X-cell WHIPLASH

Assembly Instructions

Gas
Helicopter Kit
MA1033-3 Flybarless

miniature aircraft usa

Step up to excellence with X-Cell

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Version 1.6

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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 "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

- 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

Kit Assembly (1033-3)

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, 23-29cc R/C format gas engine
2. Helicopter style muffler suited to the engine you choose.
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 sevro)
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 and 105mm Tail Blades
8. R/C helicopter starting and fueling equipment compatible with gasoline fuel
9. R/C helicopter engine governor is recommended

Refer to the "Whiplash Gas User Guide" on page 32 of this manual for more information on recommended equipment and setup.

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
1-A	0217	Swashplate - Factory	1
1-Hardware	0051	M3x3 Set Screw	2
1-Hardware	0107	M3x6 Threaded Steel Ball	3
1-Hardware	0109	M3x8 Threaded Steel Ball	4
1-Hardware	131-83	Anti-rotation Pin	1
1-B	0869	Washout Link	2
1-B	128-176	Washout Pin	2
1-B	128-195	Head Button	1
1-B	128-314	Swashplate Follower - Factory	2
1-B	131-368	FBL Head Block	1
1-Hardware	0067	M3x14 Socket Bolt	1
1-Hardware	0071	M3x18 Button Head Socket Bolt	2
1-Hardware	0447-1	M2 E-clip	2

Bag	Part No.	Part Description	Qty
1-C	131-161	Main Blade Grip - Factory	2
1-C	131-163	FBL Pitch Arm	2
1-C	131-187	Head Axle	1
1-Hardware	0107	M3x6 Threaded Steel Ball	2
1-Hardware	0061	M3x8 Socket Bolt	4
1-Hardware	0086-1	M5x16 Flanged Socket Bolt	2
1-Hardware	120-7-1	5x15 Safety Washer	2
1-Hardware	131-183	Washer	2
1-D	0133-1	M3x21.5 Ball Link	10
1-D	121-4	Servo To Swash Linkage Rod	3
1-D	121-7	Swash To PA Linkage Rod	2
1-D	131-408	FBL Main Shaft	1
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
2-A-1	131-475	T/R Pitch Slider Assembly - Factory	1
2-Hardware	0107	M3x6 Threaded Steel Ball	1
2-A-2	131-129	Tail Box Assembly - Factory	1
2-A-3	131-130-B	Tail Pitch Control Bellcrank	1
2-A-3	131-131	C/F Bellcrank Bracket	1
2-A-3	131-132-B	Bellcrank Slider Cup	1
2-Hardware	0019	M3 Lock Nut	1
2-Hardware	0064-3	M3x6 Button Head Socket Bolt	2
2-Hardware	0073	M3x20 Socket Bolt	1
2-Hardware	0107	M3x6 Threaded Steel Ball	1
2-A-4	131-64	T/R Hub	1
2-A-4	131-112	T/R Blade Grip	2
2-Hardware	0009	M3 Washer	2
2-Hardware	0019	M3 Lock Nut	2
2-Hardware	0056	M3x5 Dog-Point Set Screw	2
2-Hardware	0061	M3x8 Socket Bolt	2
2-Hardware	0071	M3x18 Socket Bolt	2
2-Hardware	0107	M3x6 Threaded Steel Ball	2
2-B-1	131-400	TT Ends	2
2-B-1	131-480	TT Bearing Cup	2
2-B-1	131-481	TT Bearing Cup O-Ring	4
2-B-1	131-482	TT Sleeve	2
2-B-1	131-485	TT Bearing	2
2-Hardware	0015	2mm Hex Nut	2
2-Hardware	0049-1	M2x12 Socket Bolt	2

Bag	Part No.	Part Description	Qty
2-B-2	133-458	TT	1
2-B-2	131-62	Tail Boom	1
2-B-2	133-472	T/R CF Control Rod	1
2-B-2	131-86	Tail Boom Support C/F Rod Assemly	2
2-B-3	0133-1	M3x21.5 Ball Link	2
2-B-3	0868-41	Control Rod Support	2
2-B-3	0868-5	Plastic T/R Guide	2
2-B-3	128-80	Aluminum Front Boom Clamp	2
2-B-3	128-144	T/R Control Rod Guide	2
2-B-3	128-149a	Upper Rear Boom Support Mount	1
2-B-3	128-149b	Lower Rear Boom Support Mount	1
2-B-3	128-400	Push Rod End	2
2-B-3	131-128	C/F Boom Clamp Plate	1
2-Hardware	0001	2mm Washer	4
2-Hardware	0016-2	4mm External Serrated Lockwasher	2
2-Hardware	0020-1	2mm Lock Nut	2
2-Hardware	0049-1	M2x12 Socket Bolt	2
2-Hardware	0053-5	M3x16 Socket Screw	2
2-Hardware	0060-1	M3x6 Socket Bolt	4
2-Hardware	0063	M3x10 Socket Bolt	2
2-Hardware	0065	M3x12 Socket Bolt	3
2-Hardware	0067	M3x14 Socket Bol	2
2-Hardware	0078	M4x12 Socket Bolt	2
2-B-4	133-60	C/F Vertical Tail Fin	1

Bag 3 - Gas Frame Assembly

Bag	Part No.	Part Description	Qty
3-A-1	128-57	Tray Mount	3
3-A-1	131-52	Delrin Tray Mount	2
3-A-1	131-53	C/F Gyro Plate	1
3-A-1	131-55	C/F Angled Battery Tray	1
3-Hardware	0032-2	M3x8 Tapping Screw	4
3-Hardware	0064-3	M3x6 Button Head	6
3-A-2	133-4117	C/F Left Frame - Gas	1
3-A-3	133-4118	C/F Right Frame - Gas	1
Frame	0003	3mm Washer	20
Hardware	0032	2.9x9.5 Tapping Screw	10
	0060-1	M3x6 Socket Bolt	30
	0061	M3x8 Socket Bolt	50
	0063	M3x10 Socket Bolt	10
3-B	128-58	Frame Spacer	4
3-B	131-46	P/A Servo Rail	2
3-B	131-47	C/F Servo Rail Spacer	2
3-B	131-186	C/F Anti-rotation Bracket	1
3-B	131-420	Mid Main Bearing Block	1
3-B	131-421	Upper Main Bearing Block	1
3-B	131-429	C/F X-Brace	1
3-Hardware	0060-1	M3x6 Socket Bolt	4
3-Hardware	0063	M3x10 Socket Bolt	2
3-Hardware	0065	M3x12 Socket Bolt	2
3-C	128-118	6mm Hex Adaptor	1
3-C	131-3	Start Shaft w/Sleeve	1
3-C	131-179	X-Block	1
3-C	131-409	Assembled Gas Clutch Bell	1
3-Hardware	0057	M4x4 Set Screw	2
BAG-S	0818-3	Mounting Block	2
BAG-S	131-50	Elevator Servo Mount	2
BAG-S	131-148	C/F Servo Plates	14
S-Hardware	0017-2	2.5mm Hex Nut	5
S-Hardware	0059-1	M2.5x6 Socket Bolt	4
S-Hardware	0059-4	M2.5x12 Socket bolt	16
S-Hardware	0059-7	M2.5x20 Socket Bolt	4
S-Hardware	0116	M2.5 Threaded Steel Ball	5
3-D-1	133-110	C/F Bottom Plate - Gas	1
3-D-2	128-57	Tray Mount	3
3-D-2	133-107	C/F Front Doubler - Gas	2
3-D-2	133-108	C/F Rear Doubler - Gas	2
3-D-2	133-119	Flanged Clutch Spacer	2
3-D-2	133-120	One Way Bearing Bracket - Factory	1
3-D-2	133-121	Gas Motor Mount	1
3-D-2	133-400	Bottom Mount Spacer	4
3-D-2	133-401	Bottom Mount Spacer	1
3-Hardware	0009	3mm washer	4
3-Hardware	0063	M3x10 Socket Bolt	8
3-Hardware	0085	M5x16 Socket Bolt	4
3-Hardware	0085-3	M5x22 Socket Bolt	4
3-E	131-470	70T Machined Crown Gear	1
3-E	0875-1	10mm Split Main Shaft Collar	2
3-E	132-117-B	124T Main Gear	1
3-E	131-424	Main Gear Hub	1
3-E	131-440	Lower Main Bearing Block	1
3-E	131-466	Auto Hub	1
3-E	131-469-1	Gear Support	1
3-E	0620-01	15x21x.10 Shim Washer	1
3-E	0620-02	15x21x.20 Shim Washer	1
3-E	0620-03	15x21x.30 Shim Washer	1
3-Hardware	0021	4mm Lock Nut	1
3-Hardware	0059-2	M2.5x8 Socket Bolt	2
3-Hardware	0088	M3x8 Tapered Socket Bolt	8
3-Hardware	0088-3	M3x7 Tapered Socket Bolt	5
3-Hardware	131-202	Jesus Bolt OWB V2	1

Bag	Part No.	Part Description	Qty
3-E-1	0133-1	M3x21.2 Ball Links	2
3-E-1	106-22	Rubber Canopy Grommet	4
3-E-1	121-6	M3x75 Threaded Control Rod	1
3-E-1	128-59	M4 Front Boom Support Brace	1
3-E-1	131-150	Front Canopy Post	2
3-E-1	131-153	C/F Canopy Breakaway Tabs	4
3-E-1	131-154	Thumb Screw, not standoff	2
3-E-1	131-451	Rear Canopy Post	2
3-E-1	131-452	Splint	2
3-Hardware	0003	3mm Washer	2
3-Hardware	0016-2	M4 External Serrated Lock Washer	2
3-Hardware	0015	2mm Hex Nut	1
3-Hardware	0061	3x8 Socket Bolt	20
3-Hardware	0063	3x10 Socket Bolt	2
3-Hardware	0081	M4x16 Socket Bolt	2
3-Hardware	0103	2mm Threaded Steel Ball	1
3-E-2	2500-24	White Tuff Struts II	2
3-E-2	131-382	C/F Strut Spacer	2
3-E-2	131-454	Tray Mount	2
3-E-2	2500-39	Tuff Strut End Cup	4
3-Hardware	0003	3mm Washer	4
3-Hardware	0058-1	M4x6 Socket Set Screw	4
3-Hardware	0073	M3x20 Socket Bolt	4
3-Hardware	0078-5	M4x10 Socket Bolt	4
3-F	0405	Fuel Pick up	1
3-F	128-90	Tank Mounting Studs	2
3-F	128-92	Fuel Tank Plug	1
3-F	128-94	Fuel Nipple	1
3-F	131-144	Rubber Fuel Tank Mount	4
3-F	133-94	C/F Fuel Tank Plate	1
3-F	133-99	Whiplash Gas Fuel Tank	1
3-Hardware	0011	5mm Washer	1
3-Hardware	0011-5	Washer	1
3-Hardware	0014F	5mm Hex Nut - Fine Threaded	2
3-Hardware	0060-1	M3x6 Socket Bolt	4
3-G	0390	Wire Retainers	3
3-G	133-137	Rubber Wire Grommet	2
3-G	3200-30	20” Spiral Band for Wire and Cable	1
3-G	3200-48	20” 3/4 Hook and Loop Tape	1
3-G	3200-54	17” Adhesive Hook and Loop	1
BOX	133-144	Skids Blue	2
BOX	133-150	Air Filter	1
BOX	133-252	Whiplash Canopy	1
BOX	3000-73	Towel	1

manual online: www.miniatureaircraft.de/shop/ Support & Manuals

MA1033-3 - Flybarless Head Assembly Parts

0021
M4 Hex Locknut

0023
M5 Hex Locknut

0051
M3x3 Socket Set Screw

0061
M3x8 Socket Bolt

0063
M3x10 Socket Bolt

0067
M3x14 Socket Bolt

0071
M3x18 Socket Bolt

0082-4
M5x32 Shouldered Socket Bolt

0086-1
M5x16 Flanged Bolt

0107
M3x6 Threaded Steel Ball

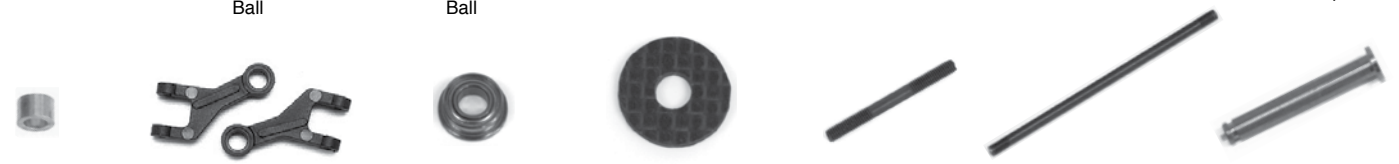
0109
M3x8 Threaded Steel Ball

0133-1
M3x21.2 Ball Link

0159
3x7x3 Bearing

0217
Swashplate

0447-1
E-Clip



0597-4
M3x4.75x.215 Brass Spacer

0869
3D Washout Link

106-06
2x5x1.5 Bearing

120-7-1
M5x15 Safety Washer

121-4
M3x30 Threaded Control Rod

121-7
M3x65 Threaded Control Rod

128-176
M2x.584 Washout Pivot Pin

128-195
Aluminum Head Button

128-314
Swashplate Follower

131-83
Swashplate Pin

131-161
Aluminum Blade Grip

131-163
Aluminum Pitch Arm

131-181
9x17x5 Bearing

131-182
9x17x5 Thrust Bearing

131-183
9x14x.75 Washer

131-187
Head Axle

131-200
M4x33 Shouldered Socket Bolt

131-368
Flybarless Head Block

131-408
Flybarless Main Shaft

131-490
Damper Sleeve

131-491
Damper O-Ring (80D)

Hardware for this assembly

0051 x 2
M3x3 Socket Set Screw

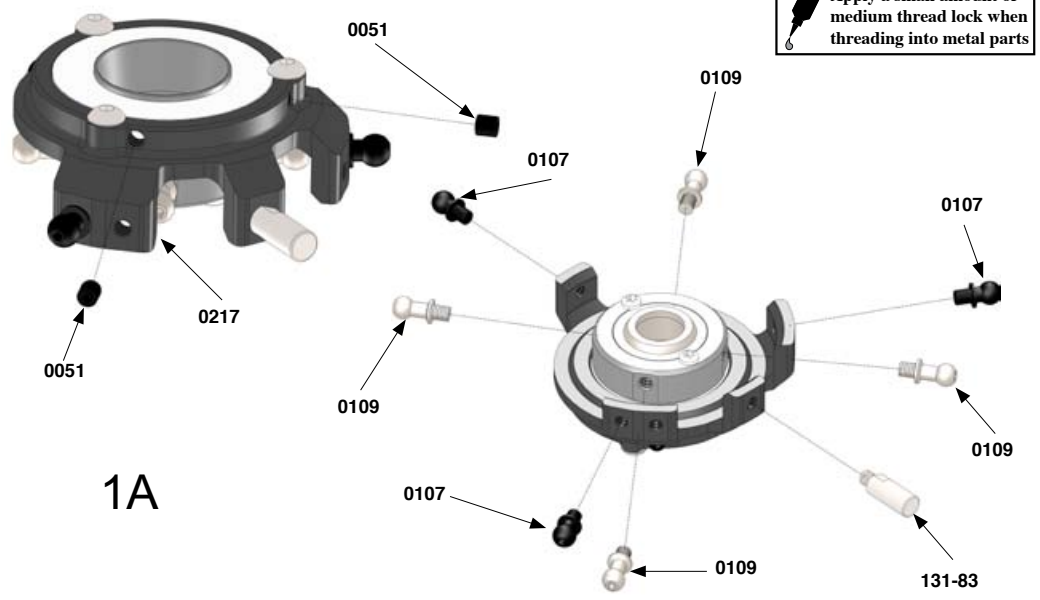
0107 x 3
M3x6 Threaded Steel Ball

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. 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.***



Hardware for this assembly

0067 x 1
M3x14 Socket Bolt

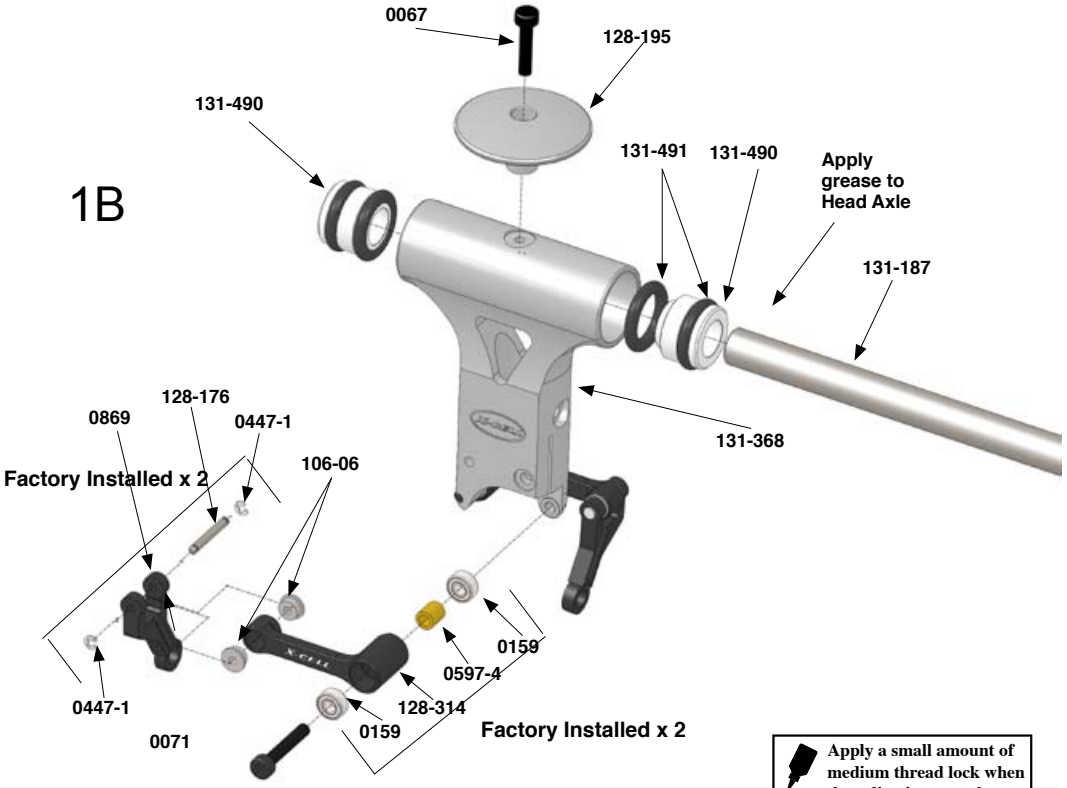
0071 x 2
M3x18 Socket Bolt

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)

