



# VELOCITY 90

User Manual



## Ultra Compact Frame TECHNOLOGY

### Features of the Velocity 90

- 120/140 degree Swash plate features double ball bearing with interchangeable swash plate upper cup for flybar or flybarless head
- Fully adjustable rotor head ratios for Beginner to Advanced 3D or FAI/F-3C flying
- Double ball raced with thrust bearing Tail blade Clips
- Ultra rigid and compact frame design feature
- Individually removable and replaceable torque tube gears
- Counter balanced fuel tank design with easy serviceable external fuel fittings
- Bell crank zero pitch alignment system with locking tools for easy and accurate servo to swash linkage setup

Length	Height	Width
: 1285mm	: 448mm	: 213mm
• Main Rotor Blade Size: 700mm • Main Rotor Diameter : 1565-1605mm	Tail Blade Length: 105mm Tail Rotor Diameter: 288mm	
Main Gear ratio: 8.2 Tail Rotor Ratio : 4.62 Approximate flying Weight with fuel: 4.4 kg / 9.7lb Lbt (depends on equipment used)		

[www.outragerc.com](http://www.outragerc.com)

# Introduction

## Read before assembly

Thank you for purchasing Outrage RC products. The Velocity 90N radio controlled helicopter is designed with easy to use features that are capable of a multitude of flight characteristics and styles – from beginner, basic, to advanced 3D aerobatic rotary flight. In order to use this product safely, please read and understand this manual before flying the helicopter. Please fly the helicopter safely, observing all rules and instructions after having fully understood the flight precautions, the unit's capabilities, and the best way to fly the helicopter. Be sure to retain this manual for future reference, routine maintenance, and tuning.

### Meaning of symbols

(!) caution:	Mishandling due to failure to follow these instructions may result in serious harm.
(!) Warning:	Mishandling due to failure to follow these instructions may result in severe injury or death.
⊘ Forbidden:	Do not attempt under any circumstances.

### **This radio controlled helicopter is not a Toy!**

Radio controlled helicopters use various high tech electronic technologies and products. Improper use of this product can result in serious injury, or even death. Please read this manual carefully before flying the Velocity 90N, and make sure to be conscious of your own personal safety and the safety of others. Be conscious of your surroundings and environment when operating Outrage products. Outrage RC, affiliated groups, and seller assume no liability for the operation or use of this product. The user/purchaser is responsible for common knowledge and implantation of one's personal safety, and the safety of others, that may be affected by the use of the product, be they a participant or spectator. This radio controlled helicopter is intended for use only by adults with experience flying radio controlled helicopters at a legal flying field. After the sale of this product, we cannot maintain any control over its operation or usage. We recommend that you obtain assistance from an experienced pilot before attempting to fly our products, and to help verify proper assembly, setup, and flight of your model for the first time. This Outrage helicopter is a consumer item that requires a certain degree of skill to operate. Any damage or dissatisfaction as a result of accidents or modifications are not covered by any warrantee, and cannot be returned for repair or replacement. For issues with your Outrage helicopter or product, please contact us for technical assistance.

### **Safety notes:**

#### **Choose a legal flying field**

- Verify air field to have ample space, flat, and smooth ground.
- Clear airfield from debris and obstacles.

#### **Do not operate**

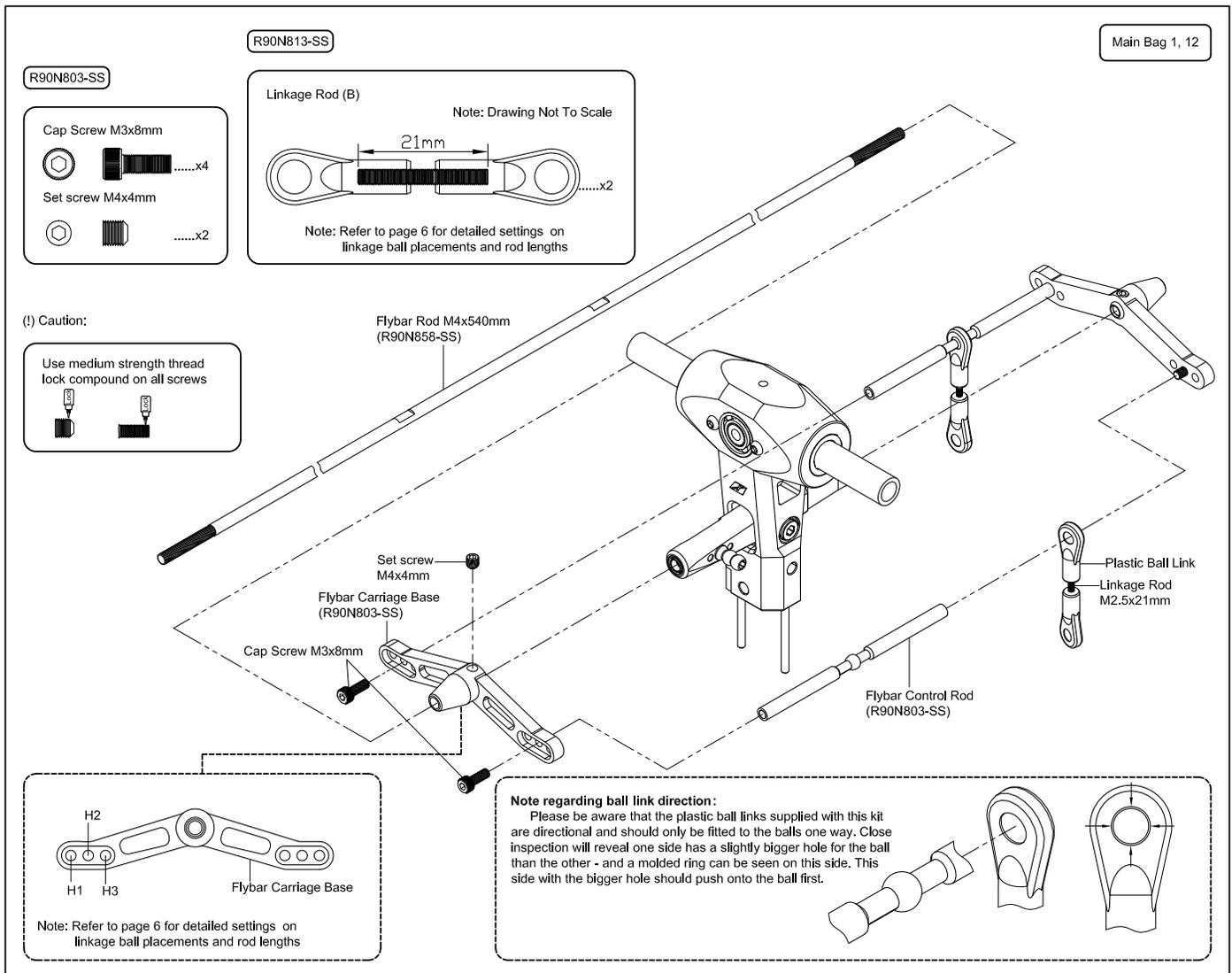
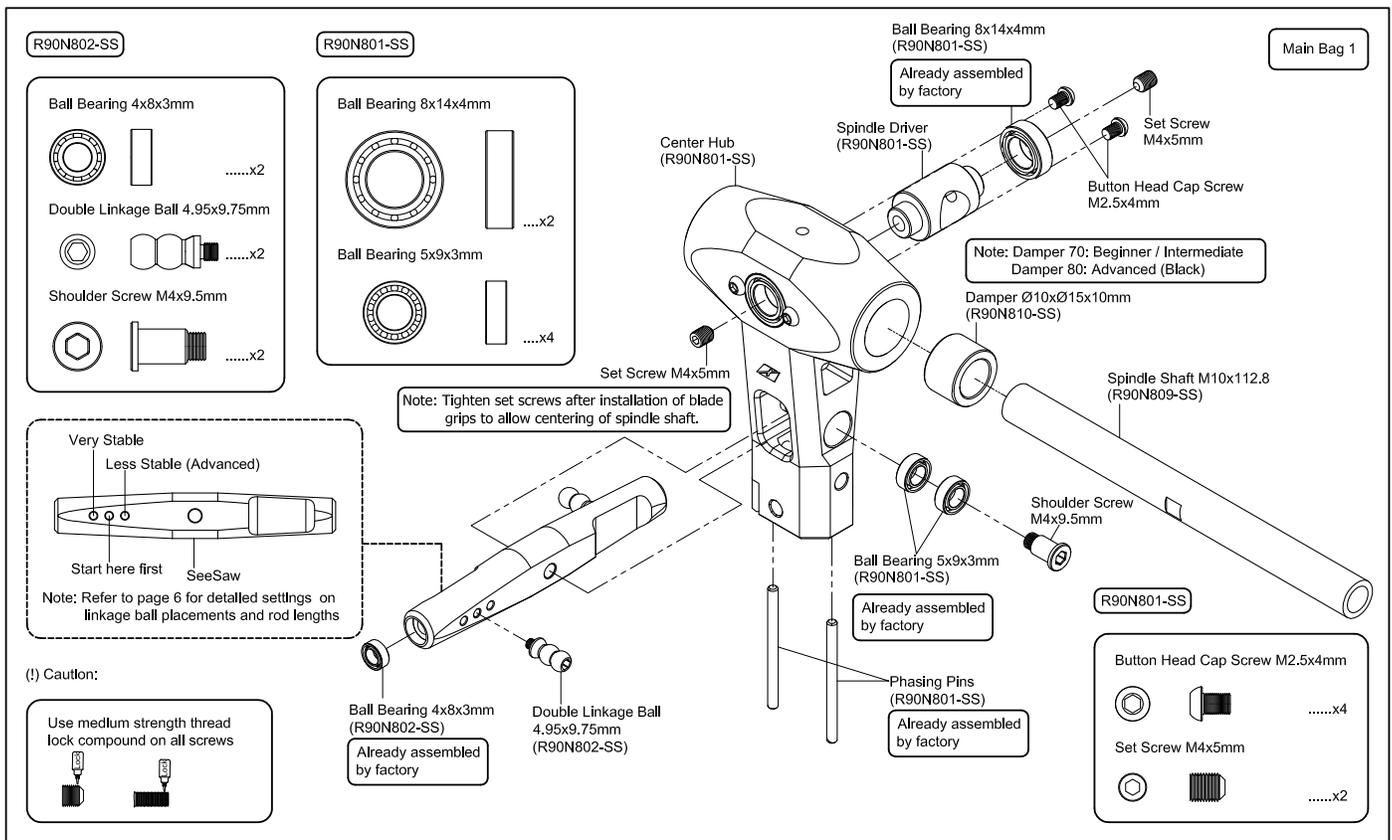
- In strong winds, night, or rain.
- If model has been in contact with rain, moisture, or contaminants.
- In cold climate conditions - plastics are very susceptible to damage due to cold climates.
- If model has been in contact with fire or high heat - plastics are very susceptible to damage or deformation due to heat.
- In crowded areas.
- Near homes, schools, or hospitals.
- Near roads, railways, or power lines.
- Near another radio controlled unit that uses same frequency.
- Do not allow children to operate.
- If tired, sick, or under the influence of drugs or alcohol.
- If beginner or individual(s) planning to operate a borrowed helicopter without being familiar with model or safety instructions.

