAFTUSA.COM](http://www.miniatureaircraftusa.com)

EMAIL: [MINAIR@MINIATUREAIRCRAFTUSA.COM](mailto:MINAIR@MINIATUREAIRCRAFTUSA.COM)

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