1B



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

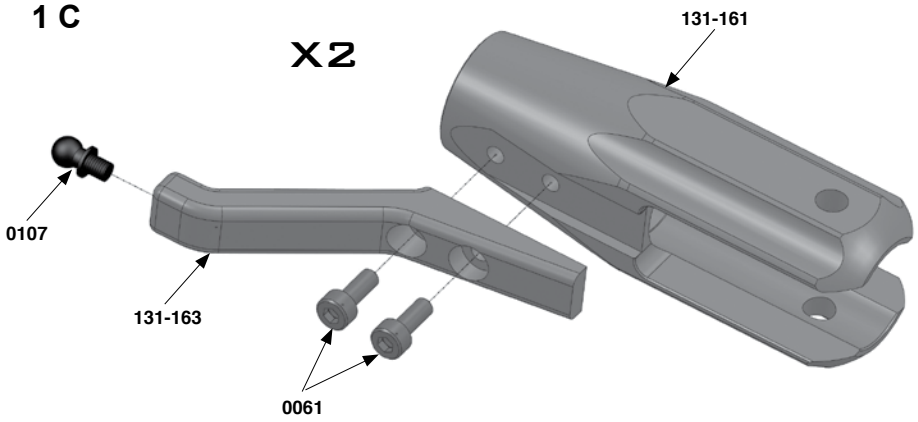
0086-1 x 2
M5x16 Flanged Bolt

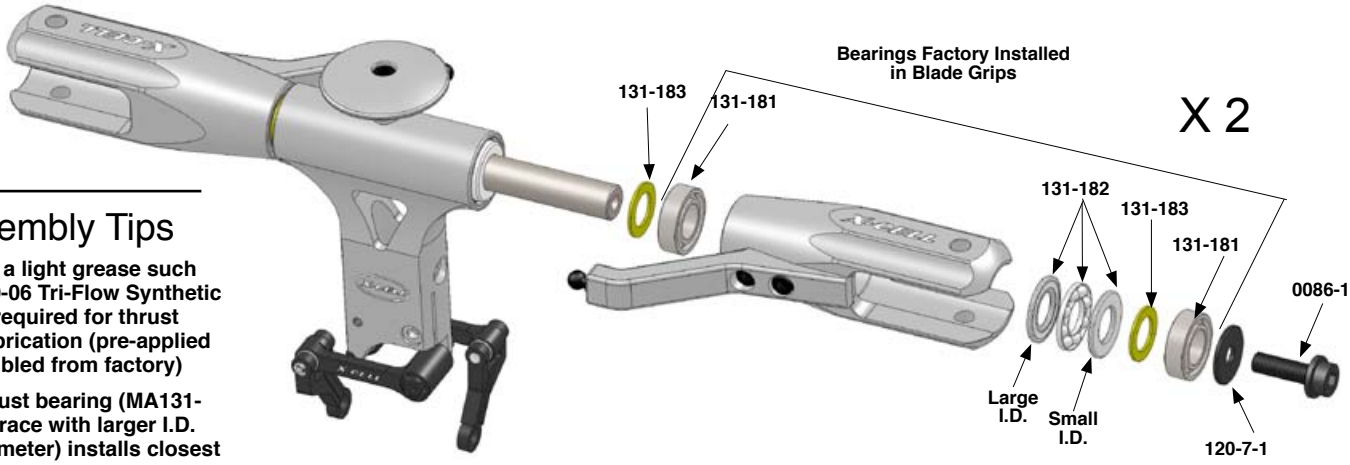
120-7-1 x 2
M5x15 Safety Washer

131-183 x 2
9x14x.75 Washer

1 C

X2





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

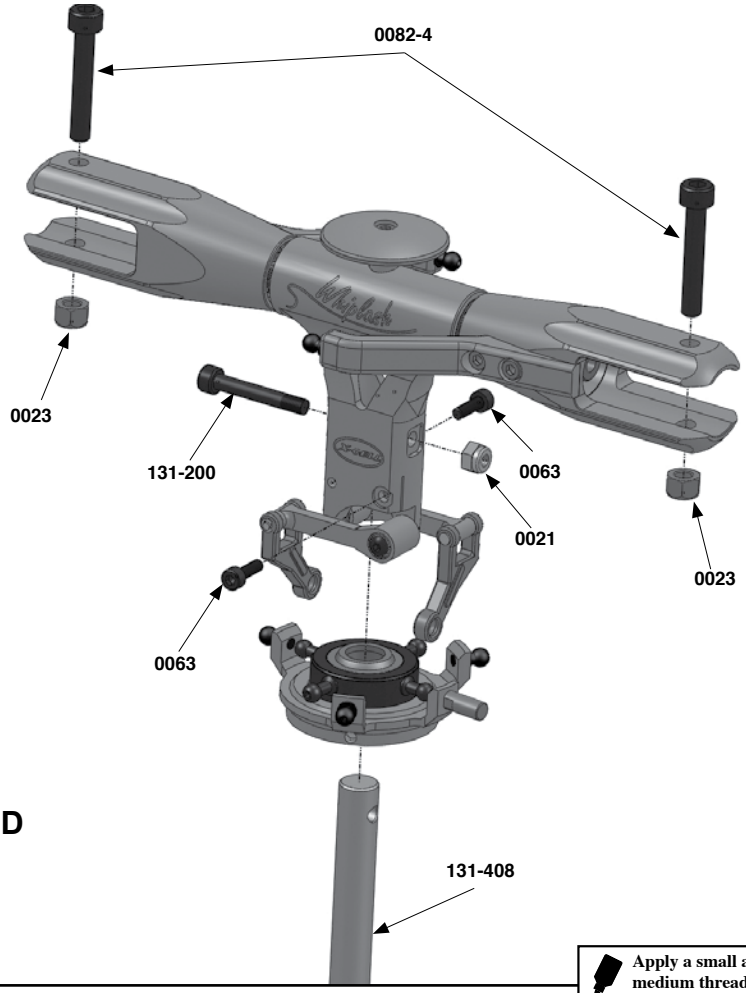
0063 x 2
M3x10 Socket Bolt

0082-4 x 2
M5x32 Shouldered
Socket Bolt

131-200 x 1
M4x33 Shouldered
Socket Bolt

Assembly Tips

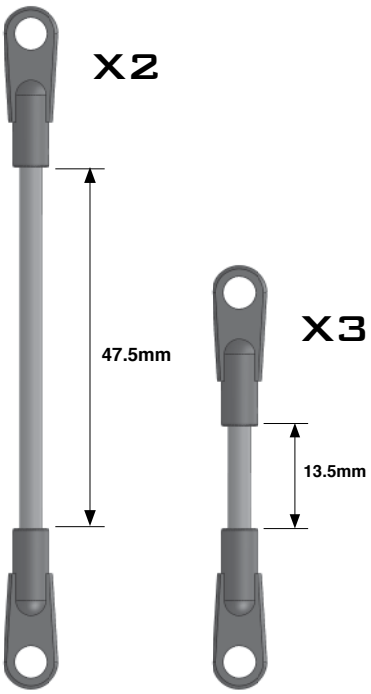
- Head, Swashplate and Main Shaft can be assembled now, or you can assemble the parts later step by step installing them to the frame.