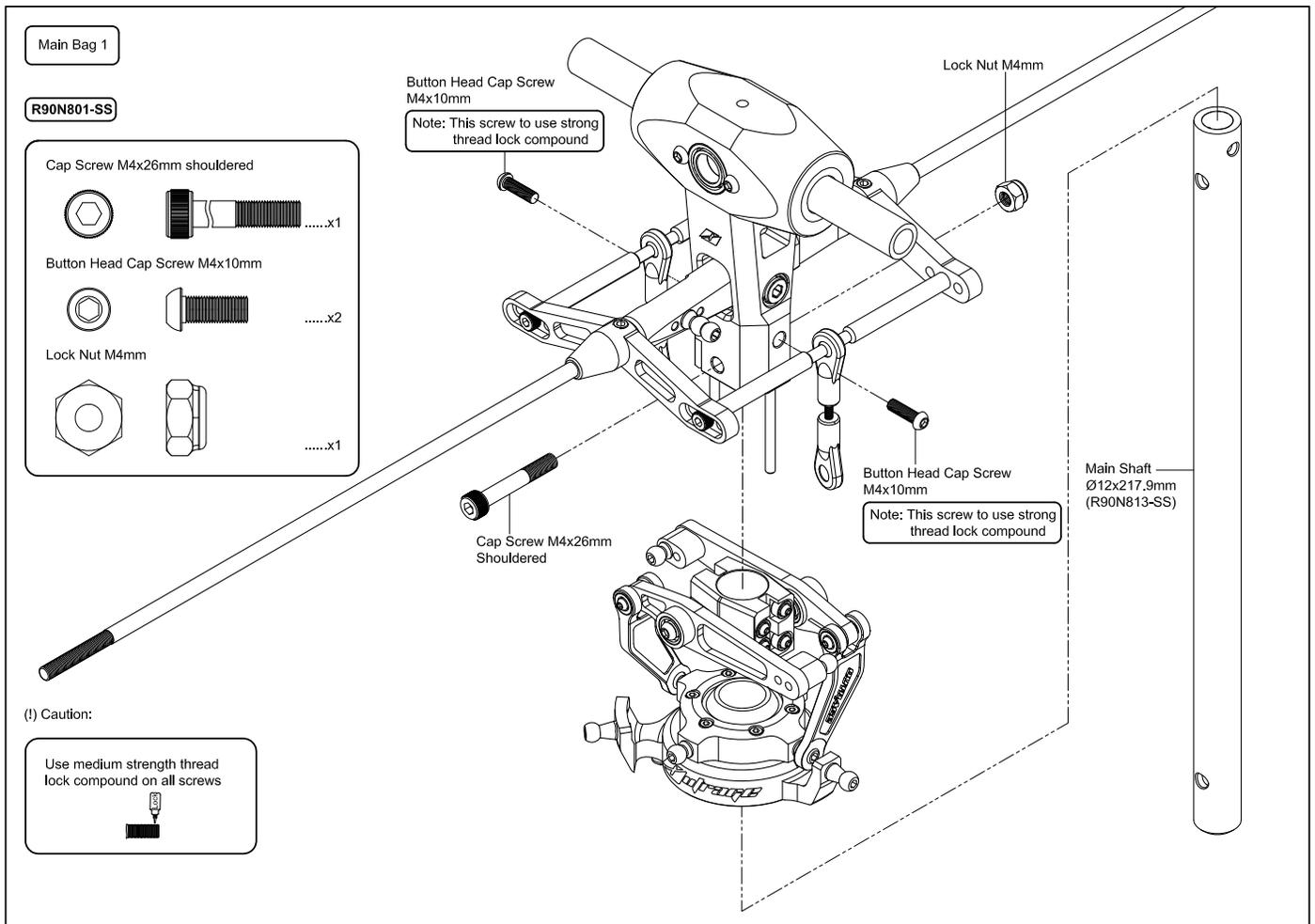
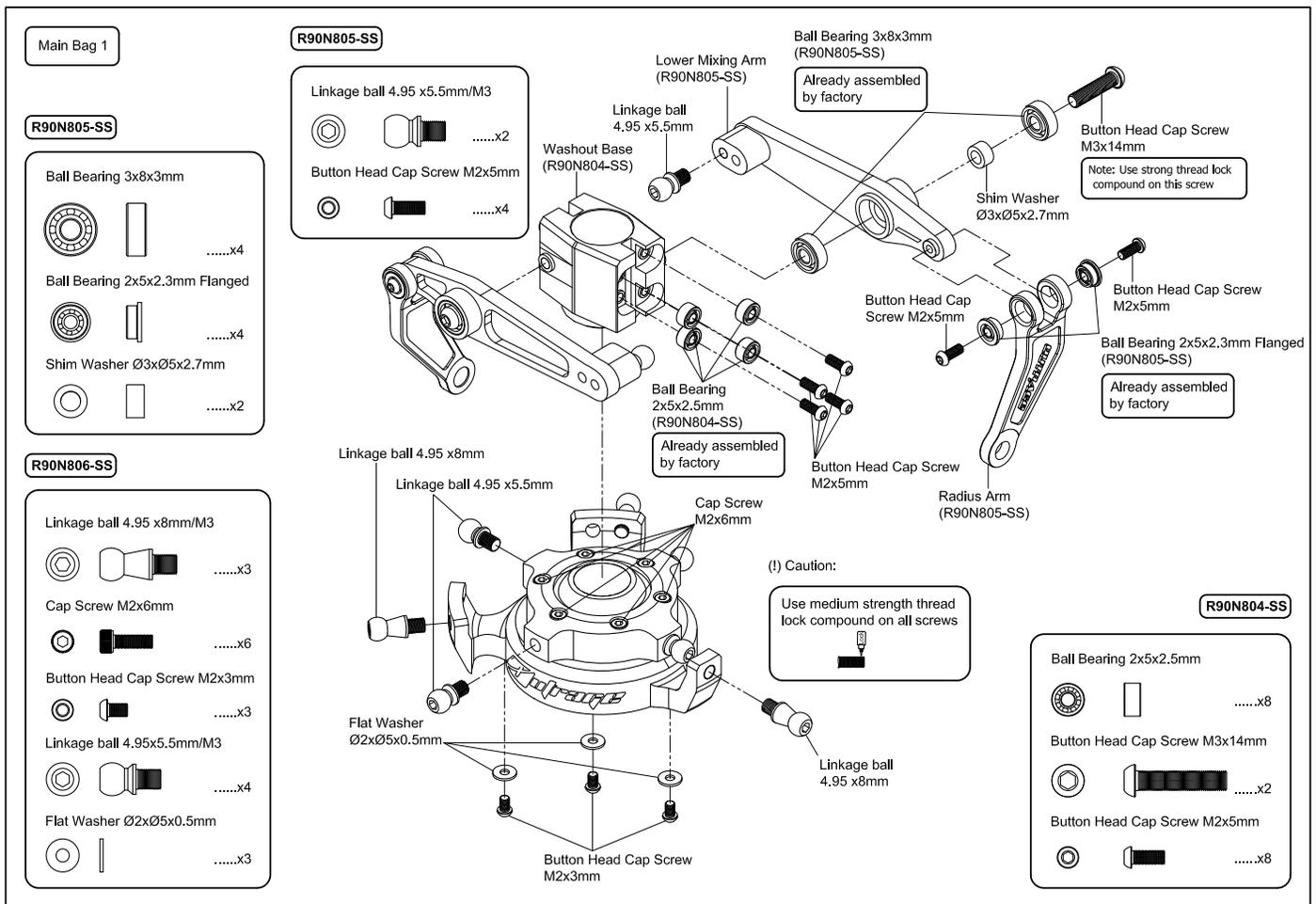
#### **Inspect All Parts**

- Before each flight, check for damaged parts and verify all parts operate normally with all functions in order.
- Adjust the positioning of movable parts and check that all nuts, bolts, screws are fastened correctly in accordance to this instruction manual.
- Verify all parts are installed correctly.
- Verify that there are no abnormalities that would adversely affect the flight of the helicopter.
- Verify all batteries on board helicopter and transmitter are to a sufficient level of charge.
- Exchange or repair damaged or worn parts using only parts shown in this instruction manual, or via the Outrage catalog.
- Verify there is no introduction or exposure to water or moisture in any form.