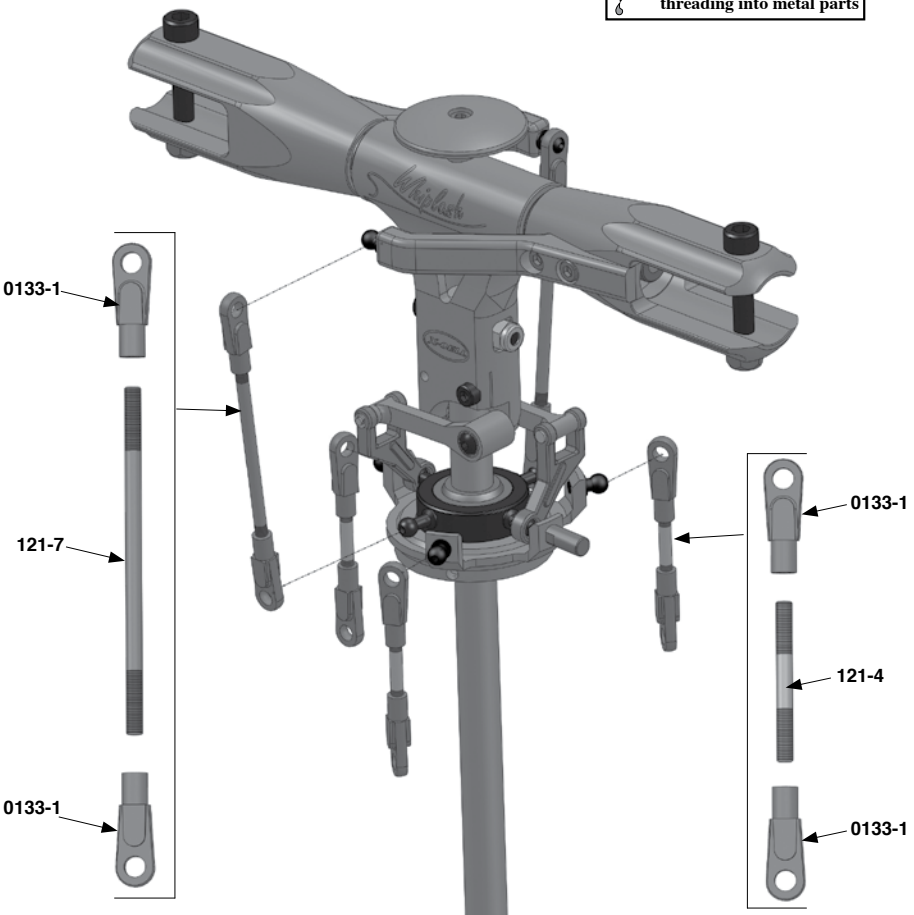


1 D

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

Link Arm Lengths and Installation





Tail Assembly Parts

0001
2mm Washer

0009
3mm Flat Steel Washer

0012-2
M3 Pem Nut

0015
2mm Hex Nut

0016-2
4mm External Serrated Lockwasher

0019
3mm Hex Locknut

0020-1
2mm Hex Locknut

0049-1
M2x12 Socket Bolt

0051
M3x3 Socket Set Screw

0053-5
M3x16 Socket Set Screw

0056
M3x5 Dog Point Socket Screw

0056-3
M3x5 Dog Point Socket Screw

0059-0
M2.5x4 Socket Bolt

0059-1
M2.5x6 Socket Bolt

0060-1
M3x6 Socket Bolt

0061
M3x8 Socket Bolt

0063
M3x10 Socket Bolt

0064-3
M3x6 Button Head Socket Bolt

0065
M3x12 Socket Bolt

0067
M3x14 Socket Bolt

0071
M3x18 Socket Bolt

0073
M3x20 Socket Bolt

0078
M4x12 Socket Bolt

0107
M3x6 Threaded Steel Ball

0133-1
M3x21.2 Ball Links

0159
3x7x3 Bearing

0215
Auto Hub Ret. Collar

0225
Pivot Pin For Pitch Links

0273
M6x10x.011" Steel Shim Waasher

0273-1
M6x10x.0.1 Steel Shim Waasher

0442
Pivoting T/R Pitch Link

0868-41
Push Rod Support

0868-5
Plastic T/R Guide

120-39
5x10x4 Bearing

122-70
Washer

128-80
Aluminum Front Boom Clamp

128-144
T/R Control Rod Guides

128-146
Aluminum Boom Support Ends

128-149
Rear Boom Support Mount

128-400
CF Rod Ends

131-17-C
Tail Bevel Gear, Shaft Side

131-18-C
Tail Bevel Gear, Torque Tube Side

131-33
15x21x4 Bearing

131-33-1
15x21x4 Flanged Bearing

131-62
Aluminum Tail Boom

131-64
Tail Hub

131-66
5x10 Thrust Bearing

131-70
Tail Rotor Output Shaft

131-84
Carbon Boom Support Rod

131-86
Tail Boom Support Assembly

131-112
T/R Blade Grip

131-129
Tail Case

131-130-B
Tail Bellcrank

131-131
Carbon Fiber Bellcrank Bracket

131-132-B
Bellcrank Cup

131-180
8x12x3.5 Flanged Bearing

131-400
Torque Tube End

131-473
8x12x3.5 Bearing

131-474
Pitch Slider Ring

131-475
Tail Pitch Slider

131-476
Tail Pitch Yoke

131-477
Brass Slider

131-480
Torque Tube Bearing Cup

131-481
Torque Tube Bearing Cup O-ring

131-482
Torque Tube Sleeve

131-485
12x18x4 Bearing

133-60
CF Vertical Tail Fin

133-128
Carbon Fiber Boom Clamp Plate

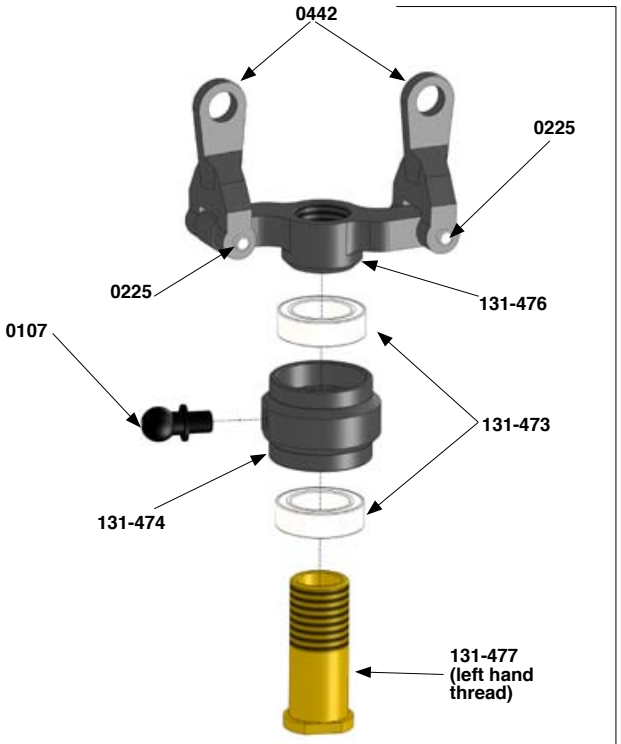
133-472
Tail CF Linkage Rod

133-458
Torque Tube

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

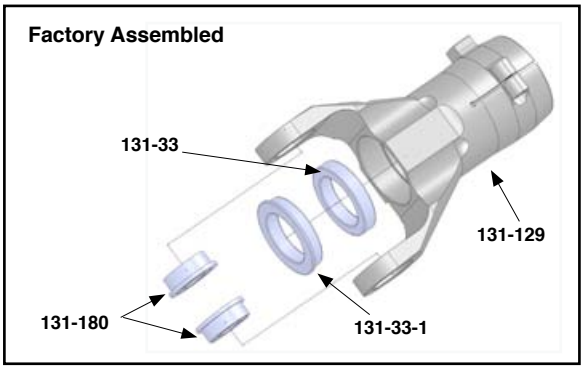
0051 x 2
M3x3 Socket Set Screw

0056 x 2
M3x5 Dog Point Socket Screw

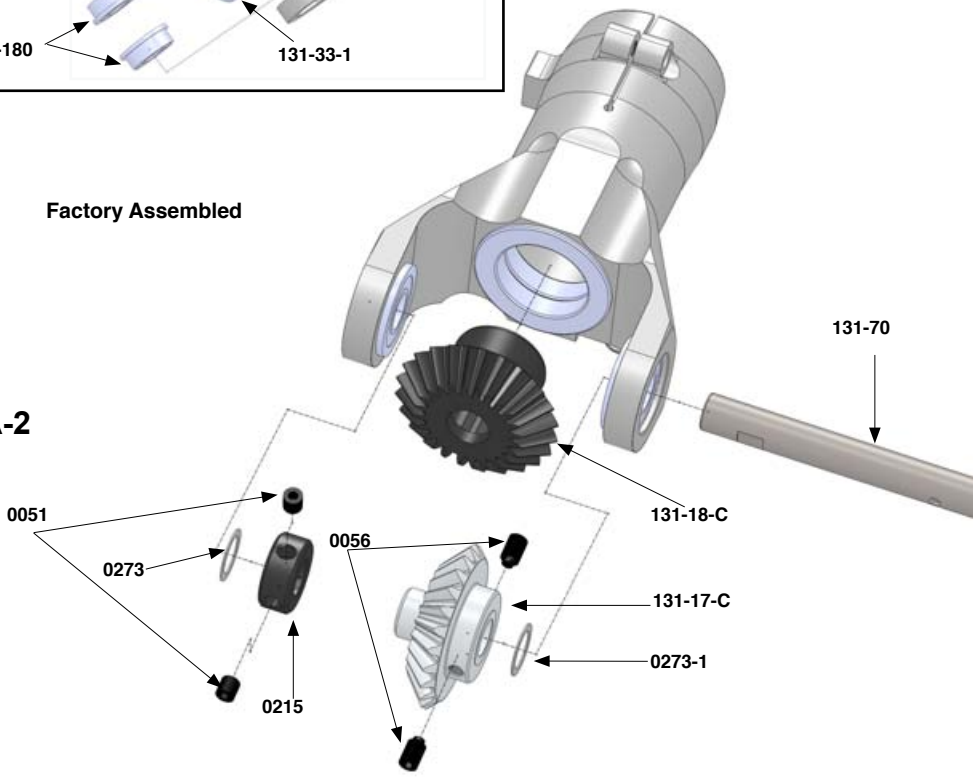
0273 x 1
m6x10x.011" Steel Shim Washer

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

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

0019 x 1
3mm Hex Nut

0059-1 x 1
M2.5x6 Socket Bolt

0064-3 x 2
M3x6 Button Head Socket Bolt

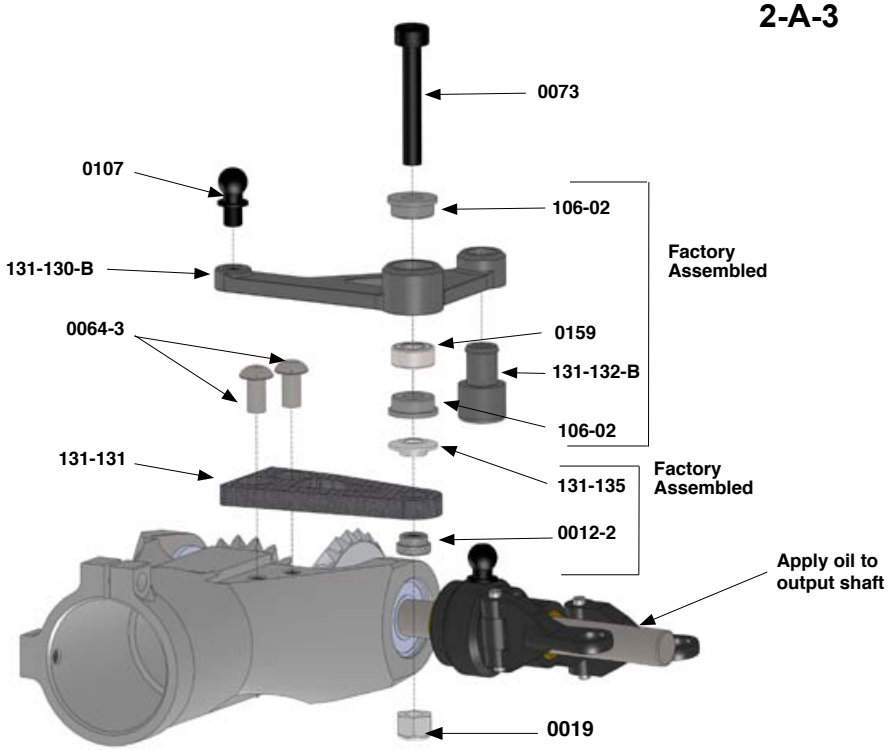
0073 x 1
M3x20 Socket Bolt

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

2-A-3



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 2
3mm Lock Nut

0061 x 2
M3x8 Socket Bolt

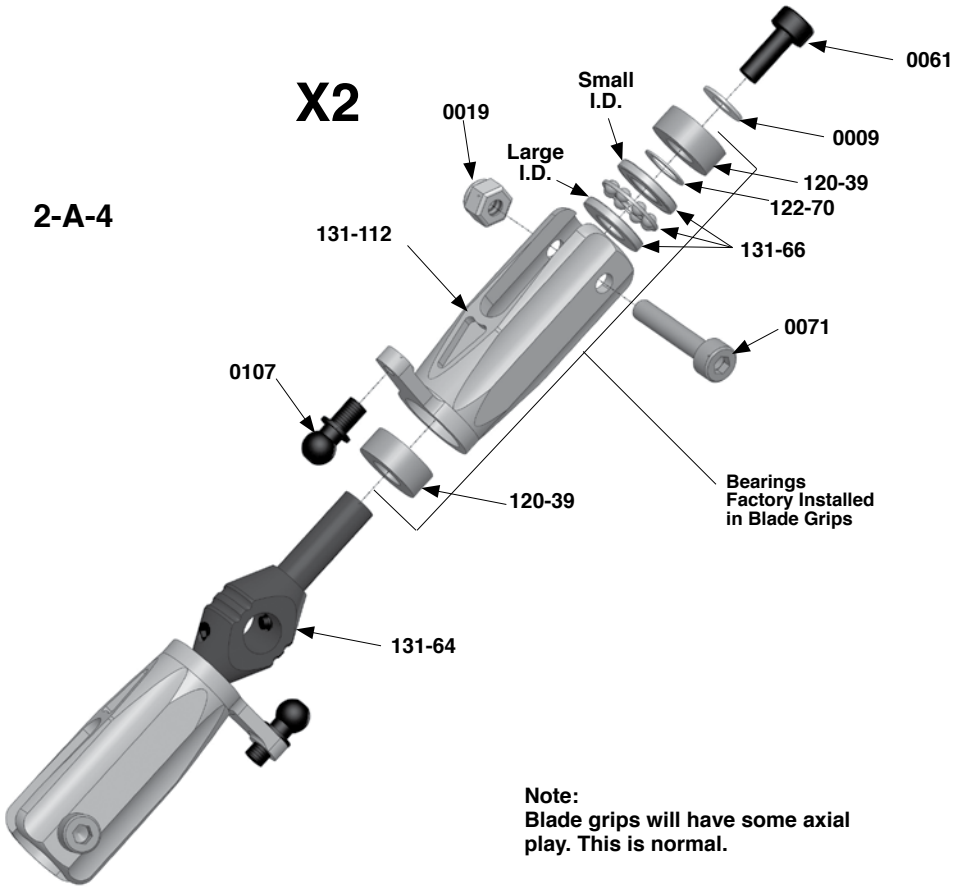
0071 x 2
M3x18 Socket Bolt

0107 x 2
M3x6 Threaded Steel Ball

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



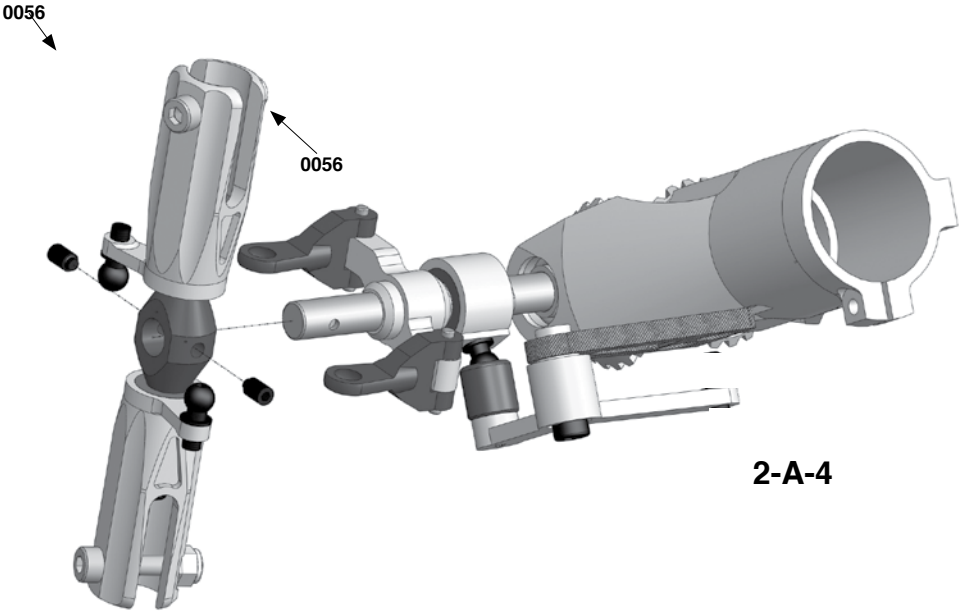
Note:
Blade grips will have some axial play. This is normal.

Hardware for this assembly

0056 x 2
M3x5 Dog Point
Socket Screw

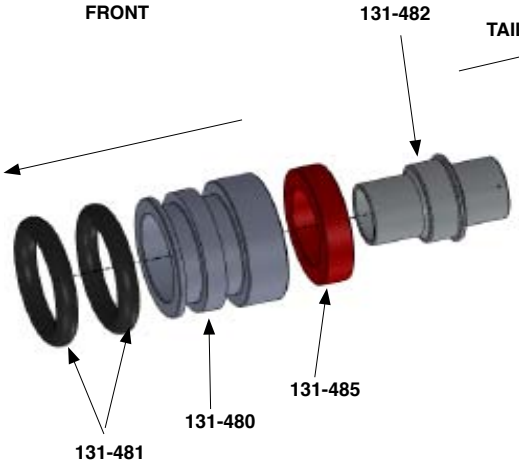
Assembly Tip

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



2-A-4

Apply Loctite 648 when mounting the bearing at the sleeve



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.

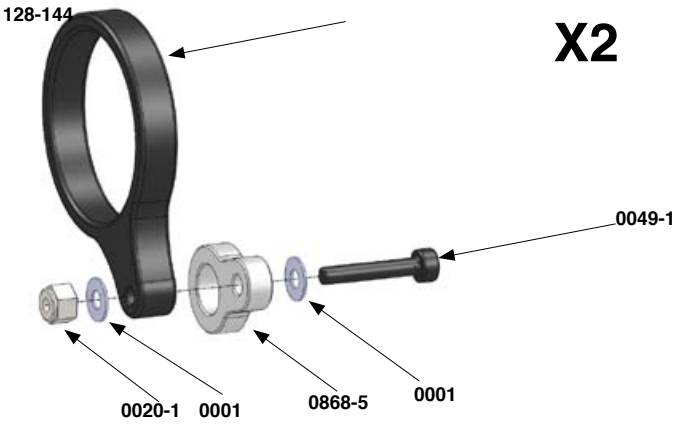
Apply a small amount of Loctite 648 when mounting the bearing cup assemblies at the torque tube.

Hardware for this assembly

0001 x 4
2mm Steel Washer

0020-1 x 2
2mm Lock Nut

0049-1 x 2
M2x12 Socket Bolt



X2

Hardware for this assembly

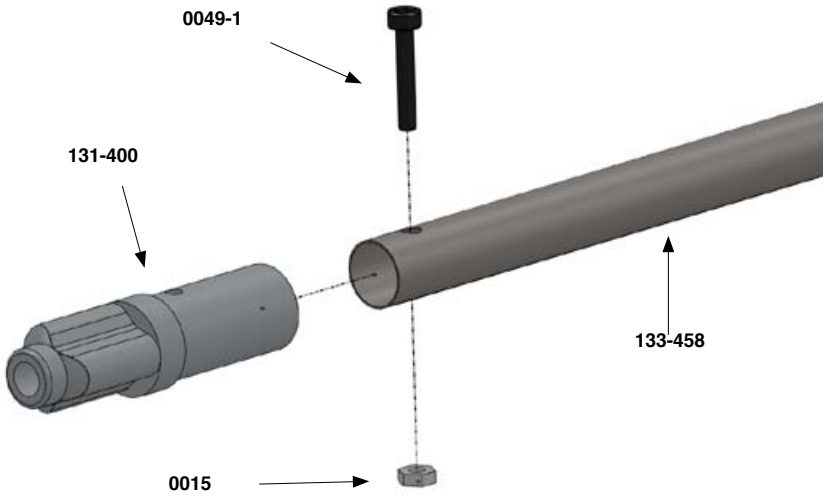
0015 2 x
2mm Hex Nut

0049-1 x 2
M2x12 Socket Bolt

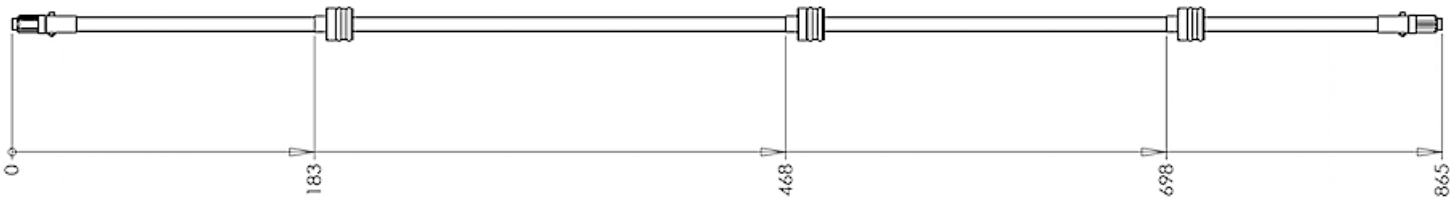
Assembly Tips

- Use only Loctite 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



Tail **2-B-2** **Front**



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

Apply a small amount of Loctite 243 thread lock when threading into metal parts

Hardware for this assembly

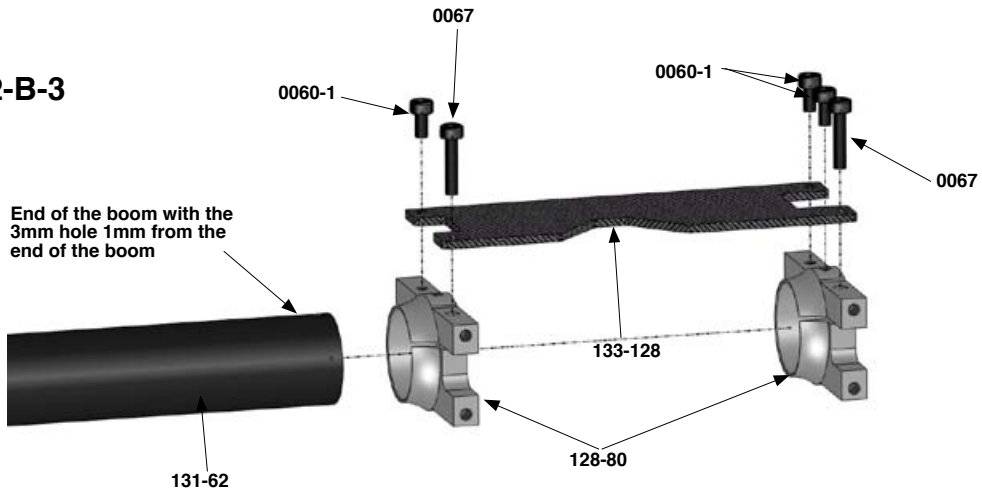
0060-1 x 3
M3x6 Socket Bolt

0067 x 2
M3x14 Socket Bolt

Assembly Tips

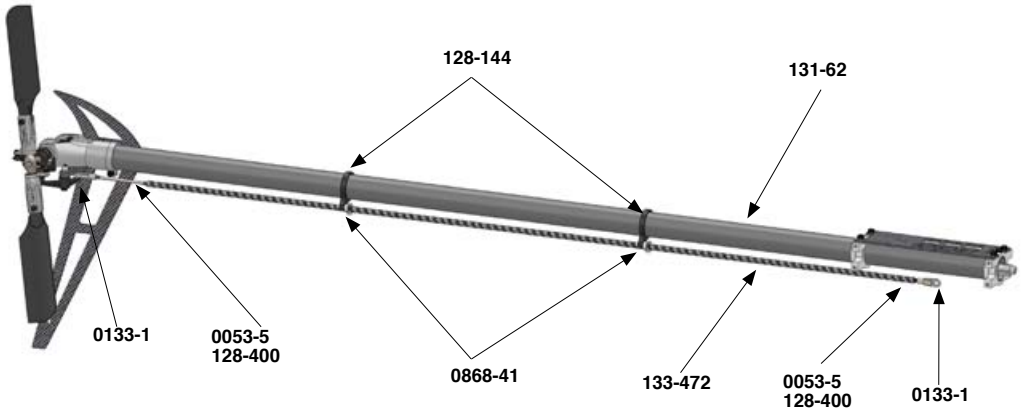
- Ensure that the boom is full inserted through boom clamps.
- Do not overtighten MA0067 Socket Bolts as it is possible to crush tail boom.

2-B-3



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) .



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

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

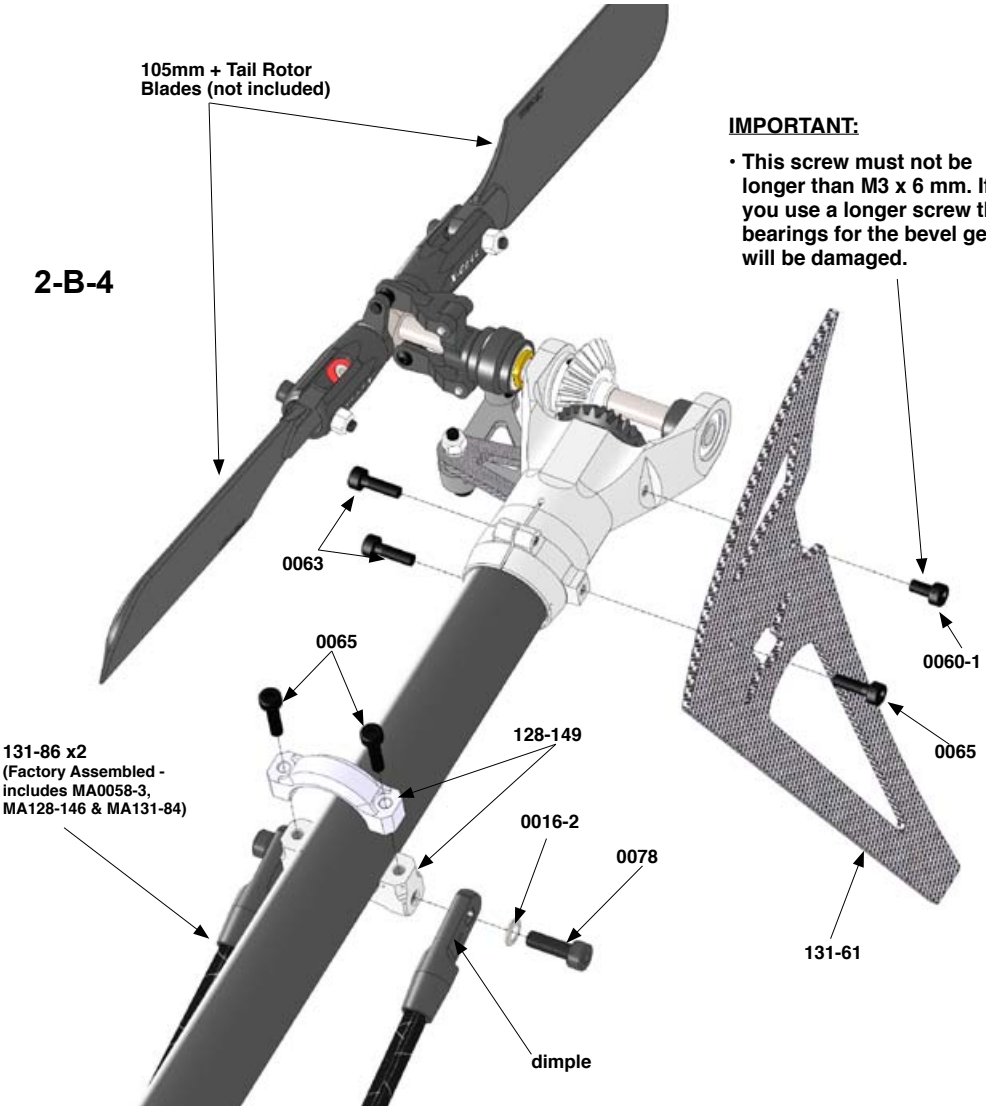
Assembly Tips

- 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."

2-B-4



Gas Frame Assembly Parts


0003
3mm Flat Steel Washer


0004
M4 Washer


0011
5mm Washer


0011-CF
Carbon Washer


0012-1
2.5mm Pem Nut


0012-2
3mm Pem Nut


0014F
5mm Hex Nut Fine Thread


0015
2mm Hex Nut


0016-2
4mm External Serrated Lockwasher


0017-2
2.5mm Hex Nut


0021
M4 Hex Locknut


0032
M 2.9 x 9.5 Self Tapping Screw


0032-2
M3x8 Self Tapping Screw


0057
M4x4 Set Screw


0059-2
M2.5x8 Socket Bolt


0059-3
M2.5x10 Socket Bolt


0059-7
M2.5x20 Socket Bolt


0060-1
M3x6 Socket Bolt


0061
M3x8 Socket Bolt


0063
M3x10 Socket Bolt


0064-3
M3x6 Button Head Socket Bolt


0065
M3x12 Socket Bolt


0073
M3x20 Socket Bolt


0081
M4x16 Socket Bolt


0085
M5x16 Socket Bolt


0088
M3x8 Tapered Socket Bolt


0088-3
M3x7 Tapered Socket Bolt


0103
M2 Threaded Steel Ball


0116
M2.5 Threaded Steel Ball


0133-1
M3x21.2 Plastic Ball Link


0183
10x19x5 Bearing


0208
10x12 One-Way Torrington Bearing


0225-5
Pin


0273
0273-05
Washer


0390
Large Wire Lead Retainer


0405
Fuel Pick-up Fitting


0620-01
0620-02
0620-03
Shim Washer


0818-3
Rectangular Mounting Block


0875-1
Collar


105-70
6x15x6 Bearing

105-100
Gasoline Fuel Line

106-22
Rubber Canopy Grommets

121-6
M3x75 Threaded Control Rod

128-57
Tray Mount

128-58
Main Frame Spacer

128-59
Front Boom Support Spacer

128-90
Tank Plate Mounting Studs

128-92
Fuel Tank Plug

128-94
Fuel Nipple

128-118
6mm Hex Starting Adaptor

131-3
Start Shaft

131-19
10x26x8 Bearing

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
C/F Gyro Plate

131-55
C/F Angled Battery Tray

131-144
Rubber Tank Mounts

131-148
Carbon Fiber Servo Plate

131-150
Front Canopy Post

131-153
Carbon Fiber Breakaway Tab

131-154
Thumb Screw

131-179
X-Block

131-180
6x13x5 Flanged Bearing

131-186
Anti Rotation Bracket

131-202
M4 Jesus bolt OWB V2

131-382
C/F Strut Spacer

131-419
15x24x4 Bearing

131-420
Middle Main Shaft Bearing Block

131-421
Upper Main Shaft Bearing Block

131-424
Main Gear Hub

131-426 Sprag Bearing

131-428
Clutch Bearing Block

131-429
Carbon Fiber X-brace

131-442
Bottom Main Shaft Bearing Block

131-451
Rear Canopy Post

131-452
Canopy Post Splint

131-454
Landing Gear Frame Post

131-466
Auto Hub Base

131-469-1
Crown Gear Plate

131-470
70T Crown Gear

132-117-B
117T Main Gear

133-94
C/F Fuel Tank Plate

133-99
Whiplash Gas Fuel Tank

133-107
C/F Front Frame Double

133-108
C/F Rear Frame Double

133-110
C/F Bottom Plate

133-119
Flanged Clutch Spacer

133-120
OWB Bracket

133-144
Skid Tube Blue

133-150
Air Filter

133-252
Whiplash Canopy

133-400
133-401
Bottom Mount Spacer

133-409
Whiplash Gas Clutch Bell

133-417
17T Pinion Gear

133-4117
Whiplash Gas C/F Left Frame

133-4118
Whiplash Gas C/F Right Frame

133-4121
Motor Mount

2500-24
Landing Struts

3200-48
3/4" Hook and Loop Tape

Hardware for these assemblies

0011 x 1
5mm Washer

0011-CF x 1
5x15 CF Washer

0014F x 2
5mm Hex Nut
Fine Thread

0032-2 x 4
M3 x 8 Tapping
Tapered Screw

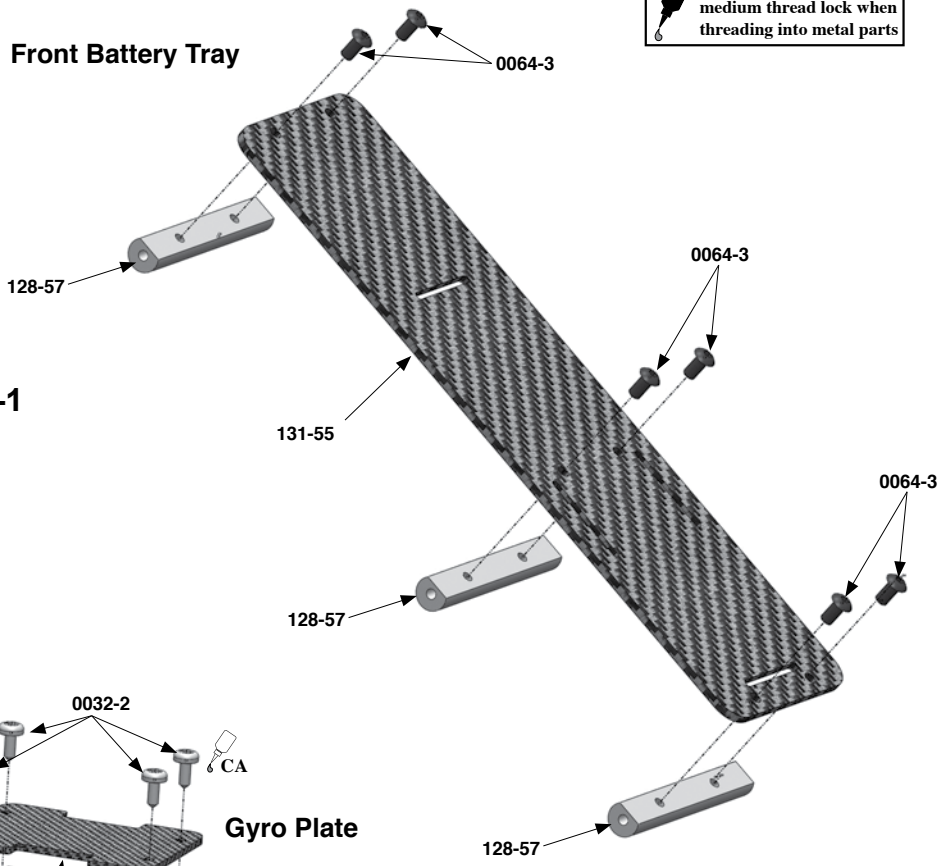
0064-3 x 6
M3x6 Button Head
Socket Bolt

Assembly Tip

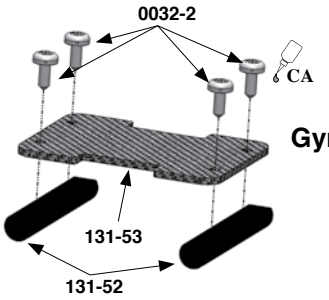
- Do not overtighten MA0032-2 Self Tapping Screw into MA131-52 Delrin Tray Mount. Secure screws with a small amount of CA glue.
- Recommended length for fuel clunk line is 6.5 inches (165mm)

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

Front Battery Tray

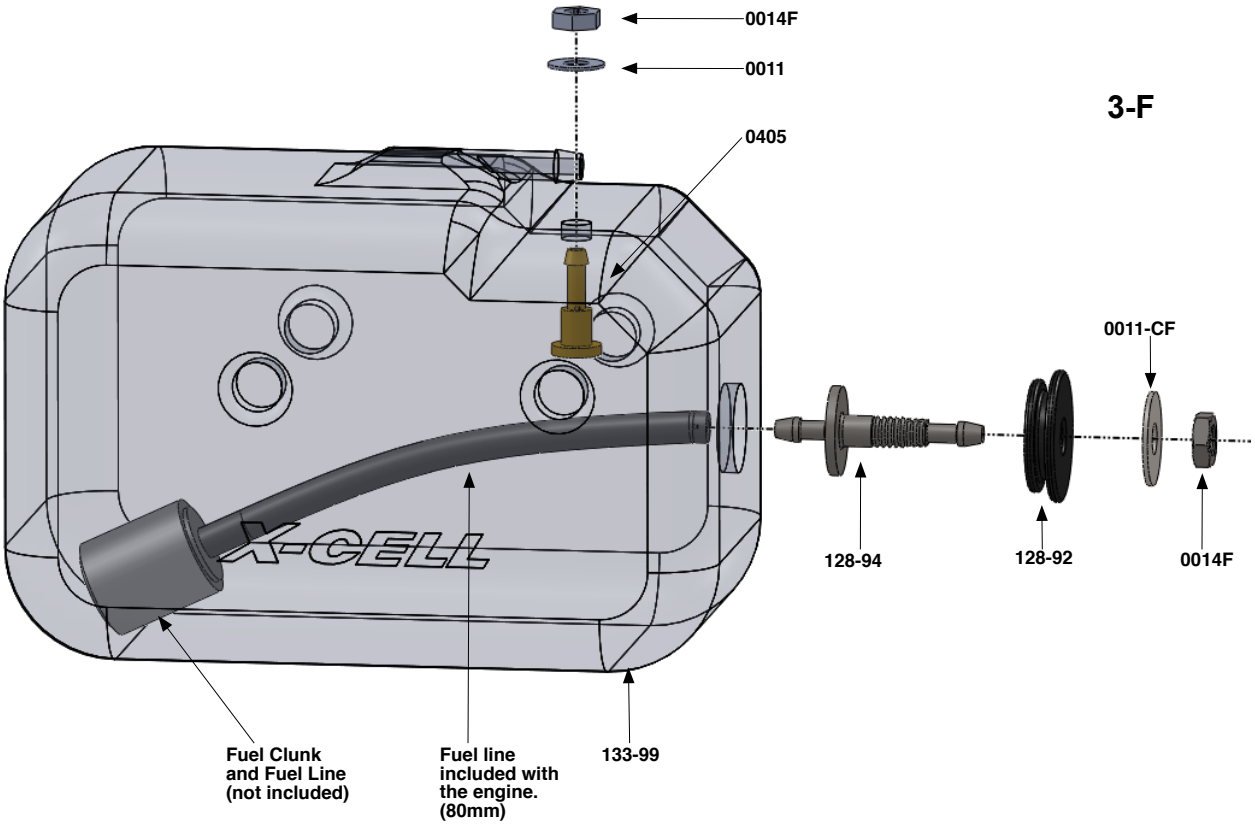


3-A-1



Gyro Plate

3-F



Hardware for this assembly

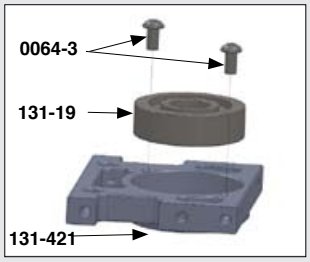
0003 x 3
3mm Flat Steel Washer

0032 x 2
M3 Self Tapping Screw

0061 x 5
M3x8 Socket Bolt

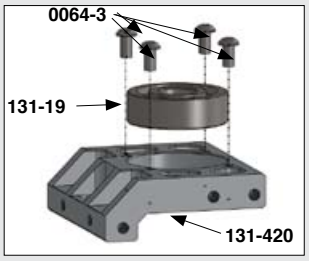
0063 x 3
M3x10 Socket Bolt

Upper Main Shaft Bearing Block (Factory Assembled)



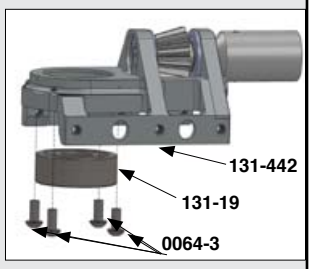
NOTE: Upper bearing block features smooth, wrench access holes

Middle Main Shaft Bearing Block (Factory Assembled)



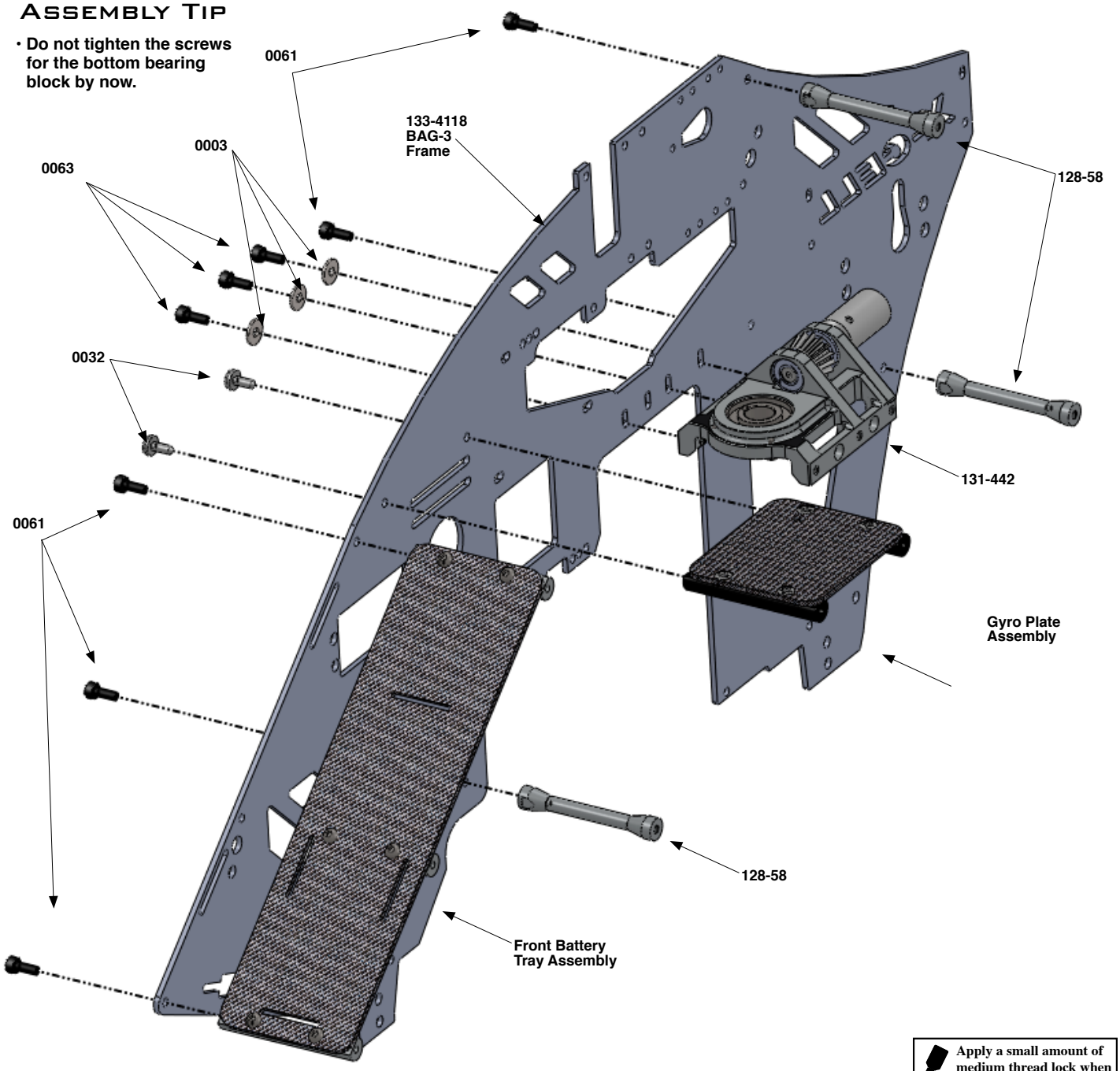
NOTE: Middle and bottom bearing blocks features threaded holes.

Bottom Main Shaft Bearing Block (Factory Assembled)



Assembly Tip

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



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

Hardware for these assemblies

0060-1 x 10
M3x6 Socket Bolt

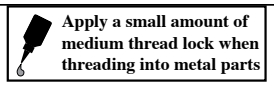
0063 x 2
M3x10 Socket Bolt

0065 x 2
M3x12 Socket Bolt

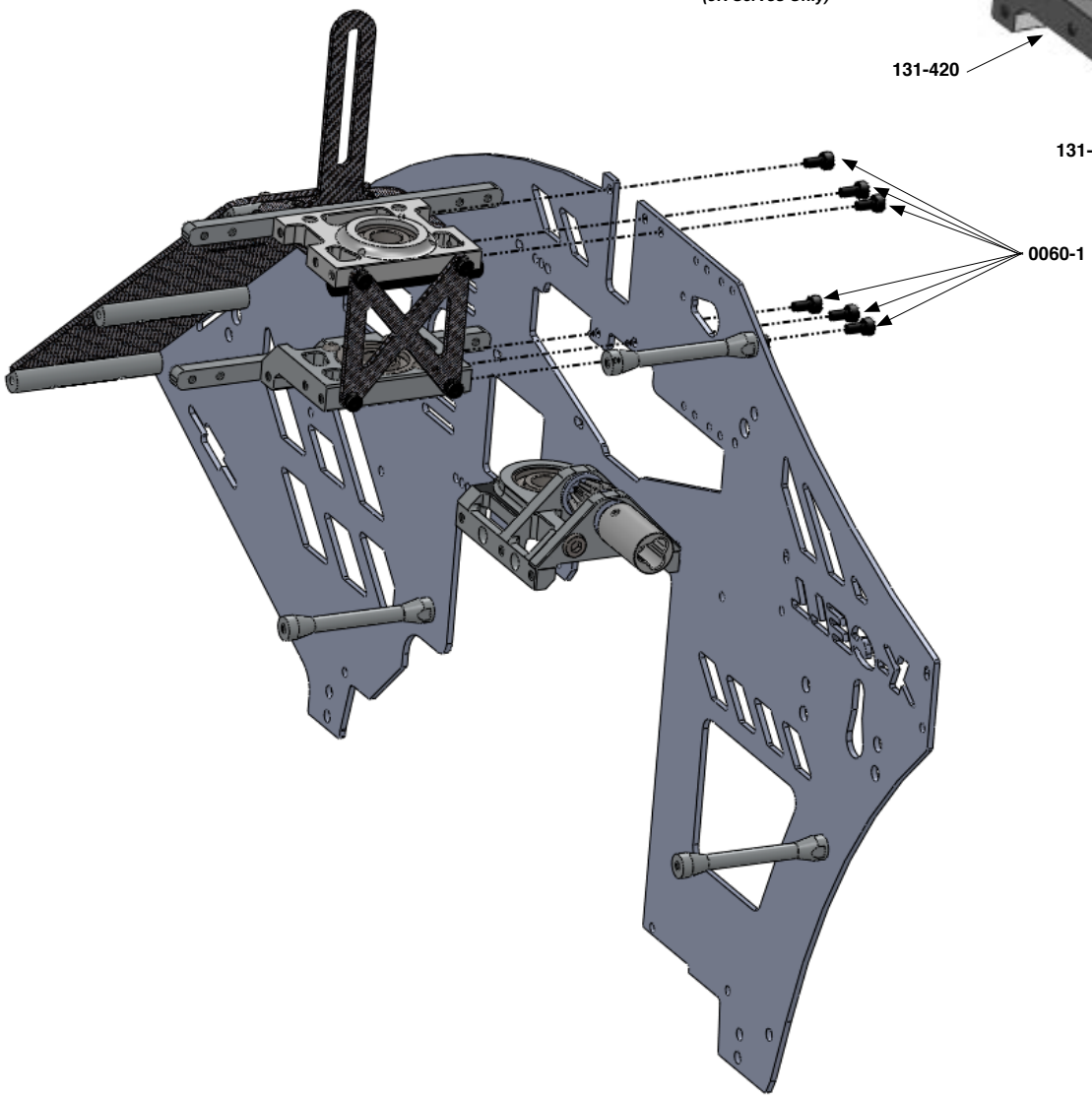
Assembly Tip

- **If using JR brand servos or other "tall" servos, MA131-47 Servo Rail Spacers are included for proper servo linkage alignment, if required.**