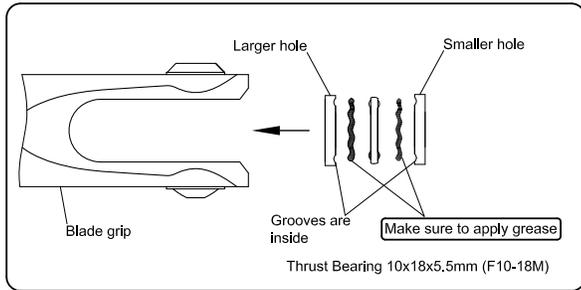
#### **During operation of helicopter**

- Always be aware of your surroundings.
- Maintain safe distances from aircraft and rotating main/tail rotor blades.
- Be conscious of your actions.
- Wear appropriate clothing that does not interfere with transmitter or helicopter.
- Never leave your model unattended.
- Maintain eye contact during all aspects of flight.

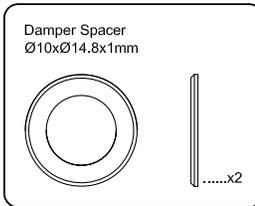




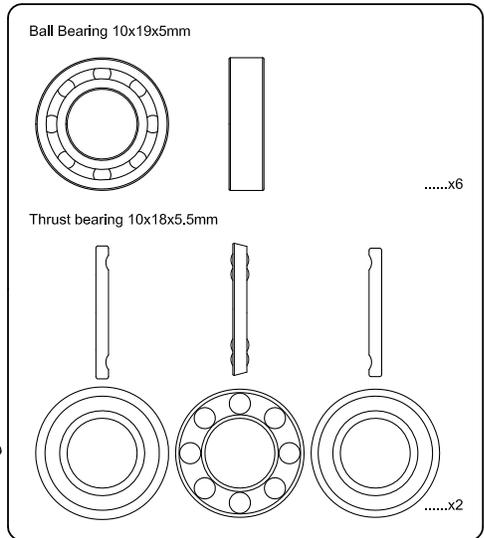
(!) Caution:



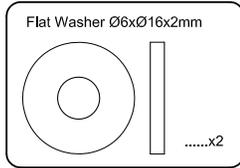
**R90N810-SS**



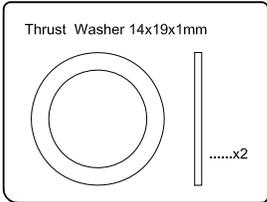
**R90N807-SS**



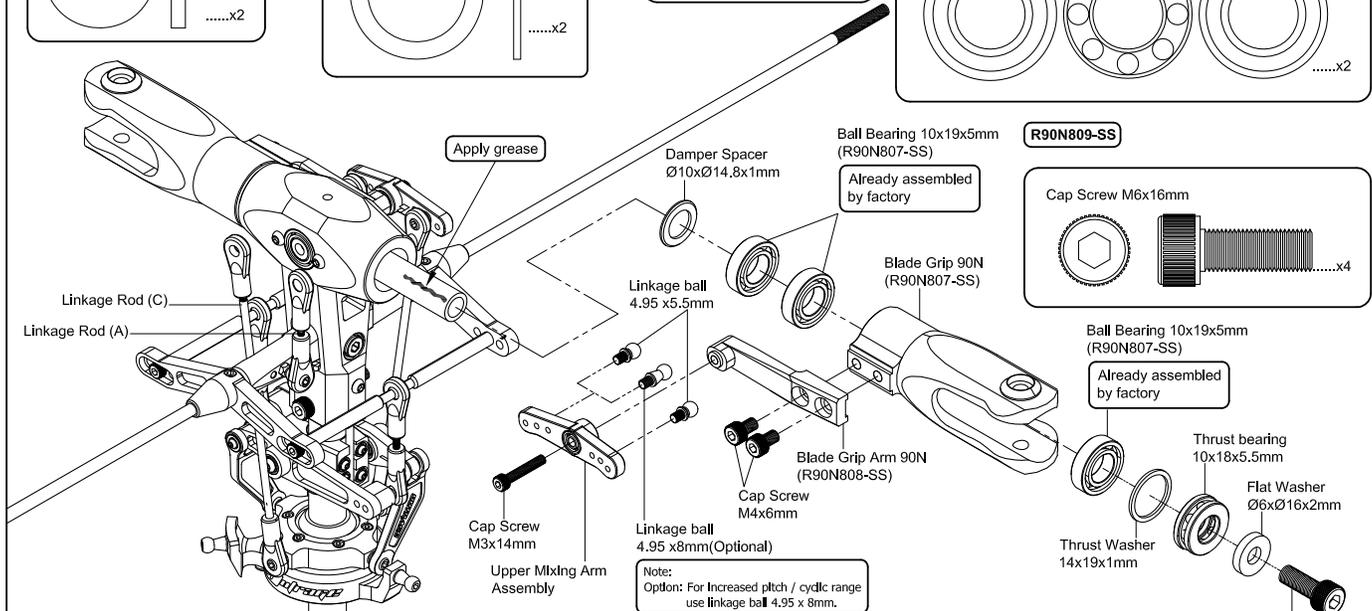
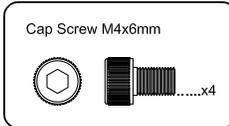
**R90N809-SS**



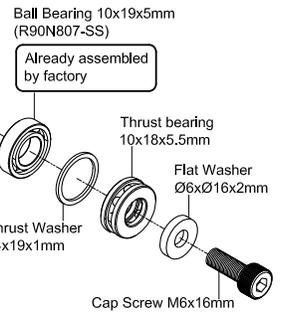
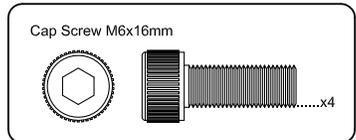
**R90N807-SS**



**R90N808-SS**

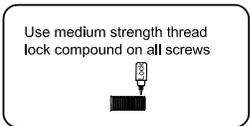


**R90N809-SS**

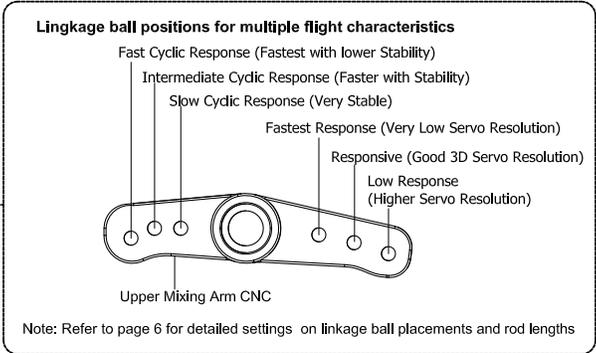
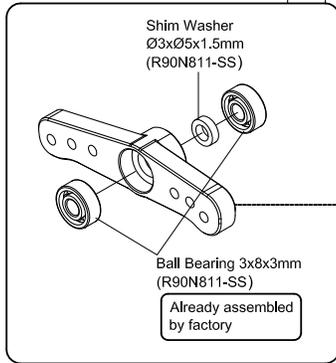


Note: This screw to use strong thread lock compound

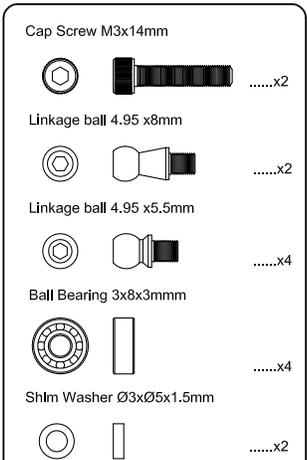
(!) Caution:



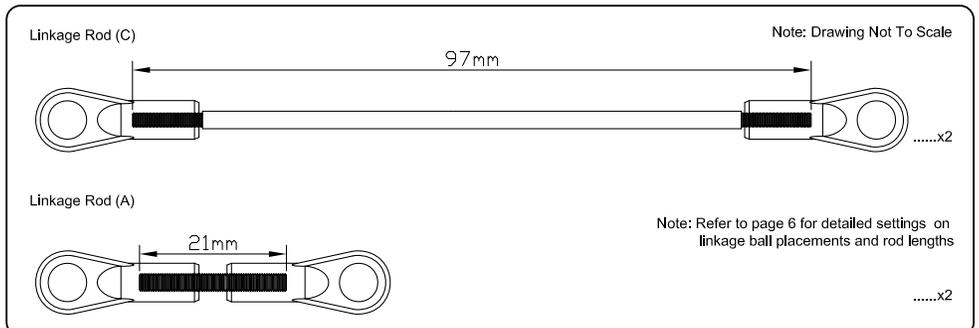
Upper Mixing Arm Assembly



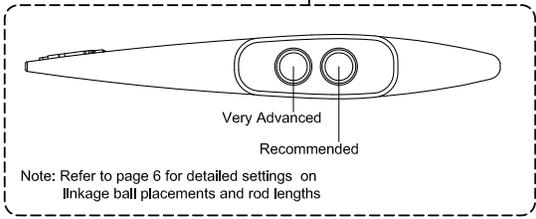
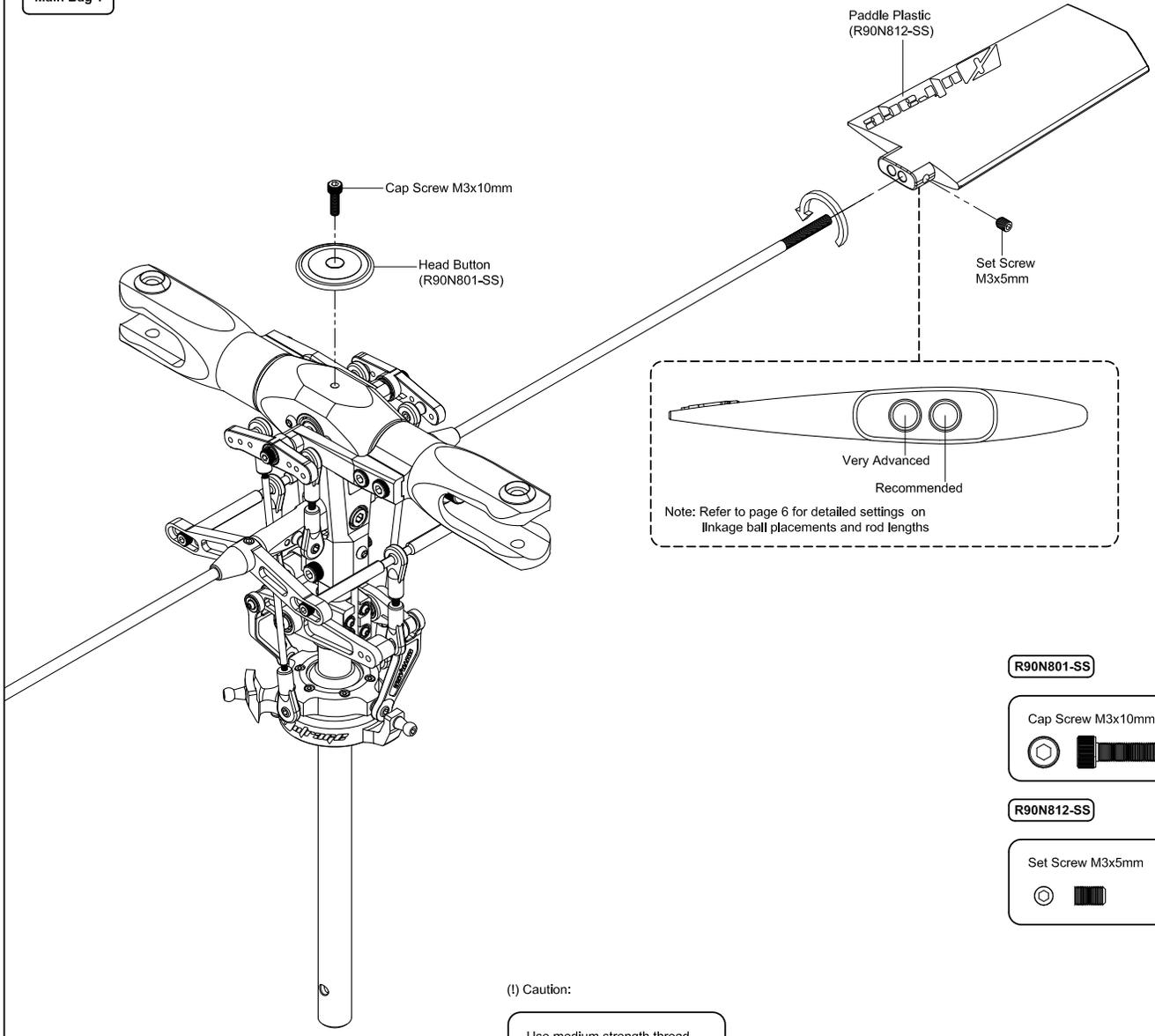
**R90N811-SS**



**R90N813-SS**



Main Bag 1



R90N801-SS

Cap Screw M3x10mm

.....x1

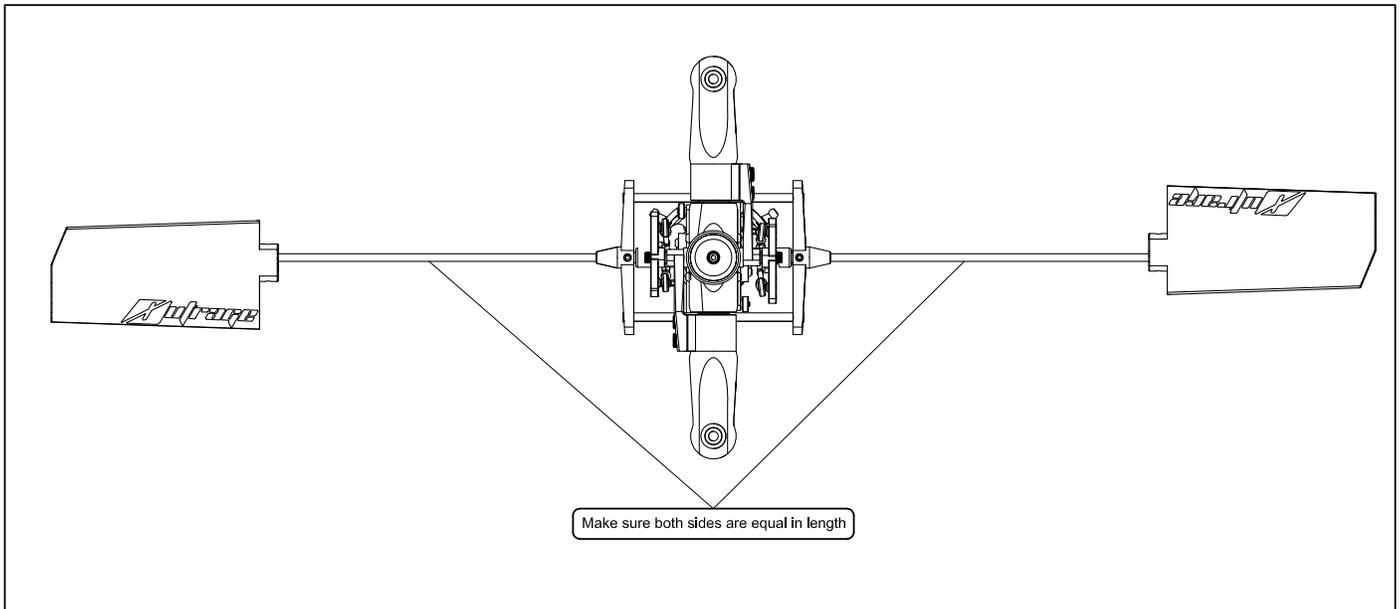
R90N812-SS

Set Screw M3x5mm

.....x2

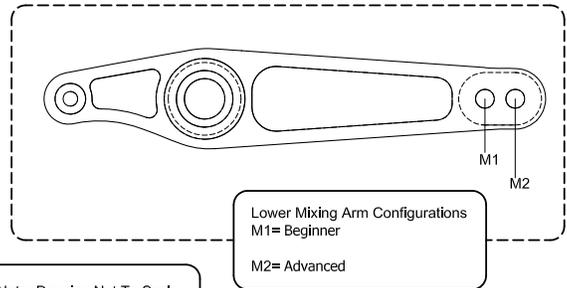
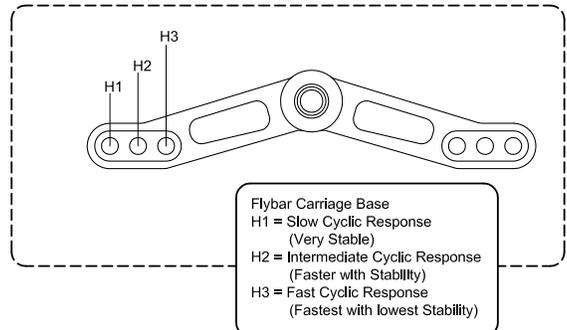
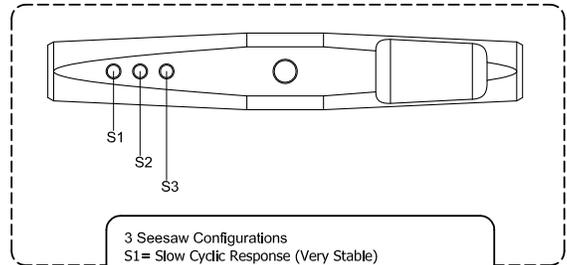
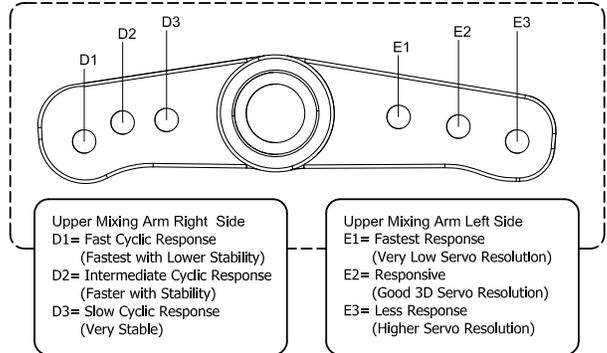
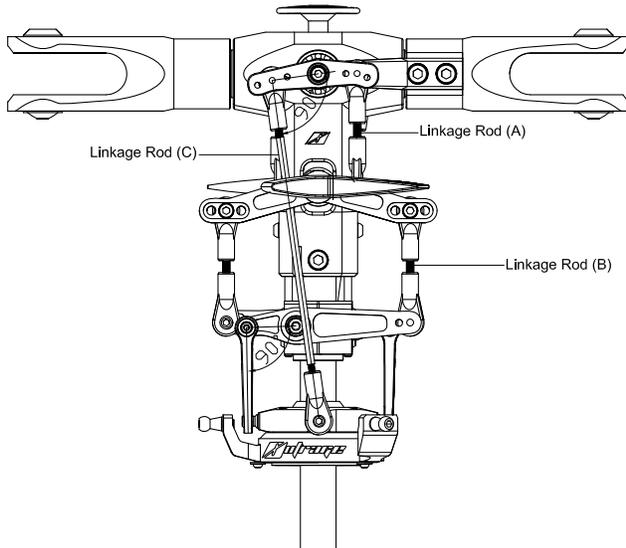
(!) Caution:

Use medium strength thread lock compound on all screws



**Basic setup configurations for beginner, intermediate, and advanced flying skills**

In the diagram below we supply three basic mechanical setting possibilities of this rotor head. There are many other achievable setups all providing different results. Adjust these settings to suite your flying style. Some of the settings can produce binding. Ensure that servo travel settings in the radio and linkage rod adjustments are made to eliminate binding. This is important to achieve the best performance from the rotor head.