3-B



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



Hardware for these assemblies

0003 x 4
3mm Flat Steel Washer

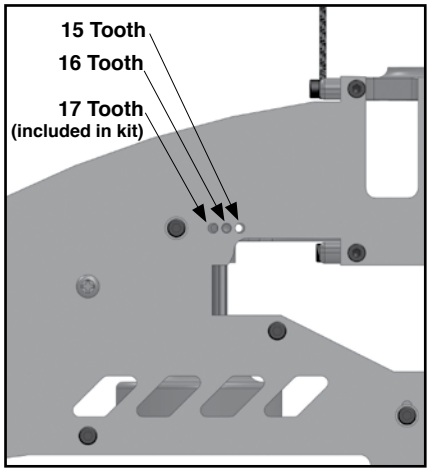
0057 x 2
M4x4 Socket Set Screw

0061 x 4
M3x8 Socket Bolt

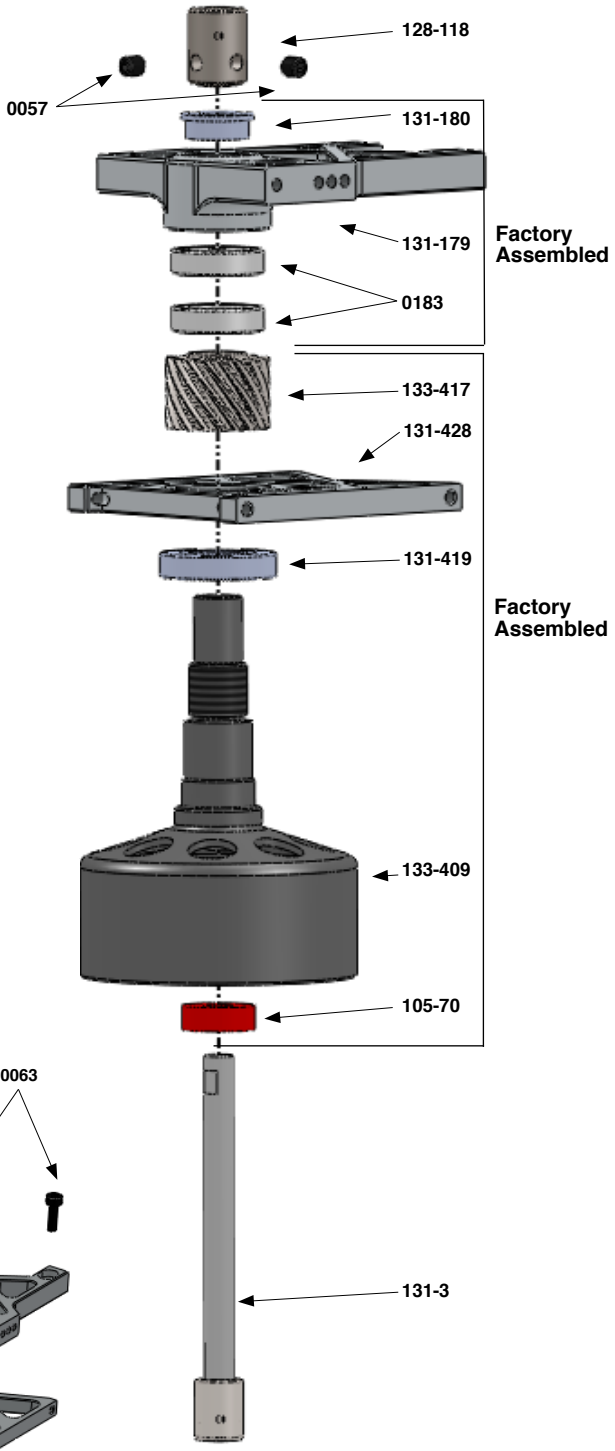
0063 x 2
M3x10 Socket Bolt

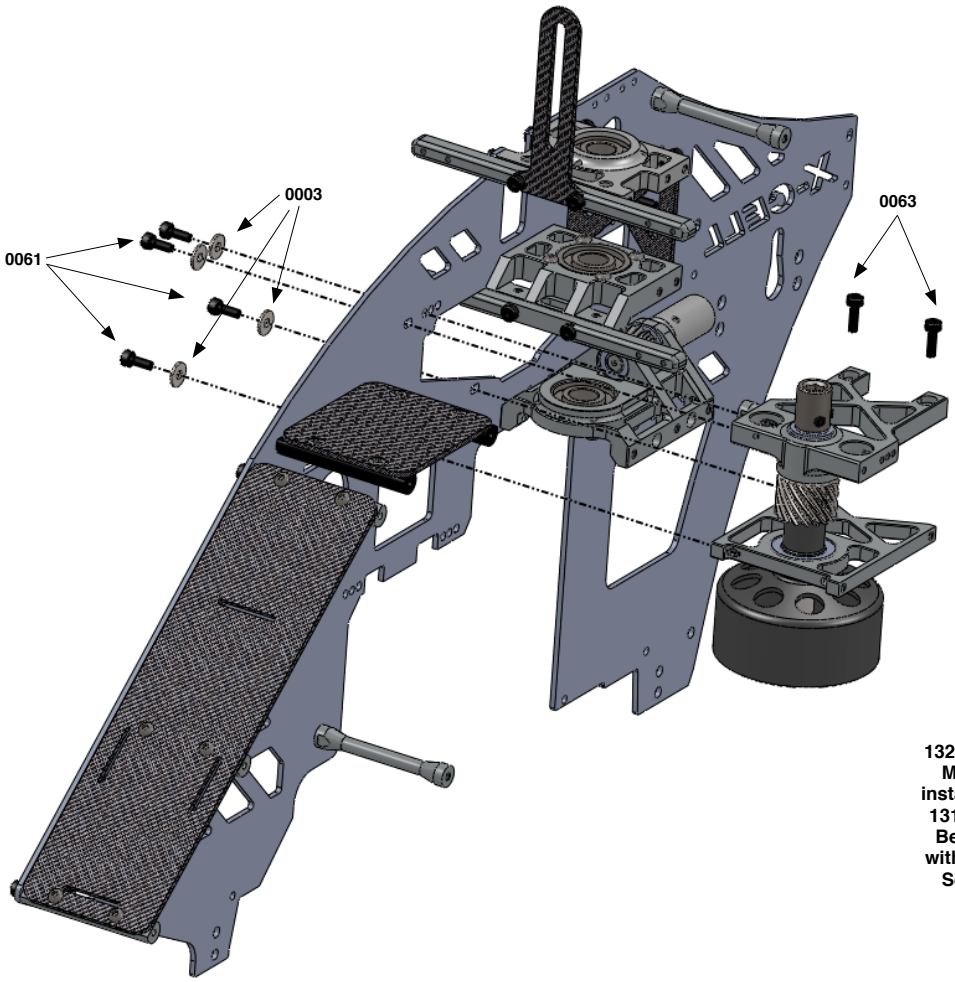
Assembly Tip

- **Do not tighten the screws for the clutch bearing block 131-428 and the screws for the hex starter 128-118 by now.**



NOTE: Motor Mount and Lower Pinion Bearing Block bolt locations for proper gear mesh.
- 15 Tooth - Rear Holes
- 16 Tooth - Middle Holes
- 17 Tooth - Front Holes





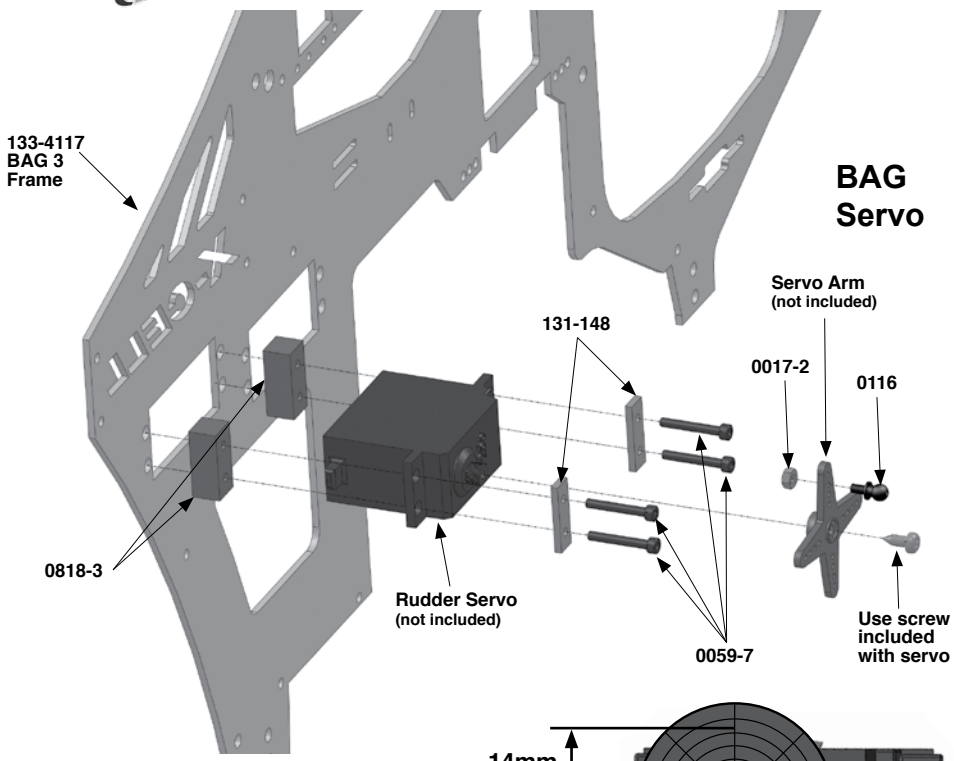
3-C

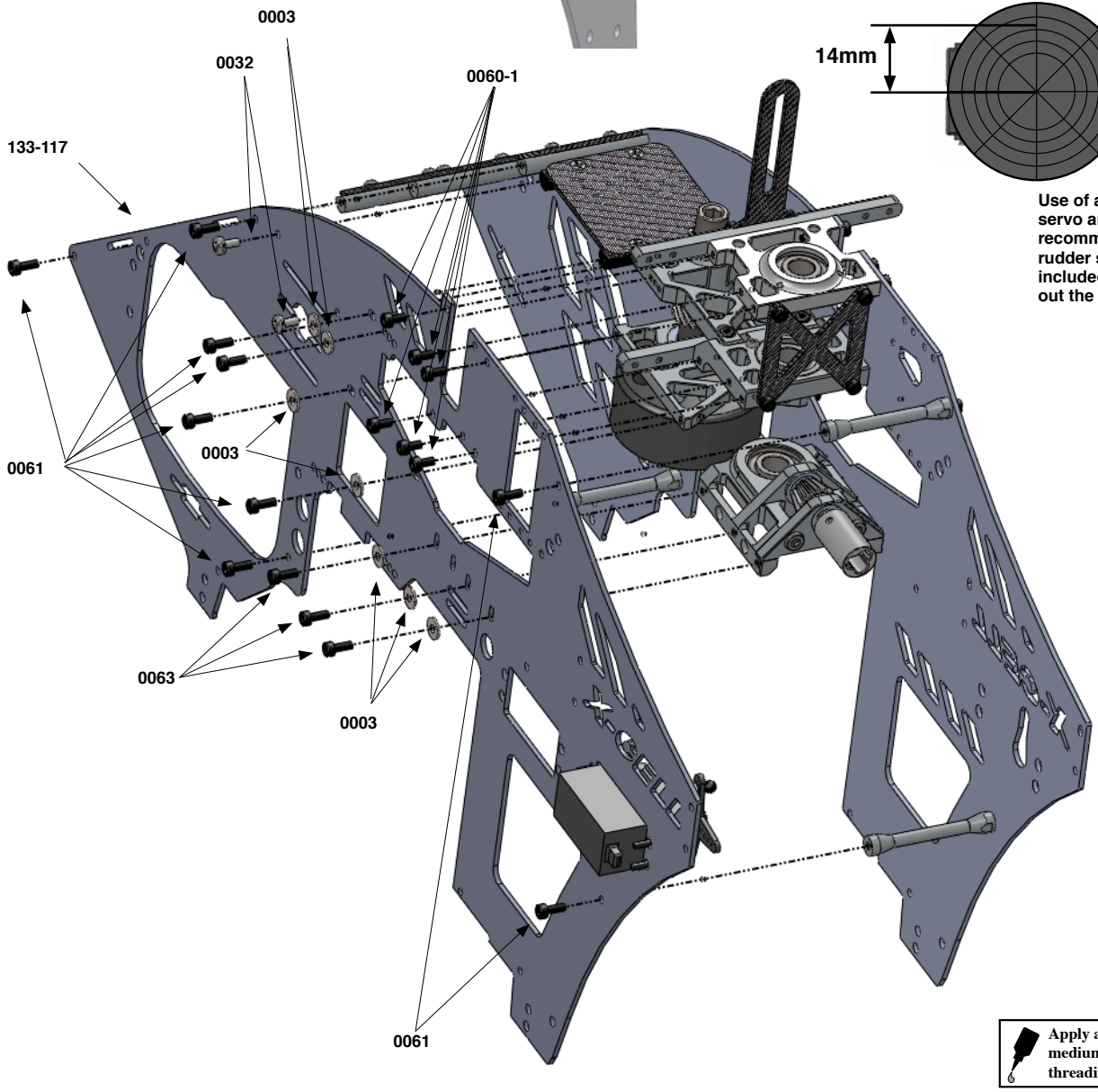
132-179 X-Block/ Motor Mount installs on top of 131-420 Middle Bearing Block with 0063 M3x10 Socket Bolts

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

Hardware for these assemblies

- 0003 x 7 — 3mm Flat Steel Washer
- 0017-2 x 1 — 2.5mm Hex Nut
- 0032 x 2 — M3 Self Tapping Screw
- 0059-7 x 4 — M2.5x20 Socket Bolt
- 0060-1 x 6 — M3x6 Socket Bolt
- 0061 x 9 — M3x8 Socket Bolt
- 0063 x 3 — M3x10 Socket Bolt
- 0116 x 1 — M2.5 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 these assemblies

0003 x 6
3mm Flat Steel Washer

0009 x 4
3mm Flat Steel Washer

0061 x 8
M3x8 Socket Bolt

0063 x 8
M3x10 Socket Bolt

0085 x 4
M5x16 Socket Bolt

0085-3 x 4
M5x22 Socket Bolt

Assembly Tip

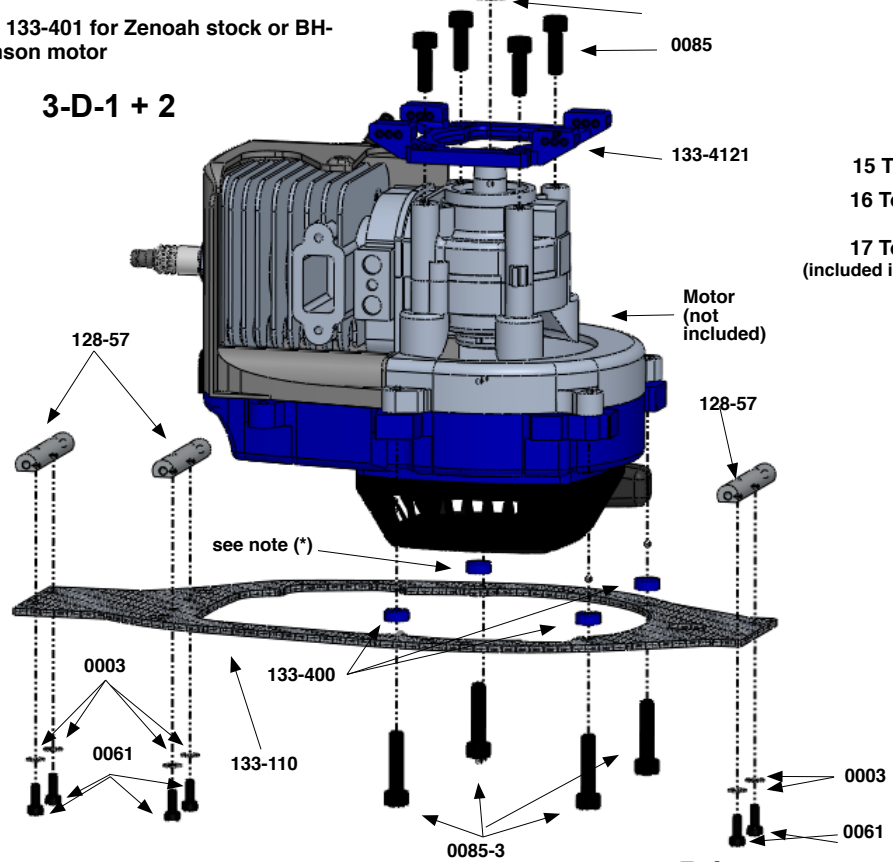
- Take care installing the clutch. Check runout of the clutch system. Turn frame upside down to insert engine.
  Align the engine and thigten the 4 MA0063 socket bolts with 0009 shims into motor mount MA 133-4121. The engine is aligned proper if the start shaft can be rotated without force.
  Tighten MA0061 Socket Bolts into the MA128-57 Tray Mounts and MA0085-3 Socket Bolts once the motor is properly aligned.

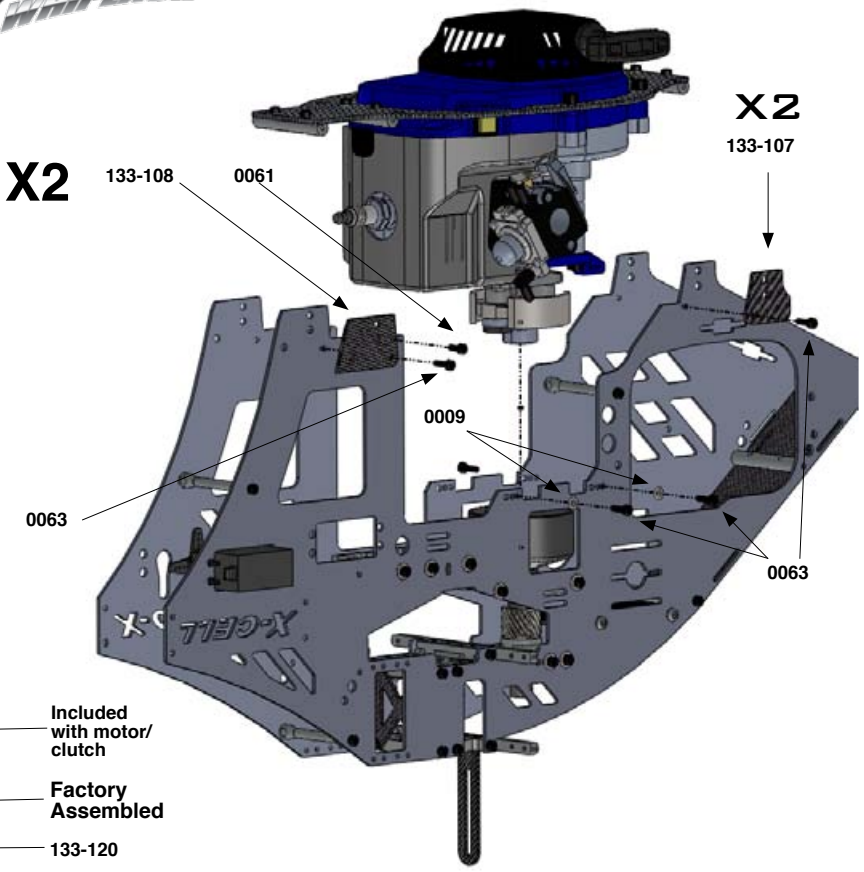
Note: (*)

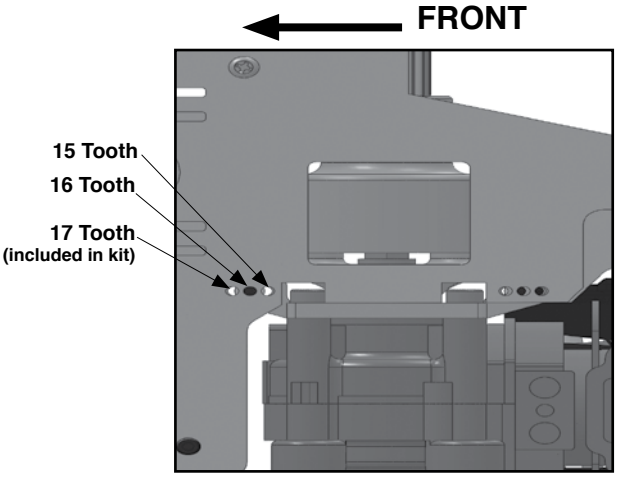
use 133-400 for TRM motor

use 133-401 for Zenoah stock or BH-Hanson motor

3-D-1 + 2







NOTE: Motor Mount bolt locations for proper gear mesh.
- 15 Tooth - Rear Holes
- 16 Tooth - Middle Holes
- 17 Tooth - Front Holes

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

Hardware for these assemblies

0003 x 4
3mm Flat Steel Washer

0058-1 x 4
M4x6 Socket Set Screw

0060-1 x 4
M3x6 Socket Bolt

0061 x 2
M3x8 Socket Bolt

0073 x 4
M3x20 Socket Bolt

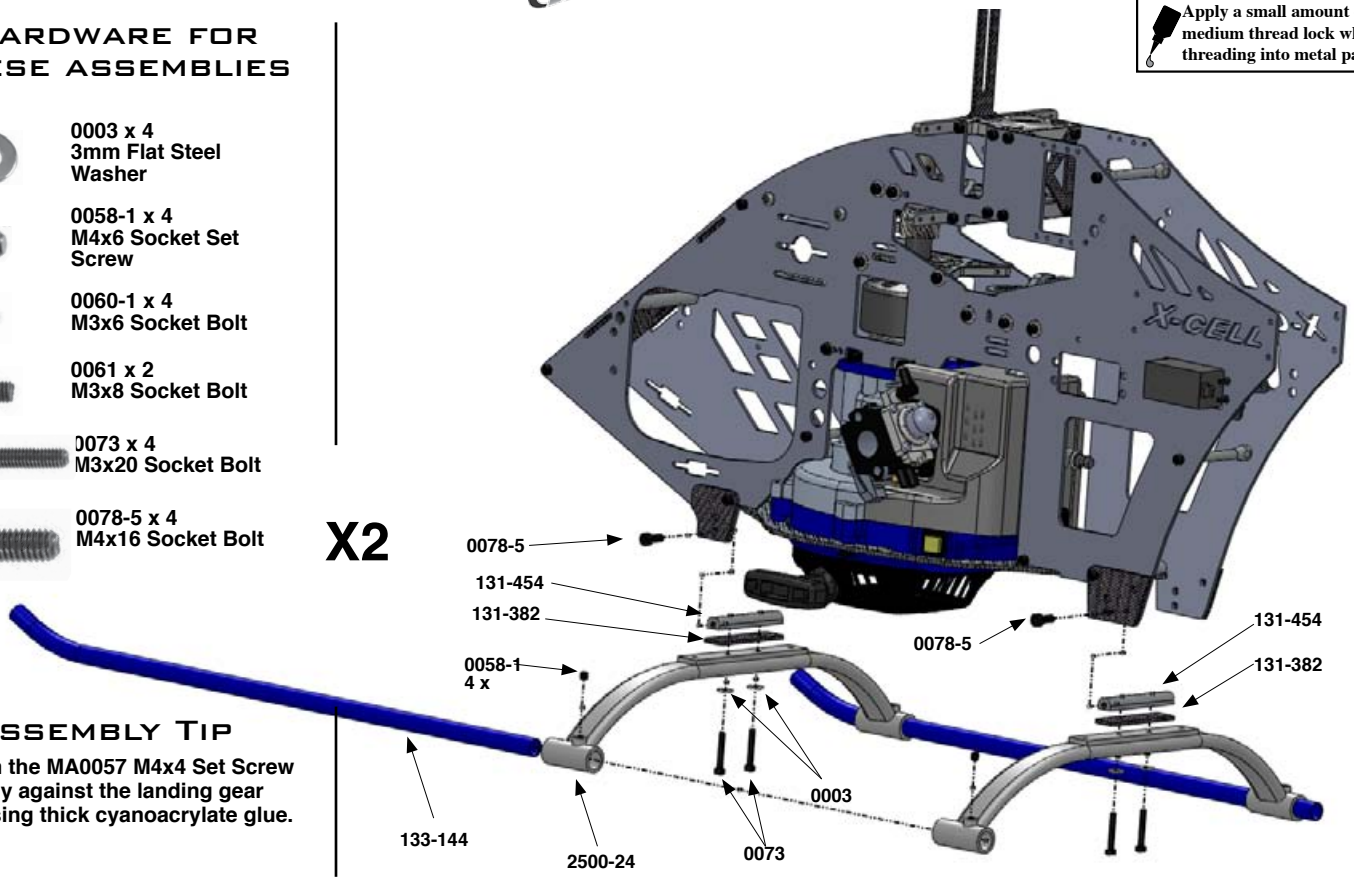
0078-5 x 4
M4x16 Socket Bolt

X2

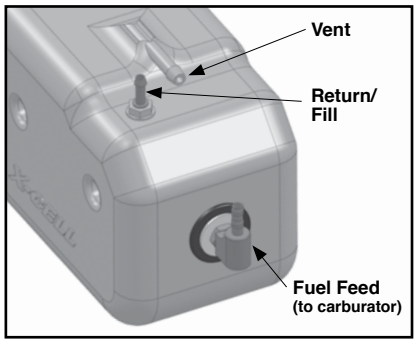
Assembly Tip

- Tighten the MA0057 M4x4 Set Screw securely against the landing gear tube using thick cyanoacrylate glue.

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



Fuel Line Connections



3-F

Hardware for these assemblies

0017-2 x 3
2.5mm Hex Nut

0059-1 x 4
M2.5x6 Socket Bolt

0059-4 x 12
M2.5x12 Socket Bolt

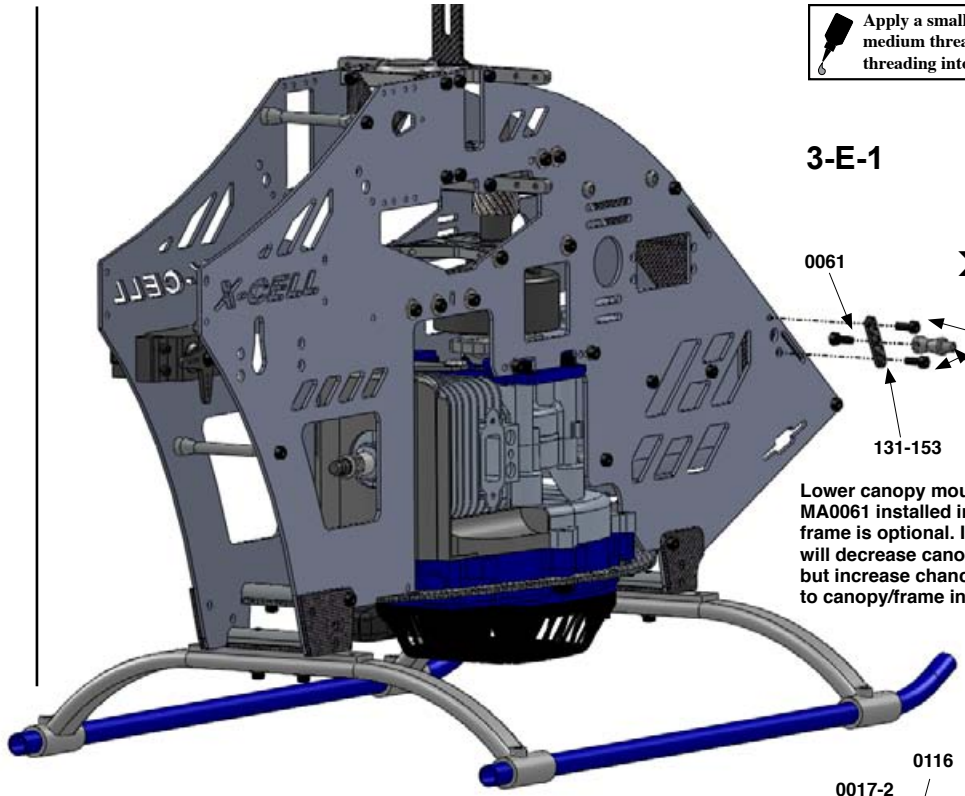
0061 x 6
M3x8 Socket Bolt

0116 x 3
M2.5 Threaded Steel Ball

Assembly Tip

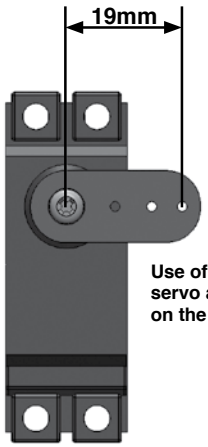
- MA131-148 Servo Spacers are included for proper servo linkage alignment, if required.

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

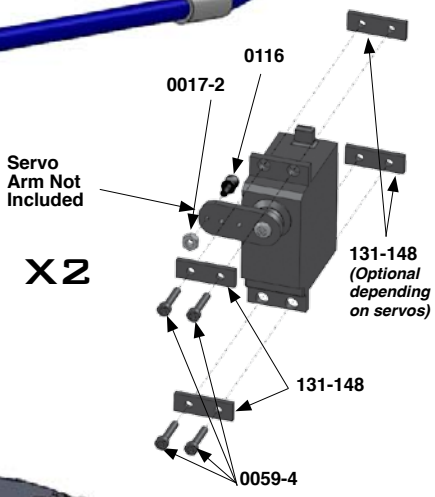


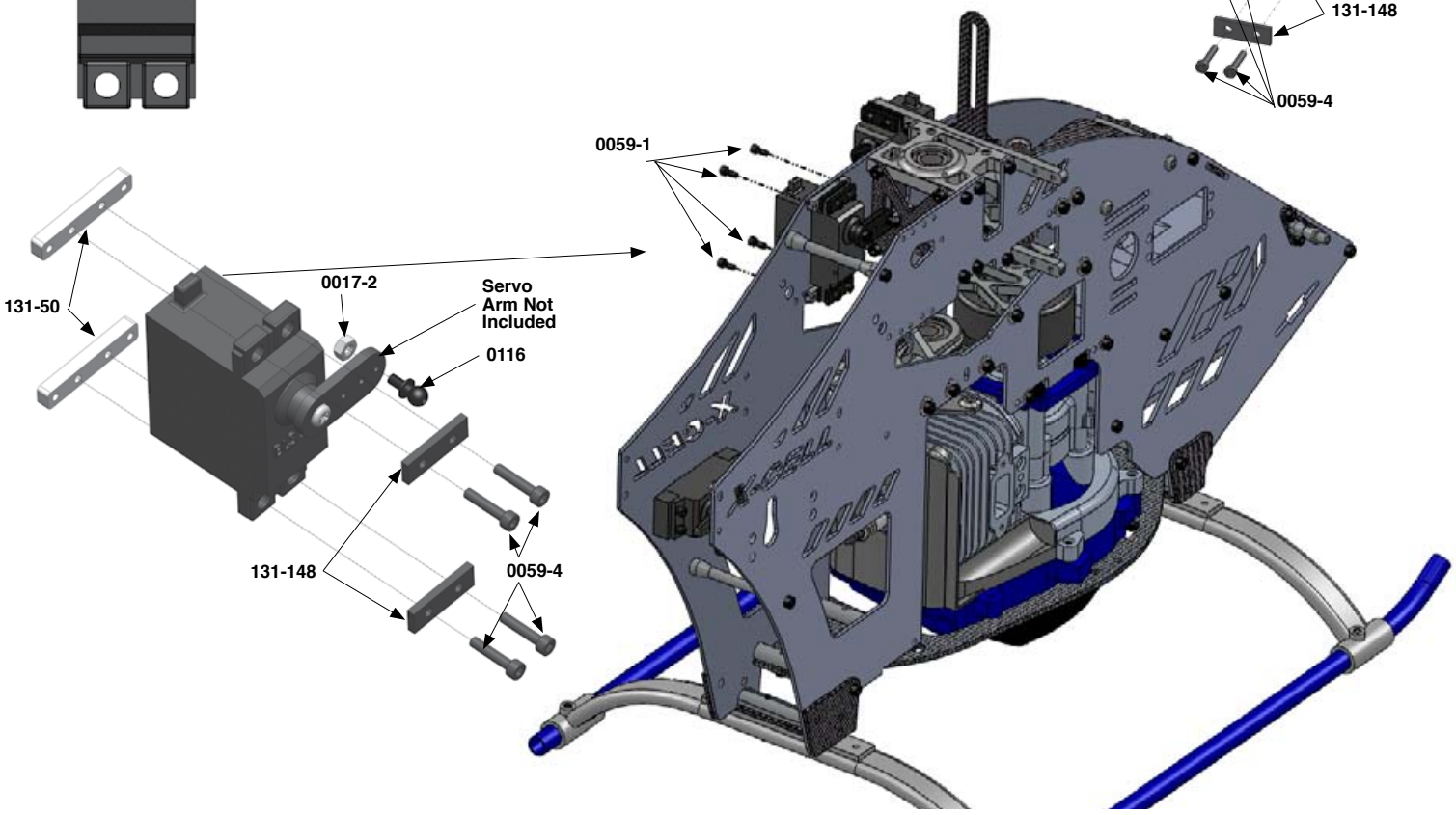
3-E-1

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/frame in a crash.



Use of heavy duty servo arms is required on the cyclic servos.





Hardware for these assemblies

0004 x 1
M4 Washer

0015 x 1
2mm Hex Nut

0017-2 x 1
2.5mm Hex Nut

0021 x 1
M4 Hex Locknut

0059-3 x 4
M2.5x10 Socket Bolt

0088 x 8
M3x8 Tapered
Socket Bolt

0088-3 x 5
M3x7 Tapered
Socket Bolt

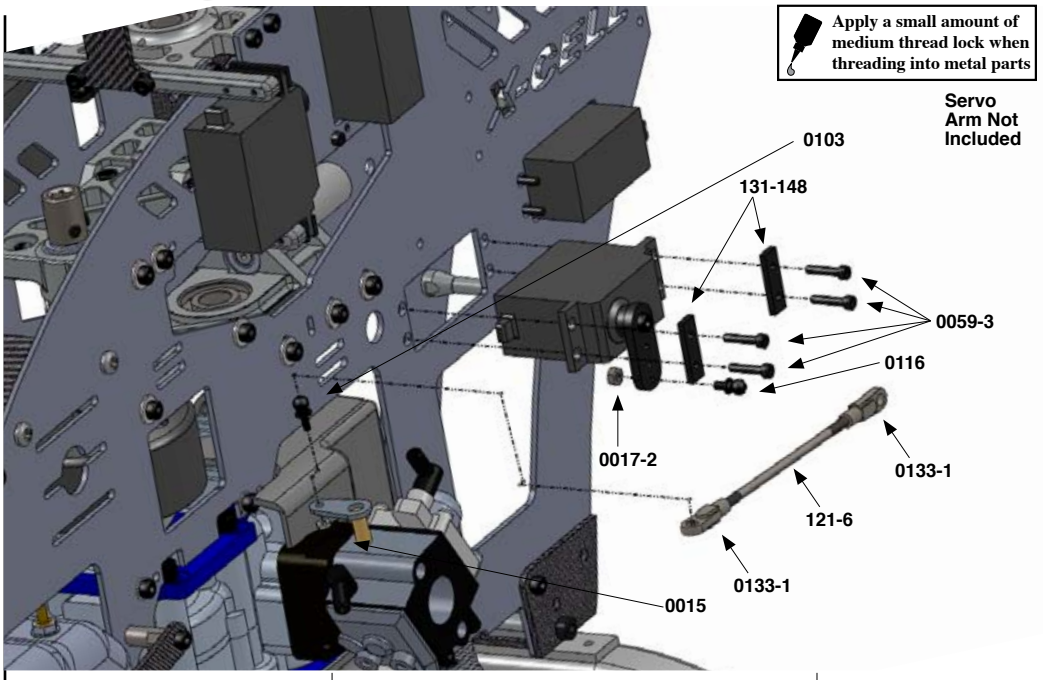
0103 x 1
M2 Threaded Steel Ball

0116 x 1
M2.5 Threaded Steel
Ball

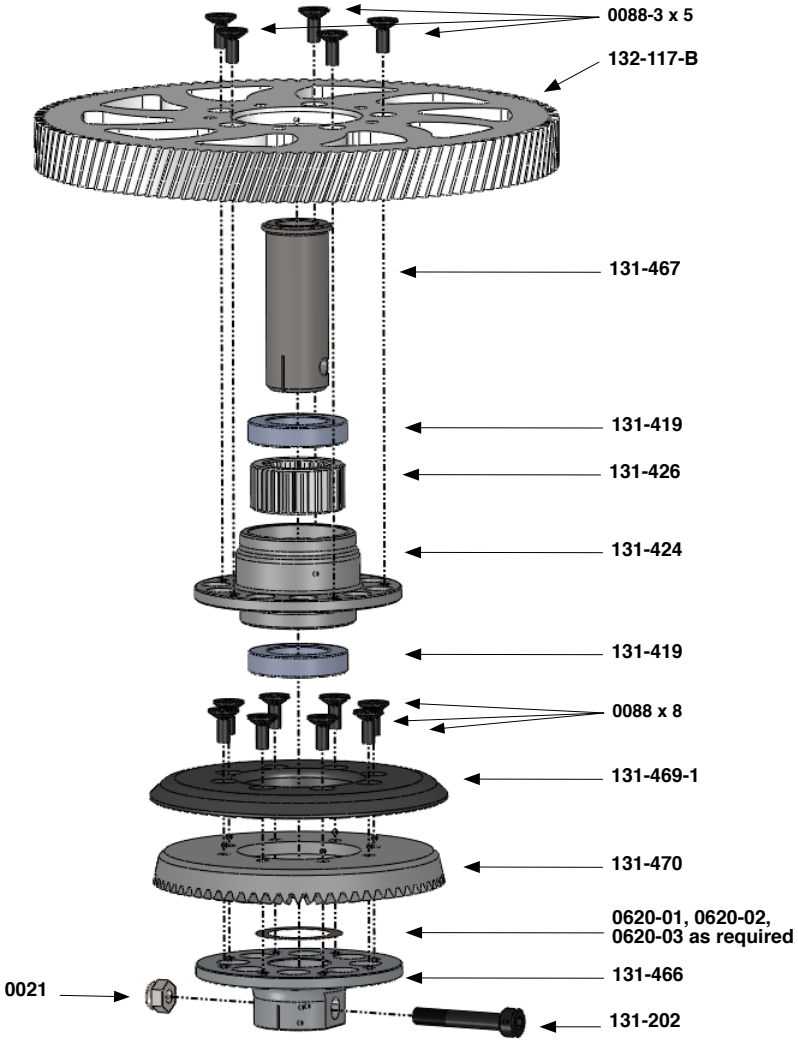
131-202 x 1
M4 Jesus Bolt OWB V2

Assembly Tips

- Throttle linkage length is only an estimate. Linkage lengths will very depending on motor and servo brand.
- Use shim washer 0620-01 (0.1mm), -02 (0.2mm) and/or -03 (0.3mm) to set gear mesh for crown gear 0866-5-B. 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. Take care that the Bottom Main Shaft Bearing Block is horizontal ausgerichtet. Now check gear mesh of crown gear. If necessary remove or add 0620-0x shim washers. Gear mesh should be about 0.1mm.



3-E



Hardware for these assemblies

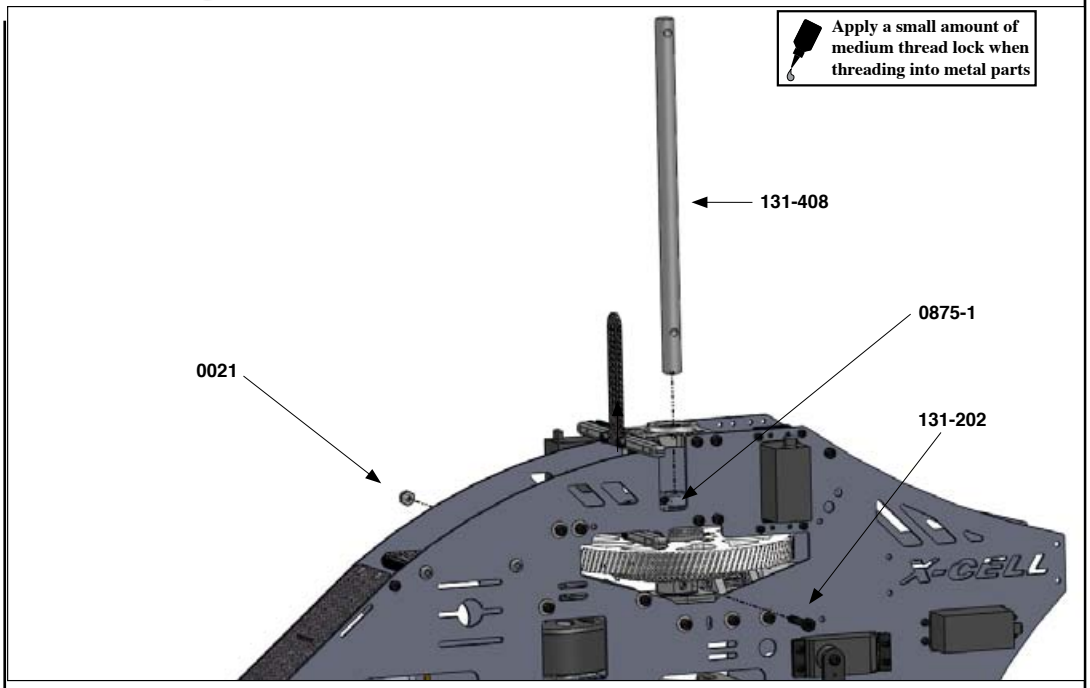
0021 x 1
M4 Hex Locknut

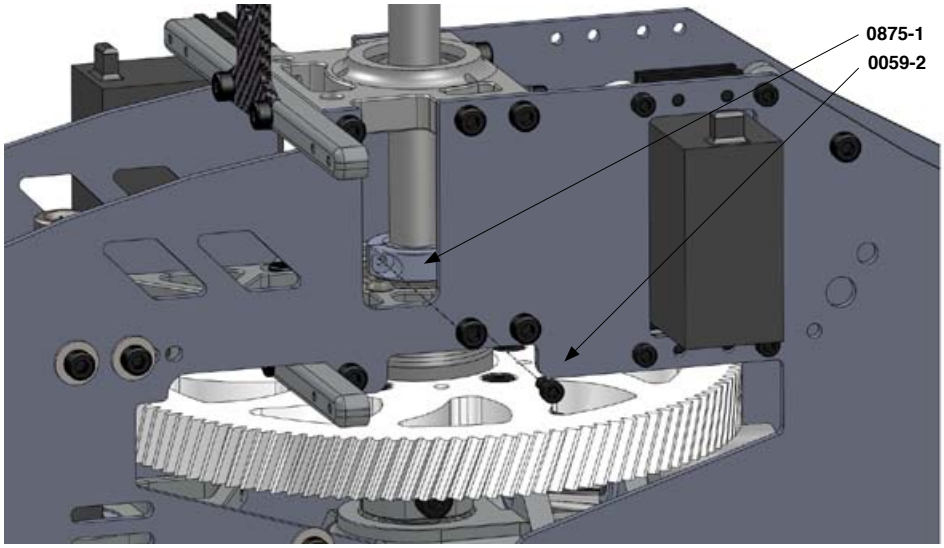
0059-2 x 2
M2.5x8 Socket Bolt

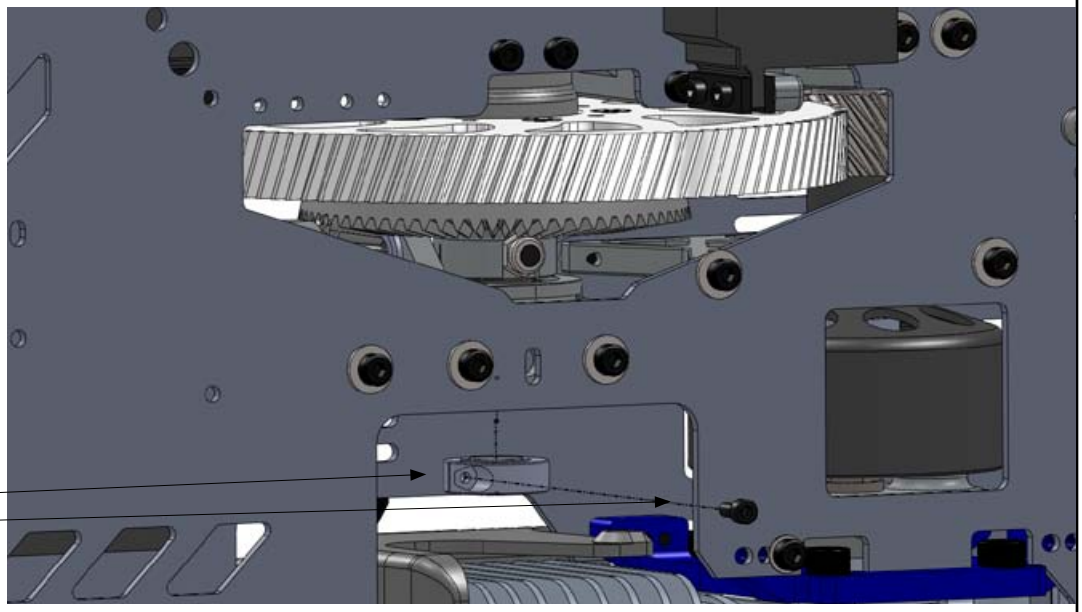
131-202 x 1
M4x25 Shouldered Socket Bolt

Assembly Tips

- **One collar 0875 is installed on top of the Middle Bearing Block and one on bottom of the Bottom Bearing Block.**
- **Don't forget to use some Loctite 243 at screws 0059-1. Do not overtighten.**







Hardware for these assemblies

0021 x 1
M4 Hex Locknut

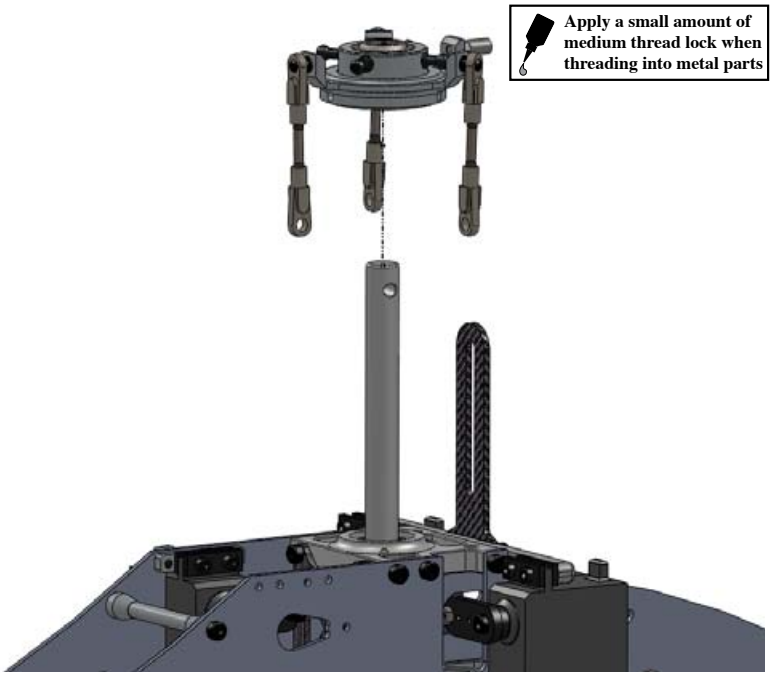
0063 x 2
M3x10 Socket Bolt

131-200 x 1
M4x33 Shouldered Socket Bolt

Assembly Tips

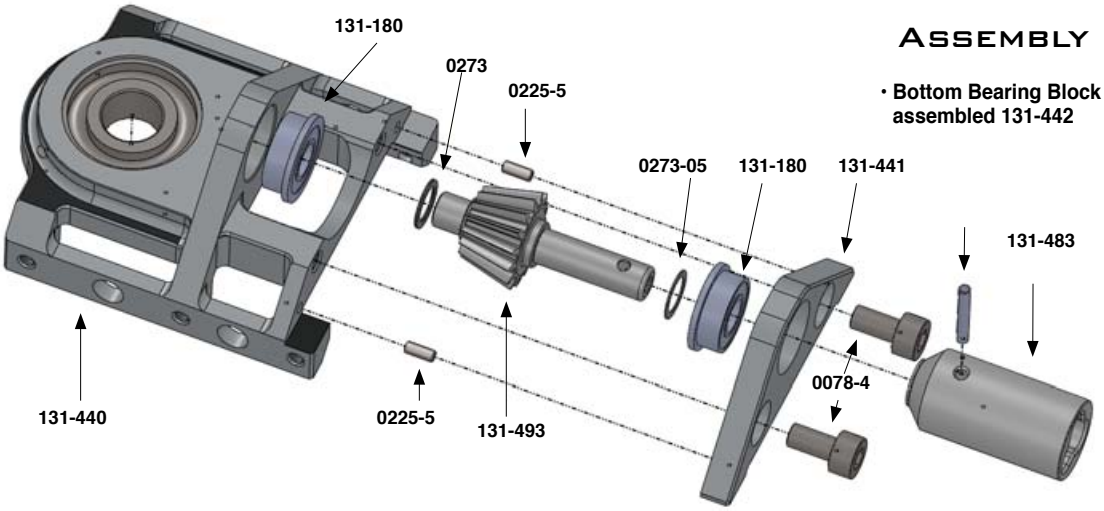
- **Be carefull inserting the swashplate antirotation pin**
- **Don't forget to use some Loctite 243 at screws 0063. Do not overtighten.**

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



Assembly Detail

- **Bottom Bearing Block Factory assembled 131-442**



Hardware for these assemblies


0003 x 2
3mm Flat Steel Washer


0016-2 x 2
4mm External Serrated Lockwasher


0021 x 1
M4 Hex Locknut


0059-3 x 4
M2.5x10 Socket Bolt

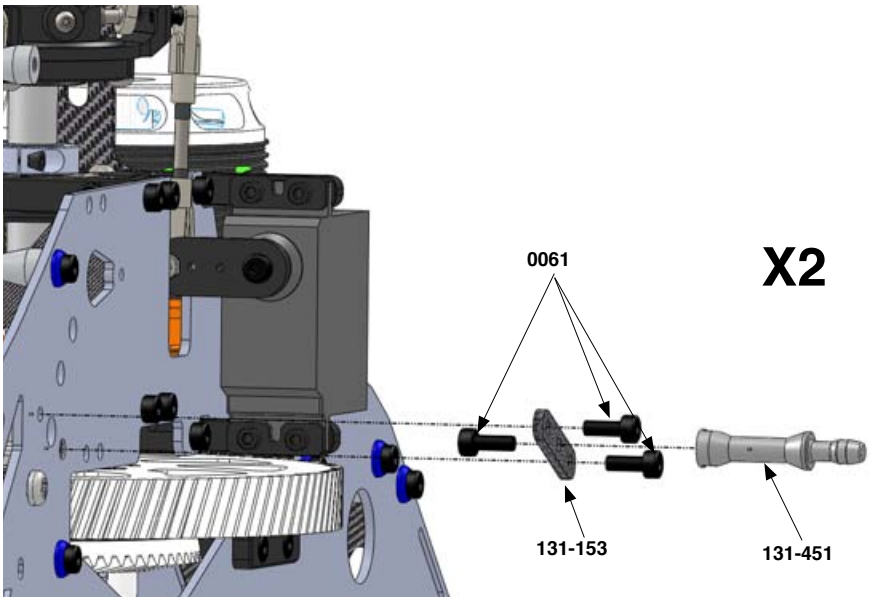

0061 x 14
M3x8 Socket Bolt

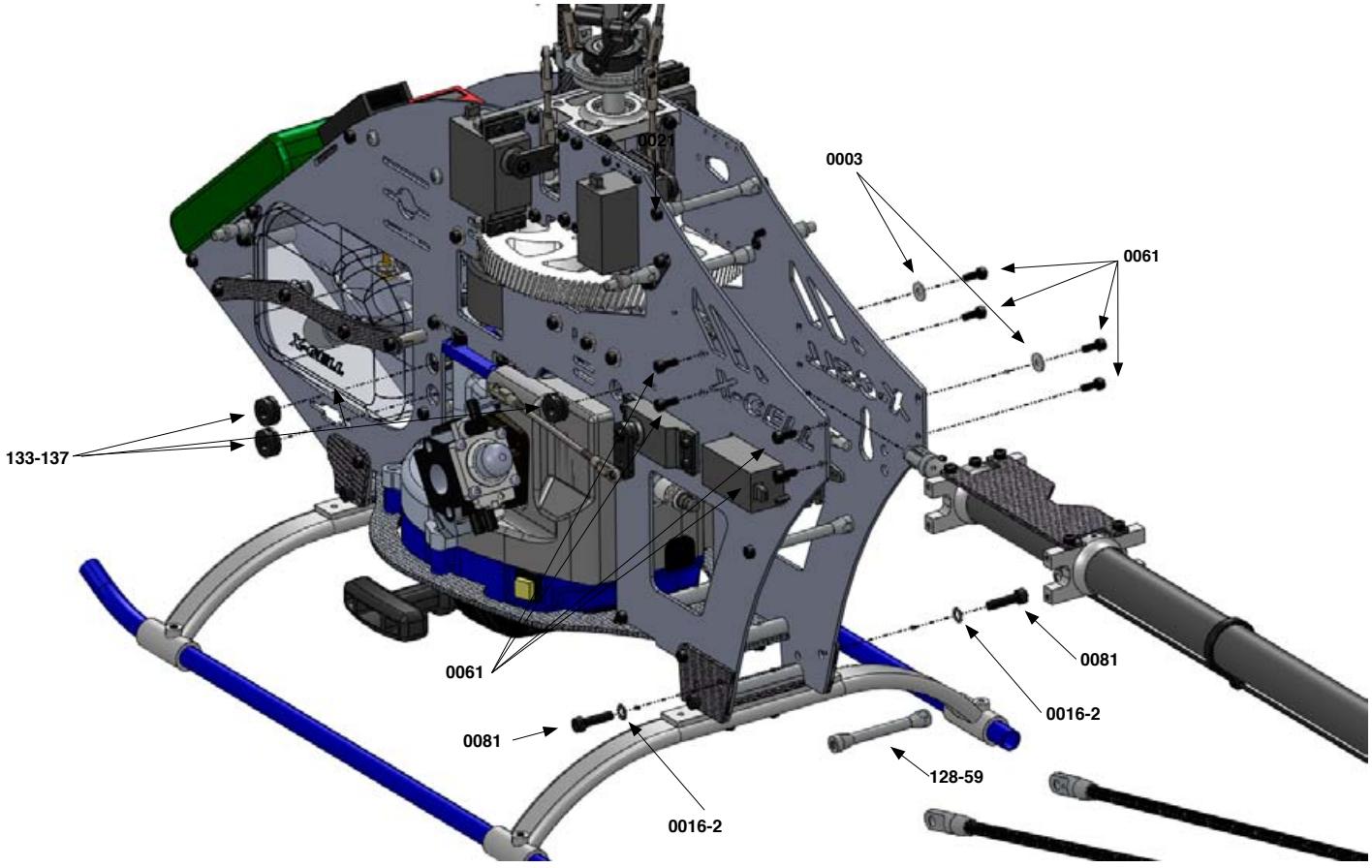

0063 x 2
M3x10 Socket Bolt


0081 x 2
M4x16 Socket Bolt

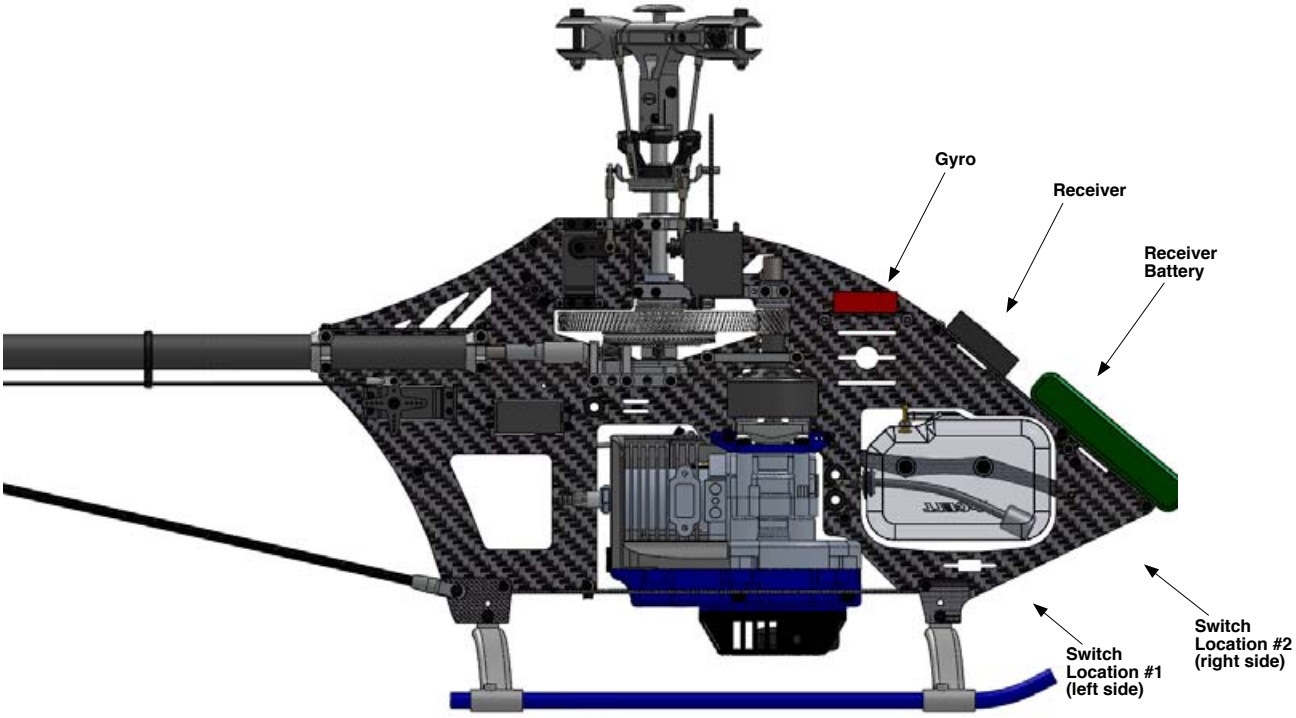
Apply a small amount of medium thread lock when threading into metal parts

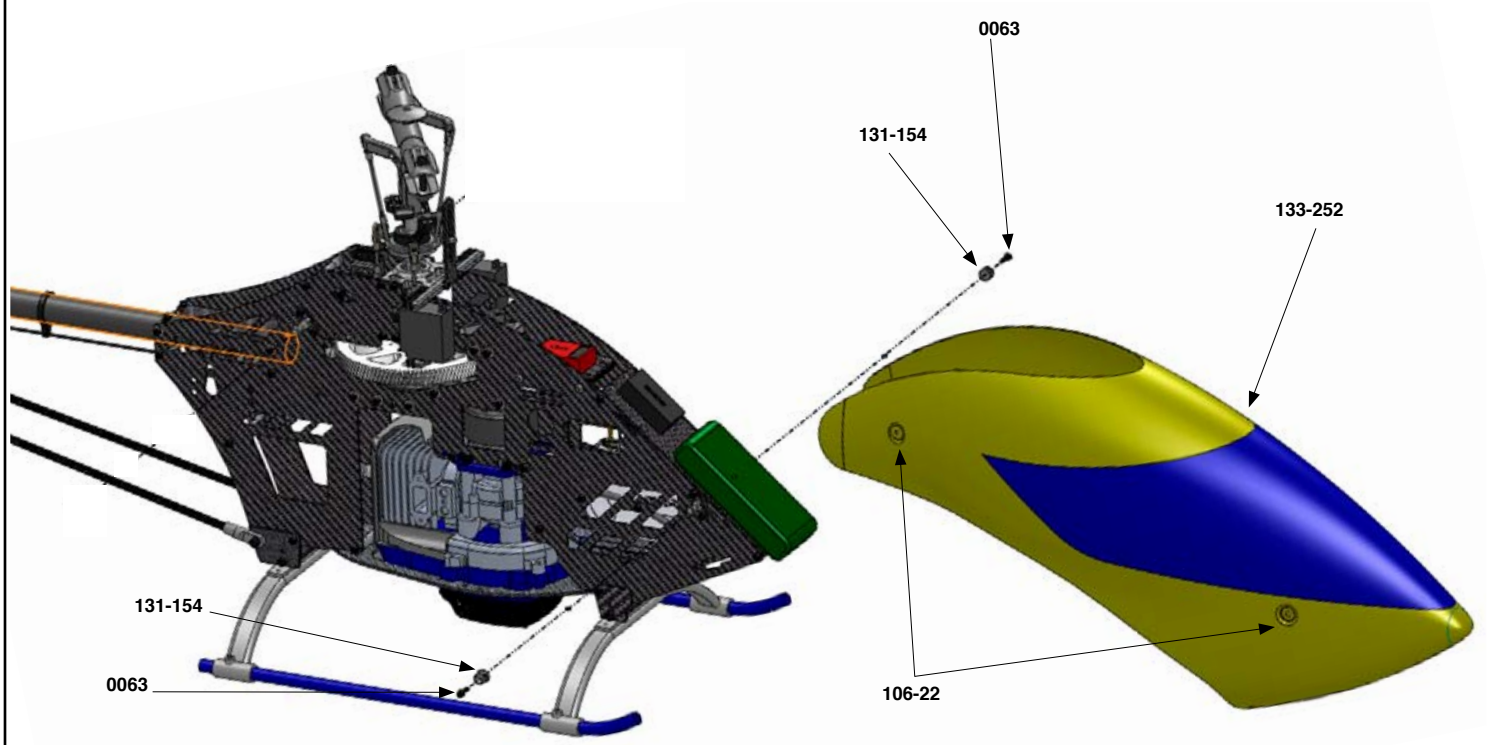
Rear canopy mounting bolt MA0061 installed into PEM nut in frame is optional. Installing bolt will decrease canopy vibration, but increase chance of damage to canopy in a crash.





Suggested Electronics Mounting Positions





Hardware for this assembly

0063 x 2
M3x10 Socket Bolt

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. Be careful no to get it on the outside of the canopy as it will damage the finish.

Whiplash Gas User Guide

Operating and maintaining your Whiplash Gas helicopter is not much different than the other Whiplash versions or any other model helicopter. The power system is different and its operation may be unfamiliar to those who have only flown electric or glow powered models. With that in mind this user guide will help you operate your Whiplash Gas helicopter from its first flight. The following sections address each of the areas that may be new or you may not be familiar with.

Safety

Gasoline or its equivalents is much more flammable than glow fuel. If you fly in an area with fire hazards, consider having access to a fire extinguisher in the event a fire occurs. Keep all flames or hot sources away from the fuel and fuel tank in both the model and your fuel can. A gasoline fire is very dangerous and destructive.

Also be aware that the engine muffler will operate at a significantly higher temperature than you may be accustomed to with a glow powered model. Contact with the muffler can easily cause a fire or bodily injury and it will be hot enough to easily peel off skin so be careful!

Engine

The Whiplash requires the acquisition of the RC format of either the Zenoah or Chung Yang motors. The model is not compatible with the PUH motor version used in the XCell Spectra G and many other models

These motors are available in 23cc (RC240), 26cc (RC270) and 29cc (RC290) versions. They are available from multiple sources in their stock form or from Zenoah specific motor tuners/modifiers. Some of the modified motors have different displacements

If you intend to run a stock, unmodified motor, it is recommended that you use the 23cc or 26cc version of the motor. They have the best inherent engine balance and will run the smoothest in the model

If you select a modified motor, the modifier can recommend the most appropriate motor from their selection for the Whiplash. The TRM VX300 Whiplash Edition and the BH Hanson 300 RC 3D Max versions have been extensively tested in the model

The major helicopter engine modifiers are TRM Power and BH Hanson, there are others available as well. It is highly recommended that you acquire a motor that has been properly balanced.

Fuel

The Zenoah motors for this kit are designed to run with common pump gasoline. The regular 87 octane is appropriate, it is not necessary or even desirable to use higher octane fuels unless specifically directed by an aftermarket modifier. All of these motors require an oil-premix to be run, you cannot use gasoline without first mixing in a lubricant

If your model is stored where fuel odor is undesirable, you can instead run Lantern/Camper fuel available at a sporting good or camping supply store. It is slightly more expensive than gasoline but has little odor and has approximately the same running characteristics. You also can use premixed fuel like Stihl Motomix or similar (does not smell).

Oil

If you are using a modified motor from an engine tuner, follow their instructions for type and volume of oil to premix with the fuel

If you are using a stock Zenoah motor, use a quality two stroke pre-mix oil.

Some oils that are commonly used:

- AMSOil Saber 100
- Yamalube 2R
- Honda HP2
- Klotz R50
- Stihl HP Ultra

When the motor is new and not yet broken in, run an oil mix of 32:1 per gallon of gasoline. For that ratio mix 4oz of the selected oil to each gallon of fuel. After running 1-2 gallons of fuel through the motor you can decrease the amount of oil used to the minimum support by the oil manufacturer but do not run less than a 40:1 premix ratio (no less than 3 oz of oil per gallon of fuel)

Fuel Tank Plumbing

The carburetor on the motor contains a negative pressure fuel pump which draws fuel from the tank. As a result there is no need to run any sort of pressure system or header fuel tank.

It is however REQUIRED that the fuel tank be vented!

Follow the fuel tank plumbing directions in the assembly guide but make sure to either use a one way valve or use an 8-10” length of gasoline proof fuel line to create a tightly wound “fuel vent loop”. Wrap the line into at least two loops and secure them with tie wraps or Velcro

Failure to properly vent the tank will result in the engine going lean in flight and it will likely quit running as a result of it.

Also make sure to use a filtered fuel clunk in the fuel tank. This works just like the “fuel magnet” if you’re familiar with that product for glow models and will help keep the fuel clean and reduce air bubbles from being pumped into the carburetor.

Mufflers

The Zenoah RC motor comes equipped with a standard Zenoah steel canister muffler. The helicopter can be flown with this muffler however it does not offer a pleasing sound or improved performance. There are a number of aftermarket mufflers available for the Zenoah motors that will improve the sound significantly. Power improvements are based on too many factors to make a specific comparison

Good results have been had using the following optional mufflers:

- Hatori 957 (SB-12R4)
- RJX Gas Muffler
- TRM Power Pipe
- Zimmermann Gas Muffler 2651

After the motor has been run, re-check the muffler bolts to make sure they are tight. Do this for a couple of flights and then it will no longer be necessary unless the muffler becomes obviously loose.

Air Filter

The Zenoah RC format motors ship with an air cleaner. It is recommended that you always use an air cleaner whether it's the stock one or an optional one such as those offered by Miniature Aircraft (MA133-150). Running an unfiltered intake will shorten the life of the motor especially in the case of a crash where a large amount of foreign matter can be ingested into the motor.

Spark Plug

The spark plug included with the motor will normally operate correctly for a very long time. However if you should replace it MAKE SURE that you use a "resistor" plug. The plugs designation will usually end in an R. Failure to do this will result in you losing control of your model due to ignition interference with your radio

Electronics Wiring

The configuration of the Whiplash is such that only two electronic components must be in the general area of the ignition system on the motor. Take care to keep any wiring away from direct contact with the ignition wire as this can cause unexpected results. It is NOT necessary to run any additional shielding or insulated caps especially with 2.4Ghz radios but you may if you desire

If you are still running a PPM/PCM style radio, do not route the receiver antenna within 4 inches of any part of the ignition system

It is suggested that if possible you present at least one Receiver antenna on each side of the model. If you are running a receiver with multiple antennas try to position one on each side of the model. If your radio system uses satellites, it is suggested to install one on each side of the model. This will ensure that your receiver will be able to receive signal regardless of model orientation while flying

The model has two locations for an electronics on/off switch. Either position is suitable however it is suggested that you use a heavy duty switch due to the additional vibration that is typical of a gas powered engine.

Initial Mixture settings

Locate the low speed needle that is marked on the carburetor with an "L". This will be the one closest to the cylinder. Using a screwdriver turn it clockwise until it seats closed.

Don't overtighten. Now open the low speed needle 1-3/8 turns

Locate the high speed needle that is marked on the carburetor with an "H". This will be the one closest to the air filter or the intake side of the carburetor. Using a screwdriver turn it clockwise until it seats closed.

Don't overtighten. Now open the high speed needle 1-1/2 turns

This is a suitable initial setting at normal altitudes. At high altitudes a slightly leaner mixture may be needed

Turning the needles counter clockwise causes the mixture to be richer and turning them clockwise caused a leaner mixture

The needle settings are very sensitive especially the low speed needle. Very small adjustments are recommended, movements on the order of 1/16th of an inch at a time are appropriate.

Throttle Setup/curves

Turn the idle set screw on the carburetor counter-clockwise until the throttle control arm no longer touches the screw at its full low position

Set the throttle channel at 50% of travel and then center the servo arm at a 90 degree angle to horizontal.

Install the ball on the bottom section of the arm 12mm from the center of the servo

Set the ATV's of the throttle channel to 130% on both high and low ends. If your radio won't support this percentage then set them at 100% and install the ball further out on the servo arm. You'll have to determine the correct position to mount it based on the ability to fully move the throttle through its travel

Now set the length on the throttle control rod such that the base of each link is 64.5mm apart from each other. This length is correct for Futaba servos. Other servos may require a slightly different length to account for differences in servo size/output position

Assuming the model will hover at a collective stick position of 75%, the following values will be approximately correct to achieve a 1750RPM hover speed

Normal Curve Points		**Idle Up Curve Points**	
#1	20%	#1	-100%
#2	35%	#2	-67%
#3	47%	#3	58%
#4	62%	#4	68%
#5	100%	#5	100%

Throttle hold position
– 35%

Governor setup

If you intend to use a governor, you will need to follow the manufacturers instructions as to exactly how to set up the device

For governors that have a setting for "low" throttle positions (the lowest position that the governor can set the throttle at), this value may need to be significantly less than for a glow model since thee throttle position will be lower. If your governor consistently causes a head speed that is much higher than you have set, check to see if the governor supports this setting and if so lower it until the head speed is closer to your desired setting

Governor Sensors

If you intend to use a governor, it will require a sensor of some sort to detect the engine RPM. You can devise your own method for installing the sensor that is provided with your governor or you can instead use a product known as the Stator Gator. This device replaces the push button "kill switch" and can be directly connected to your governor. For specific governor supported reference the companies website.

Starting

Fill the fuel tank with the gas/oil mixture

Press the primer bulb on the carburetor several times until it fills with fuel

Power up the helicopter electronics and allow them to stabilize

Ensure that the throttle is at its low position (the arm on the carburetor) is pointing towards the front of the helicopter

If you are pull starting the helicopter, grab the rotor head of the helicopter and place your left foot up against the left skid of the helicopter to prevent it from moving

ALWAYS FIRMLY HOLD THE ROTOR HEAD while starting the model. If the throttle should unexpectedly be set at a high RPM setting due to an incorrect radio setup these motors have a great deal of torque and can accelerate the rotor head quickly causing injury or damage.

Now pull the starter briskly. If this the first start of the day, first close the choke on the carburetor (usually located on the bottom of the stock air filter) and pull the starter 3 times. Then open the choke fully and pull the starter until the motor starts, usually less than 5 pulls

If you are using a spin starter, simply insert the starter end in the start coupler on the top of the model, grasp the rotor head firmly and spin the motor over until the engine starts. You won't need to engage the choke.

Rotor Blades

The model flies nicely with 700mm blades. The stock configuration can support up to 720mm blades with no modification and there is an optional conversion kit available to allow the use of 750-810mm blades. Keep in mind that the std 6.88 gear ratio was designed for use with a 26cc engine and 700mm blades. If using a 29cc engine 710mm to 720mm blades work fine with std 6.88 gear ratio.

Pitch Curves

Set up your pitch curves as you normally would. With stock motors and standard blades 11 degrees of max pitch will be appropriate. Of course you can set up the maximum the model will support but be careful of overloading and bogging the motor when doing hard maneuvers with large collective/cyclic pitch inputs.

If you are using modified motors then the rotor blade size and pitch curve settings will vary depending on the configuration

Gear Ratios

The standard 6.88:1 gear ratio has been found to provide good all around performance with a wide variety of model configurations. There are two optional ratios 7.3:1 and 7.8:1 which can easily be changed by replacing the pinion gear with optional ones. For more information about whether these might apply to your circumstances contact Miniature Aircraft.

Running

In general terms, the model will operate just as any other internal combustion engine.

The model has demonstrated the best overall flight characteristics when operating between 1600 and 1950 RPM for the rotor head. This can be adjusted for your particular style of flying and desired characteristics.

You will find that if you are using a new motor, it will take between 3 and 5 gallons of fuel for it to seat or “break-in”. You will notice a change in exhaust tone and improved overall running as this occurs. You may also need to adjust the mixture settings on the carburetor as the engine breaks in or if there are significant changes in operating conditions especially temperature, humidity or altitude.

There are too many possible combinations to properly describe the approach but in general terms you can check the color of the spark plug to determine the mixture setting.

- If the spark plug has milk chocolate brown color, the mixture is roughly correct
- If the spark plug is grey or white, the mixture is too lean
- If the spark plug is black and/or oily the mixture is too rich

Never lean either mixture needle to less than 1-¼ turn from fully closed unless there are specific directions included with your motor that instruct otherwise. The carburetors typically found on these motors will be very lean at settings less than this.

If you find that the motor stops abruptly either during spool-up or while flying, if the model has plenty of fuel in the tank then the mixture is likely too lean. If it stops on spool up, adjust the low speed needle, if it stops while flying adjust the high speed needle.

These are over simplifications of the tuning process for more information consult with Miniature Aircraft or with a local Team representative or consult one of the gas specific forums mentioned at the end of this section.

Additional Support References:

Gas Powered Thoughts - **http://www.gaspoweredthoughts.com**
Run Ryder Gas Forum or Miniature Aircraft Forum - **http://www.runryder.com**
Helifreak Gas Forum or Miniature Aircraft Forum - **http://www.helifreak.com**

Whiplash Kit Parts & Hardware

0003	M3 Washer
0004	M4 Washer
0009	M3 Washer Small
0011	5mm Washer
0011-5	M5.3x20 Washer
0012-1	2.5mm Pem Nut
0012-2	3mm Pem Nut
0014F	5mn Hex Nut - Fine Thread
0015	2mm Hex Nut
0016-2	M4 External Serrated Lock Washer
0017-2	M2.5 Hex Nut
0019	M3 Lock Nut
0021	M4 Lock Nut
0023	M5 Nut
0032	M3x9.5 Self Tapping Screw
0032-2	M3x8 Self Tapping Screw
0049-1	M2x12 Socket Bolt
0050-1	M2.5 Set Screw
0051	M3x3 Set Screw
0056	M3x5 Dog-Point Set Screw
0056-3	M3x8 Dog-Point Set Screw
0057	M4x4 Set Screw
0059-0	M2.5x4 Socket Bolt
0059-2	M2.5x8 Socket Bolt
0059-3	M2.5x10 Socket Bolt
0059-7	M2.5x10 Socket Bolt
0060-1	M3x6 Socket Bolt
0061	M3x8 Socket Bolt
0063	M3x10 Socket Bolt
0064-3	M3x6 Button Head Socket Bolt
0064-4	M3x16 Button Head Socket Bolt
0065	M3x12 Socket Bolt
0067	M3x14 Socket Bolt
0069	M3x16 Socket Bolt
0071	M3x18 Socket Bolt
0073	M3x20 Socket Bolt
0078	M4x12 Socket Bolt
0078-3	M4x6 Socket Bolt
0081	M4x16 Socket Bolt
0082-4	M5x32 Shouldered Socket Bolt
0085	M5x16 Socket Bolt
0086-1	M5x16 Flanged Socket Bolt
0088	M3x8 Tapered Socket Bolt
0088-3	M3x7 Tapered Socket Bolt
0103	M2 Threaded Steel Ball
0107	M3x6 Threaded Steel Ball
0109	M3x8 Threaded Steel Ball
0116	M2.5 Threaded Steel Ball
0133	M2x21.2 Ball Link
0133-1	M3x21.2 Ball Link
0159	3x7x3 Bearing
0183	10x19x5 Bearing
0208	10x12 One-Way Torrington
0214	Upper Swash Ring
0214-1	Lower Swash Ring
0215	M6 Tail Shaft Collar
0216	Heim Ball
0217	Swash Plate Assembled
0218	20x32x7 Swash Bearing
0225	Link Pin
0225-5	Link Pin
0273	6x10x.011" Steel Washer
0273-05	6x10 Steel Washer
0283	6x10x3 Flanged Bearing
0319	8x16x5 Bearing
0390	Large Wire Lead Retainer
0405	Fuel Pick Up
0442	T/R Pitch Link
0447-1	M2 E Clip
0597-1	M3x4.75x.126" Brass Spacer
0597-4	Brass Spacer
0620-01	M15x21x.10 Washer
0620-02	M15x21x.20 Washer
0620-03	M15x21x.30 Washer
0818-3	Rectangular Mounting Block
0869	Washout Link
105-70	6x15x5 Bearing
105-100	Gasoline Fuel Line
106-02	3x7x3 Flanged Bearing
106-06	2x5x1.5 Flanged Bearing
106-22	5x11 Grommet
115-65	High Flex Fuel Line
120-7-1	5x15 Safety Washer
120-25	Swash To Mixer Linkage Rod
120-39	5x10x4 Ball Bearing
121-4	Servo To Swash Linkage Rod
121-6	M3x75 Threaded Control Rod
121-7	Swash To PA Linkage Rod
122-28	Brass Spacer
122-47	10x22x6 Bearing
122-48	22mm Circlip
122-70	M5x.25 S/S Shim Washer
127-86	M6x9.7x1.0 Shim Washer
128-57	Tray Mount
128-58	Main Frame Spacer
128-59	M4 Frame Spacer
128-80	Front Boom Clamp
128-90	Tank Plate Mounting Studs
128-92	Fuel Tank Plug
128-118	6mm Hex Adaptor
128-144	T/R Control Rod Guide
128-148	Boom Support
128-149	Rear Boom Support Mount
128-176	Washout Pin
128-195	Head Button
128-314	Swashplate Follower Arm
131-3	Start Shaft
131-17B	Bevel Gear Shaft Side
131-18B	Tail Bevel Gear TT Side
131-19	10x26x8 Main Shaft Bearing
131-21	Upper Main Shaft Bearing Block
131-23	6x13x5 Flanged Bearing - Tail Shaft
131-29	C/F X-Brace
131-33	15x21x4 Bearing - Tail Gear
131-34	Front Tail Drive Transmission
131-35	Boom Clamp W/TX Holes
131-46	P/A Servo Rail
131-47	C/F Servo Rail Spacer
131-50	Elevator Servo Mount
131-51	Jack Shaft
131-52	Delrin Tray Mount
131-53	Gyro Plate
131-55	C/F Angled Battery Tray
131-62	Tail Boom
131-64	Tail Hub
131-66	4x10 Thrust Bearings - Tail Grips
131-69-1	T/R Push Rod
131-70	Tail Output Shaft
131-83	Anti Rotation Pin
131-84	Boom Support Rod
131-86	Assembled Boom Support
131-112	T/R Blade Grip
131-128	C/F Boom Clamp Plate
131-129	Tail Box
131-130	Tail Pitch Control Bellcrank
131-131	C/F Tail Bellcrank Bracket
131-132	Bellcrank Slider Cup
131-135	Bracket Washer
131-144	Rubber Fuel Tank Mounts
131-148	C/F Servo Plates
131-150	Front Canopy Post
131-151	Rear Canopy Post
131-153	C/F Breakaway Tab
131-154	Thumb Screw
131-161	Main Blade Grip
131-163	FBL Pitch Arm
131-166	4x8x3 Flanged Bearing
131-179	Whiplash X-Block
131-180	6x13x5 Flanged Bearing
131-181	9x17x5 Radial Bearing
131-182	9x17x5 Thrust Bearing (F9-17)
131-183	9x14x.030 Washer
131-184	9x14x.080 C/F Damper Washer
131-186	Anti Rotation Bracket
131-187	Head Axle
131-200	M4x33 Shouldered Socket Bolt
131-202	M4 Jesus Bolt OWB V2
131-368	FBL Head Block
131-400	Torque Tube End
131-408	FBL Main Shaft
131-420	Middle Main Shaft Bearing Block
131-424	Main Gear Hub
131-440	Bearing Block Mount
131-442	Bearing Block
131-454	Tray Mount
131-470	70 T Crown Gear
131-473	7x11x3 Bearing - Control Ring
131-474	Control Ring
131-475	T/R Pitch Slider Assembly
131-476	Tail Pitch Yoke
131-477	Brass Slider
131-480	Delrin TT Bearing Cup
131-481	TT Bearing Cup O Ring
131-482	Sleeve
131-483	Tail Drive Hub
131-485	12x18x4 Ball Bearing
131-490	Damper Sleeve
131-491	Damper O-Ring 80D
131-493	15 Tooth Pinion Gear
132-117B	Main Gear 124T
133-60	C/F Tail Fin
133-94	C/F Fuel Tank Plate
133-99	Fuel Tank
133-107	C/F Front Frame Doubler
133-108	C/F Rear Frame Doubler
133-110	C/F Bottom Plate
133-119	Flanged Clutch Spacer
133-120	One Way Bearing Bracket
133-121	Gas Motor Mount
133-135	Landing Gear Frame Post
133-137	Rubber Wire Grommet
133-140	Fuel Nipple
133-144	Skid Tube
133-252	Whiplash Canopy
133-409	Gas Clutch Bell
133-417	17T Pinion w/Sleeve
133-4117	C/F Left Frame - Gas
133-4118	C/F Right Frme - Gas
133-458	Torque Tube
133-60	Fin Painted
2500-24	White Tuff Strut II
3000-73	Towel
3200-30	Spiral Band For Wire And Cable
3200-48	3/4" Hook & Loop Tape
3200-54	3/4"Adhesive Hook & Loop
3700-160	Foam Blade Guard

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 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 VOIDS all warranties of this product by Miniature Aircraft.

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