**These are basic head configurations recommended.**

Settings were tested with 710mm carbon fiber rotor blades with "3D style" paddles and Dampers.

**Beginner settings:**  
 Use locations noted in component boxes

- S1 1650 RPM Target Head Speed.
- E1 (Use 5.5 or 8mm Ball length)
- D2 Aileron and Elevator Pitch 6 Degree
- M1
- H1 Pitch Settings + 9 Degree - 3 Degree
- Linkage rod lengths  
 A: 6.5 mm  
 B: 7.75 mm  
 C: 81.5 mm

**Intermediate settings:**

- Use locations noted in component boxes
- S2 1900 RPM Target Head Speed
- E2 (Use 5.5 or 8mm Ball length) D2 or D3
- M2 Aileron and Elevator Pitch 6 Degree
- H1 Pitch Settings + 10 Degree - 10 Degree
- Linkage rod lengths  
 A: 5 mm  
 B: 6.5 mm  
 C: 83.5 mm

**Advanced settings:**

- Use locations noted in component boxes
- S3 1950-2000 RPM Target Head Speed
- E2 (Use 5.5 or 8mm Ball length) D3 to outside ball on dual ball on seesaw
- M2 Aileron and Elevator Pitch 7 Degree
- H2 or H3 (H3 Very advanced) Pitch Settings +11 Degree - 11 Degree
- Linkage rod lengths  
 A: 5 mm  
 B: 6.5 mm  
 C: 83.5 mm

**Basic How To For Head Tuning**

Linkage Rod A:

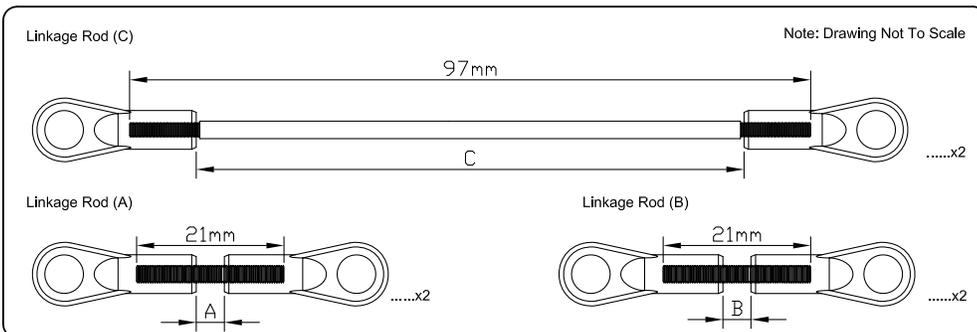
Adjustments to this linkage rod will change balance between positive and negative pitch ranges  
 Example: You have + 13 and - 9 degrees of pitch to achieve equal pitch range for both + and - sides you will change length of this rod to achieve proper balance.

Linkage Rod B:

Adjustments to this rod should not vary from key setup objects to maintain approximate 90 degree relation with plastic radius arms and lower mixing arm as noted in diagram above.

Linkage Rod C:

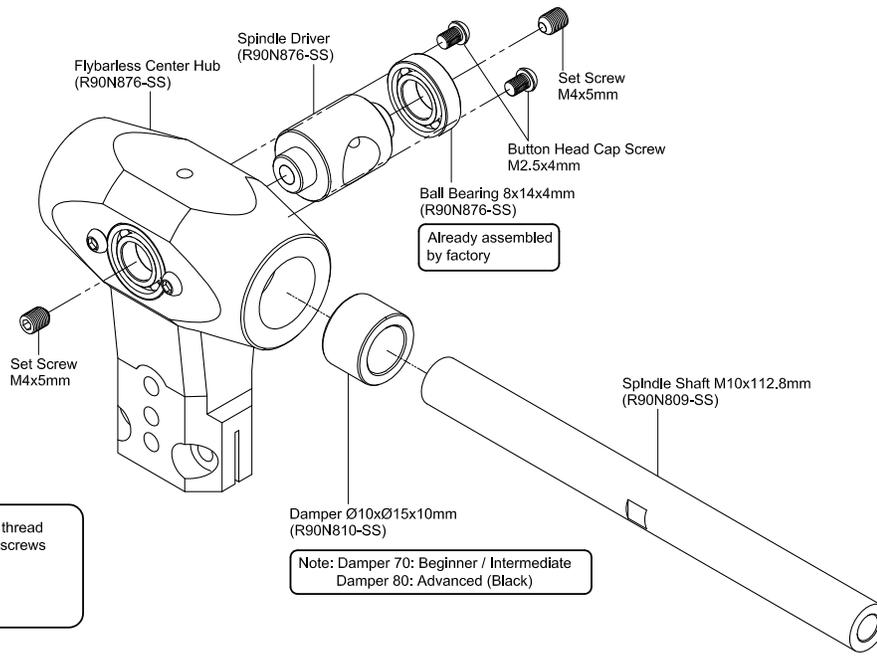
Adjustments to this linkage rod are for initial setup of zero degree pitch when set at center stick on your transmitter also for minor blade tracking corrections. Excessive length variations between both blade grips may be a sign of other problems such as 1. Improperly matched set of blades 2. A result from a crash or hard landing verify no parts are bent or damaged



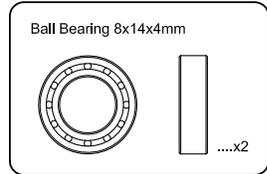
Main Bag 1A

# Flybarless Rotor Head Setup

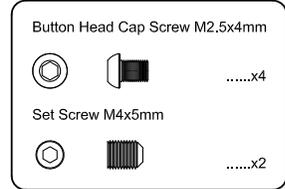
The next two pages describe assembly of the optional flybarless head components



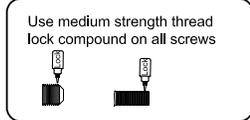
R90N876-SS



R90N876-SS



(!) Caution:

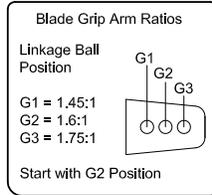
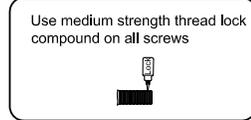


Damper Ø10xØ15x10mm (R90N810-SS)

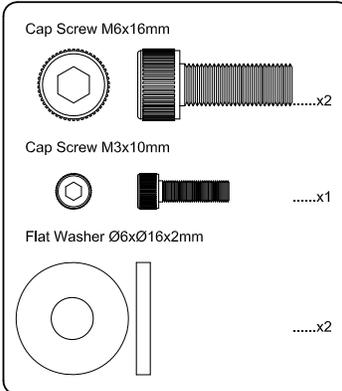
Note: Damper 70: Beginner / Intermediate  
Damper 80: Advanced (Black)

Main Bag 1A

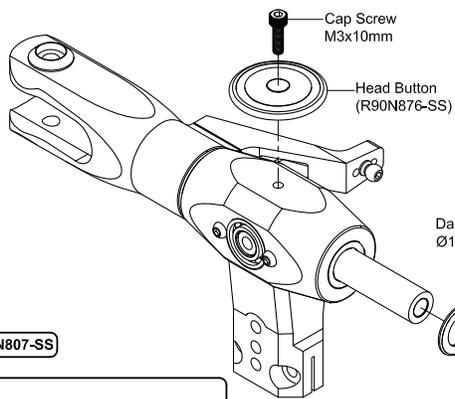
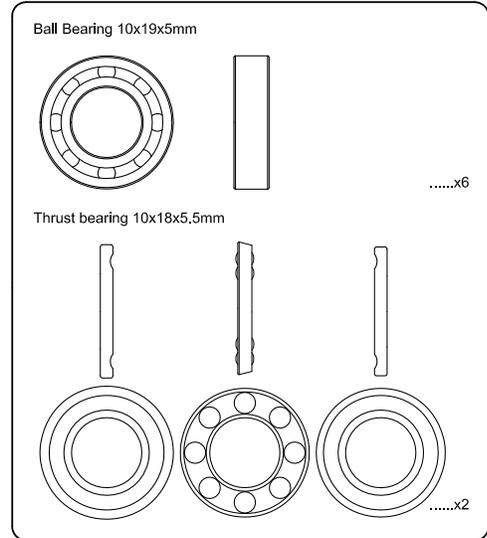
(!) Caution:



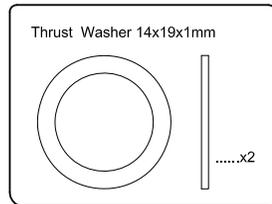
R90N876-SS



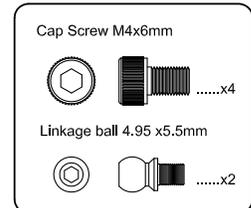
R90N807-SS



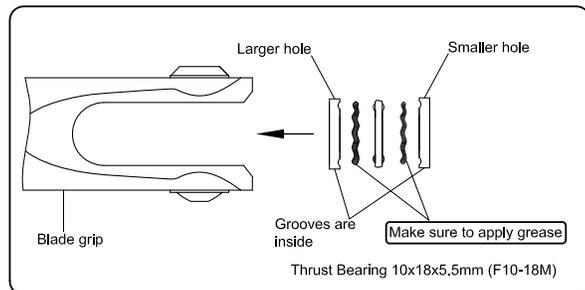
R90N807-SS



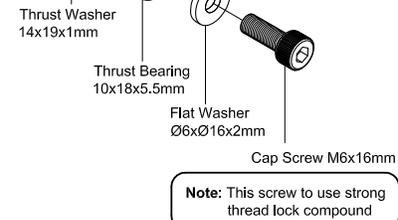
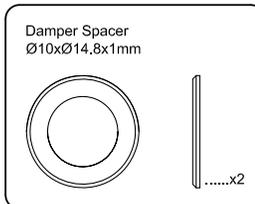
R90N874-SS

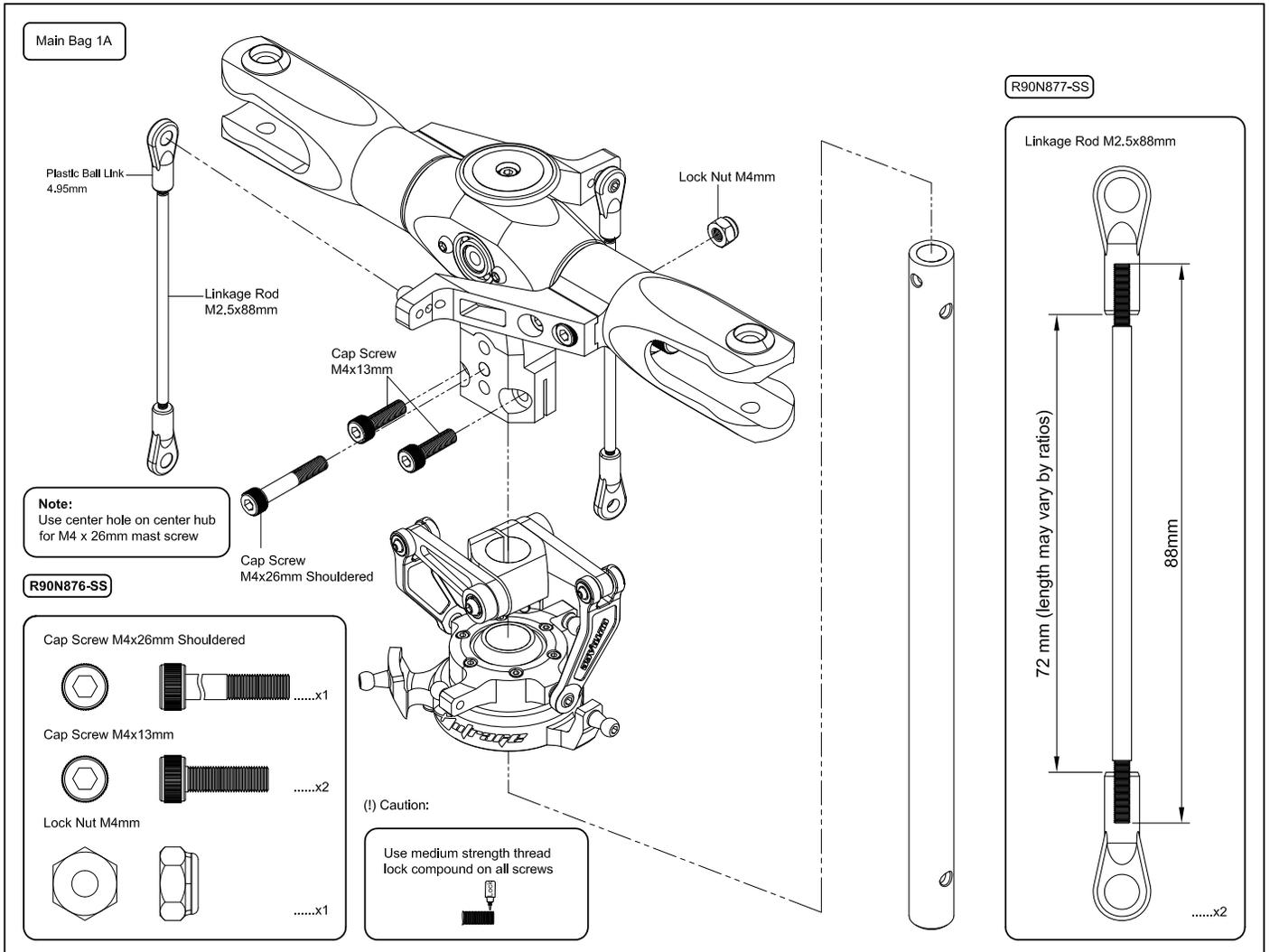
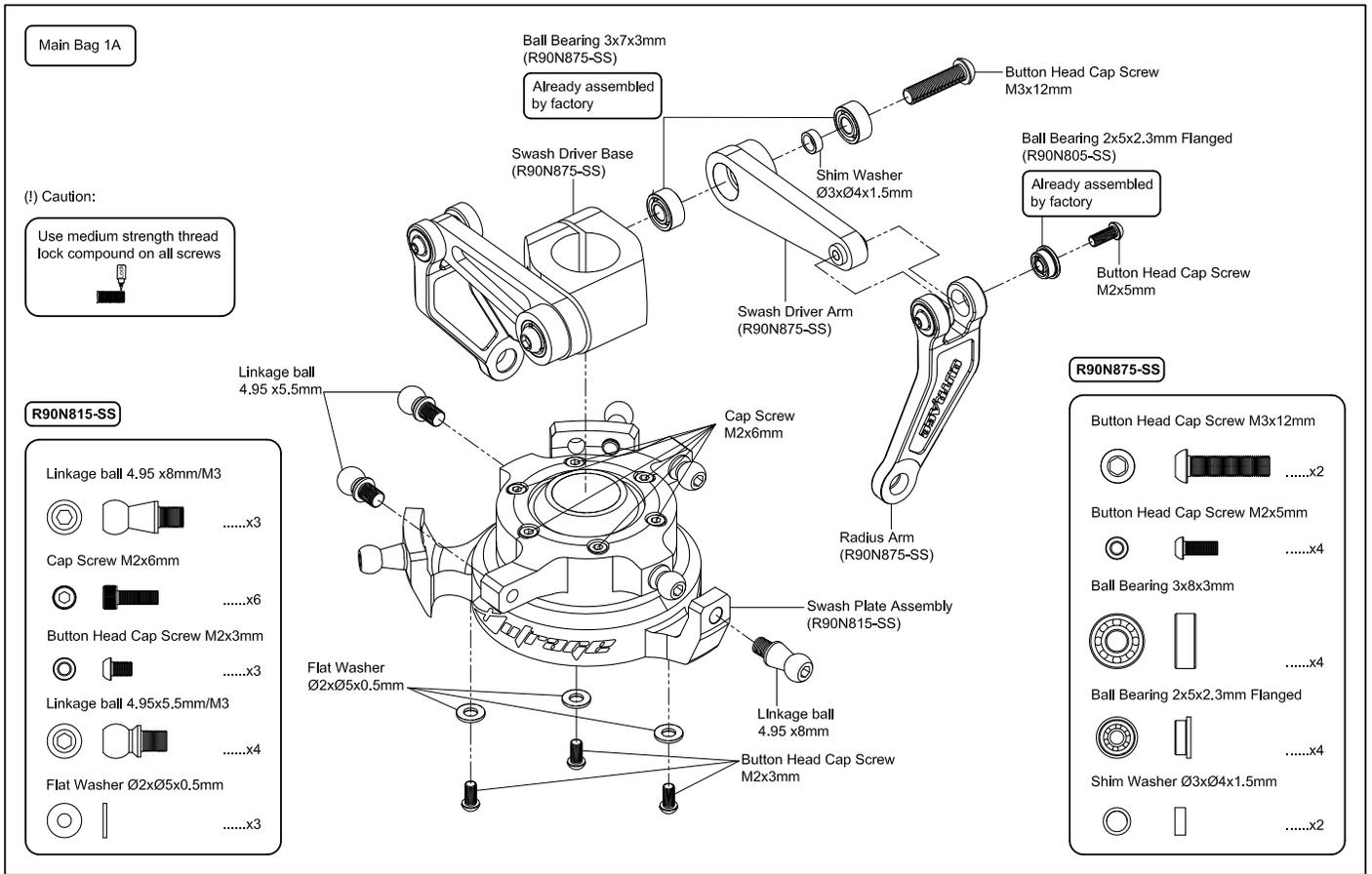


(!) Caution:



R90N810-SS





R90N829-SS

# Pre-assemble the CF right frame panel

Main Bag 2, 3, 4, 7

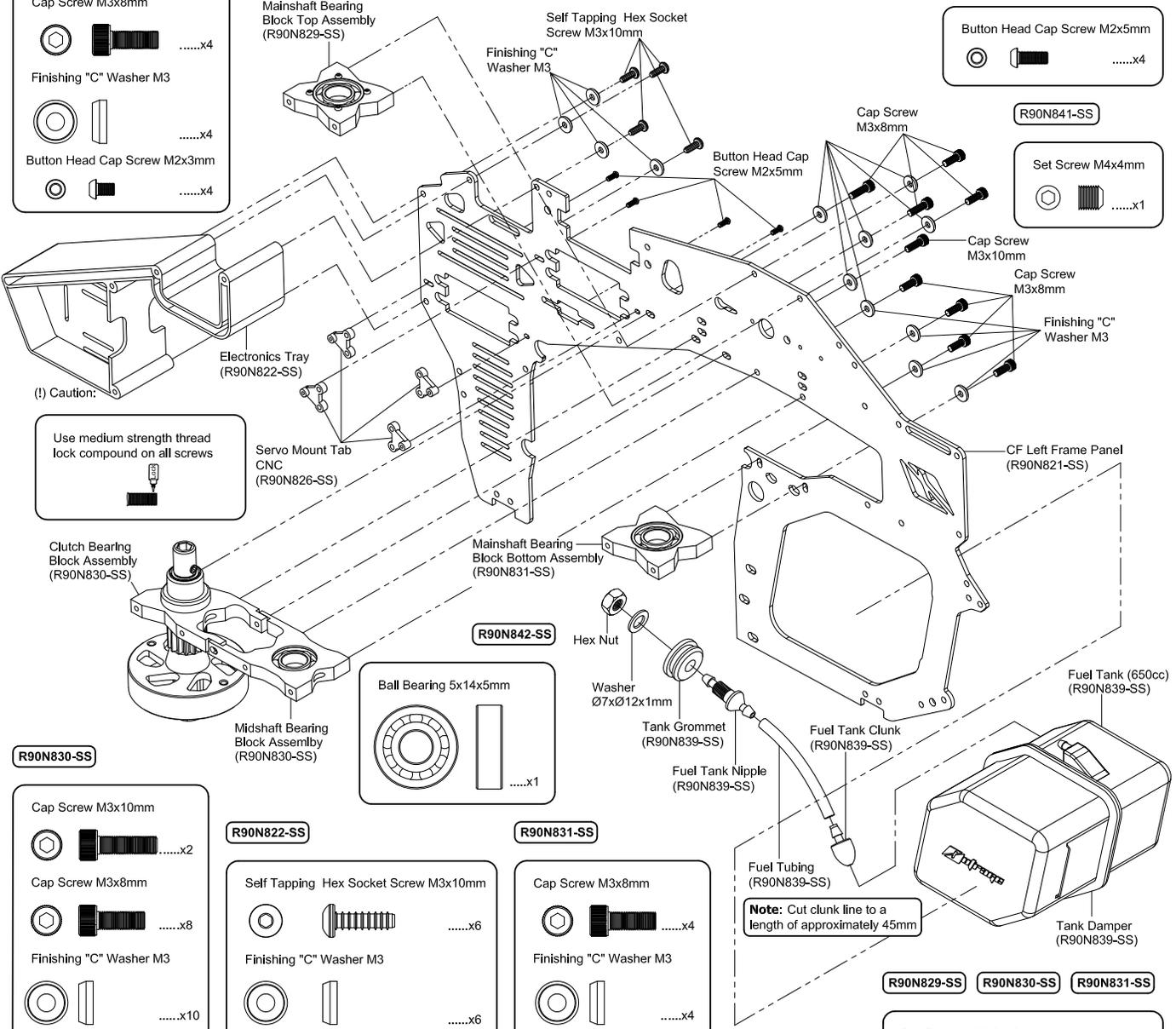
R90N826-SS

- Button Head Cap Screw M2x5mm .....x4

R90N841-SS

- Set Screw M4x4mm .....x1

- Cap Screw M3x8mm .....x4
- Finishing "C" Washer M3 .....x4
- Button Head Cap Screw M2x3mm .....x4



R90N830-SS

- Cap Screw M3x10mm .....x2
- Cap Screw M3x8mm .....x8
- Finishing "C" Washer M3 .....x10

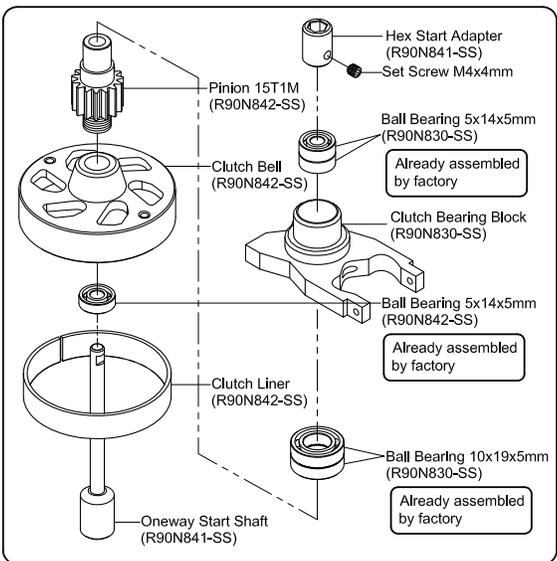
R90N822-SS

- Self Tapping Hex Socket Screw M3x10mm .....x6
- Finishing "C" Washer M3 .....x6

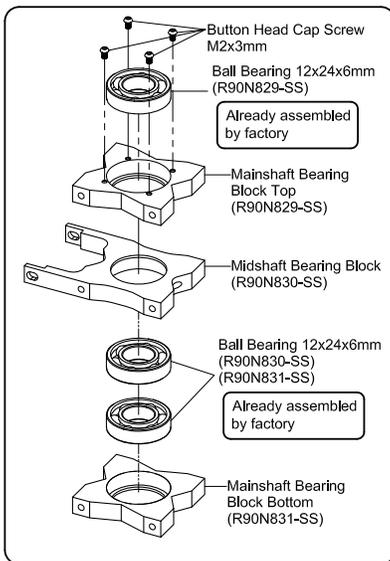
R90N831-SS

- Cap Screw M3x8mm .....x4
- Finishing "C" Washer M3 .....x4

Clutch Bearing Block Assembly



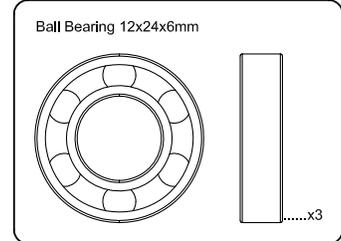
Bearing Block Top Assembly, Midshaft Bearing Block Assembly, Bearing Block Bottom Assembly.



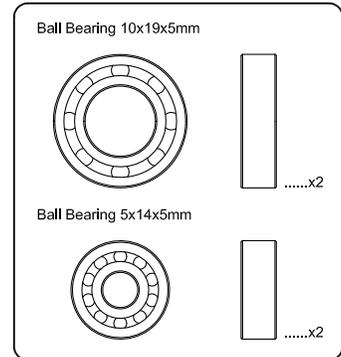
R90N829-SS

R90N830-SS

R90N831-SS



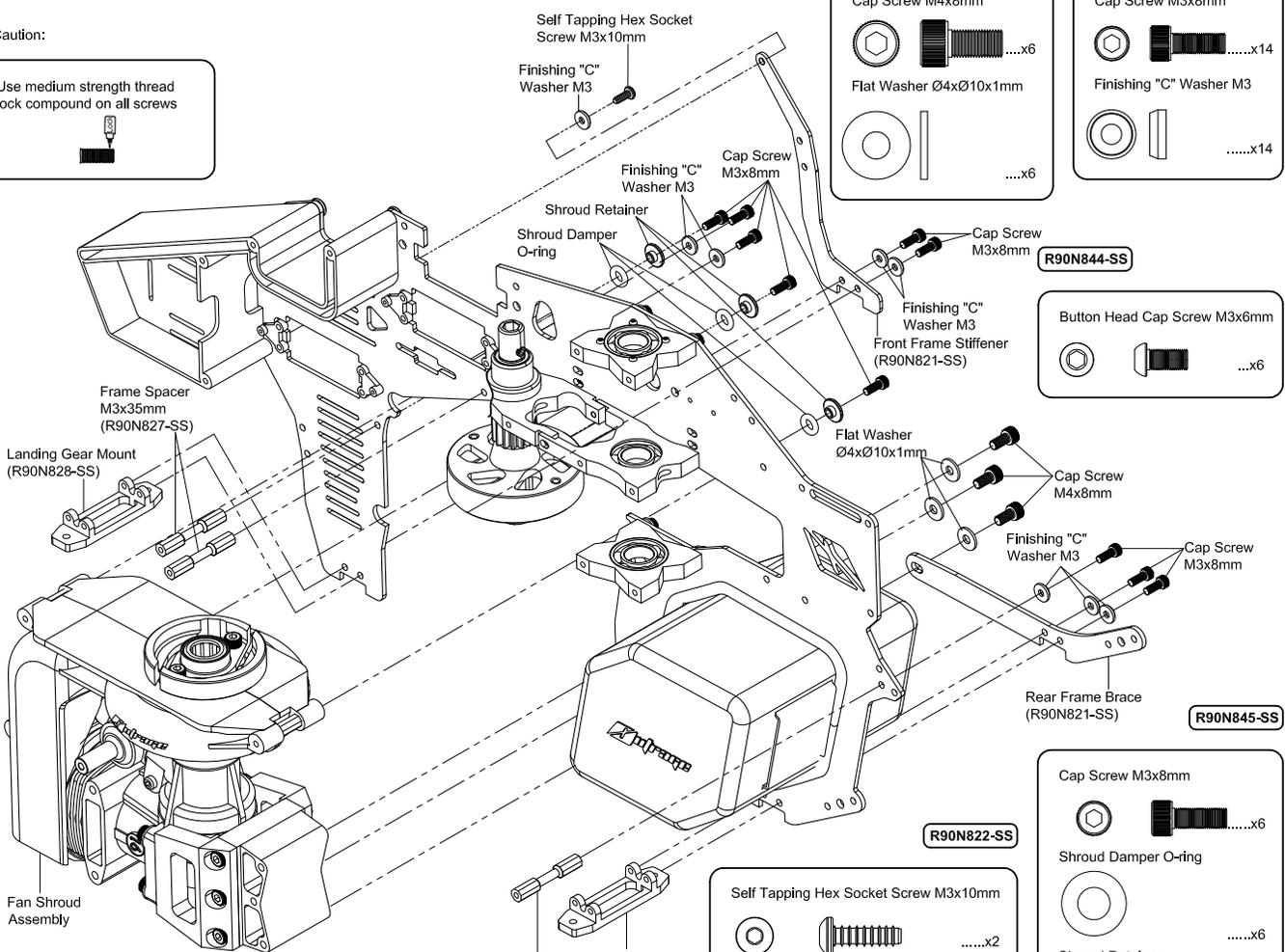
R90N830-SS



# Pre-assemble the CF right frame panel

(!) Caution:

Use medium strength thread lock compound on all screws



R90N840-SS

Cap Screw M4x14mm .....x4

Cap Screw M4x6mm .....x6

Flat Washer Ø4xØ10x1mm .....x4

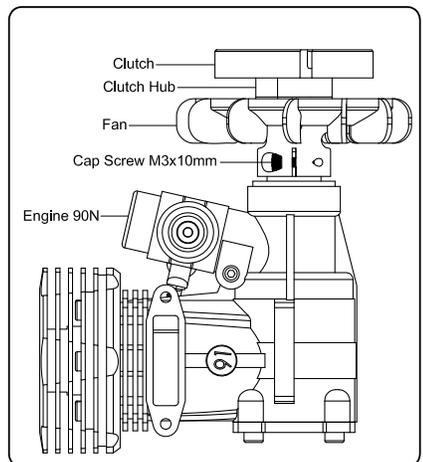
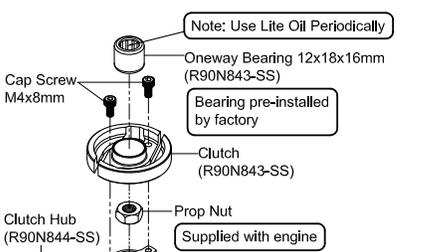
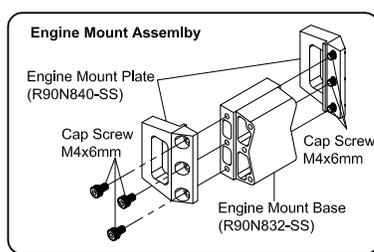
R90N843-SS

Cap Screw M3x8mm .....x2

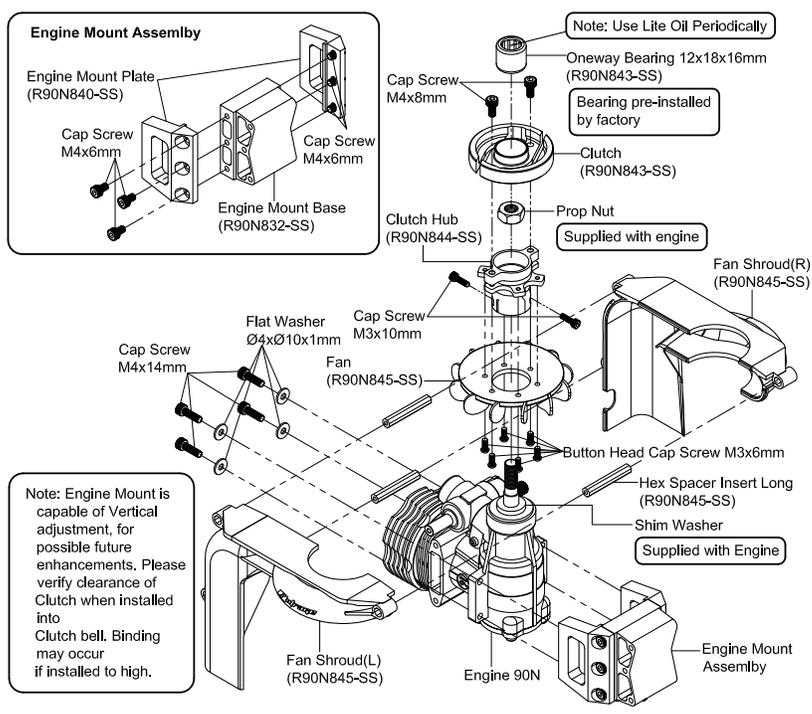
R90N844-SS

Cap Screw M3x10mm .....x2

### Fan Shroud Assembly



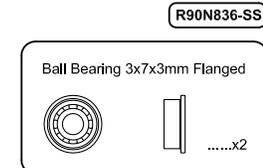
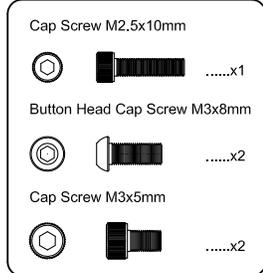
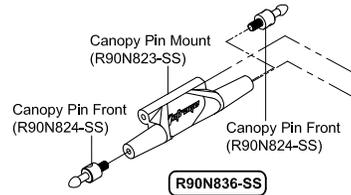
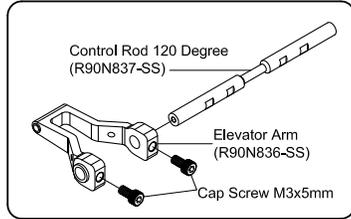
Note: Engine Mount is capable of Vertical adjustment, for possible future enhancements. Please verify clearance of Clutch when installed into Clutch bell. Binding may occur if installed to high.



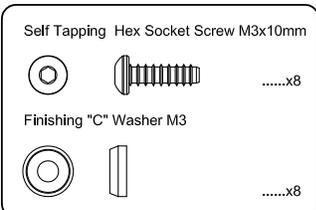
## Pre-assemble the CF right frame panel

### "A" Arm Assembly

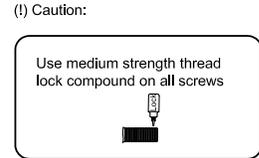
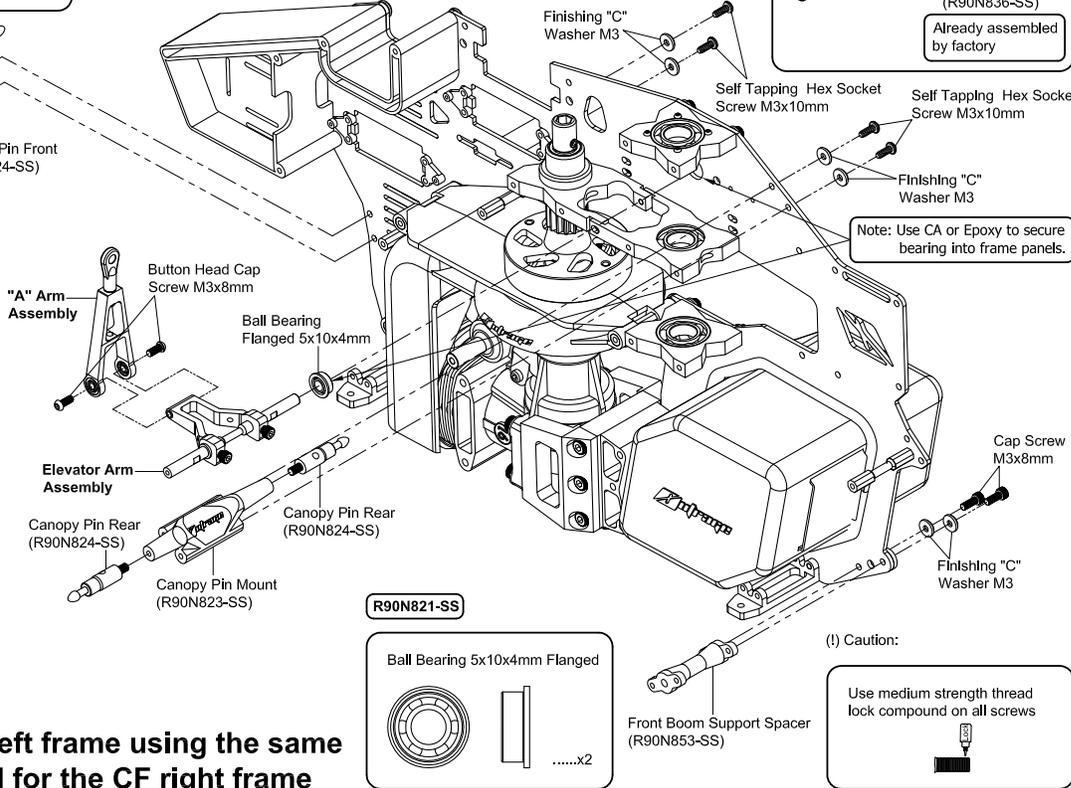
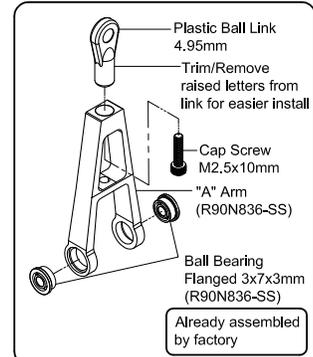
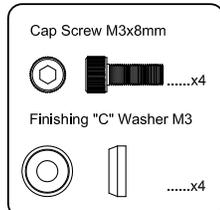
### Elevator Arm Assembly



### R90N823-SS

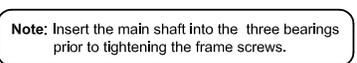
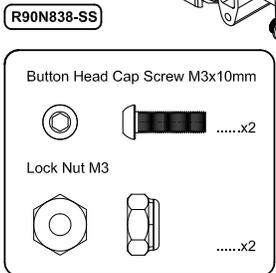
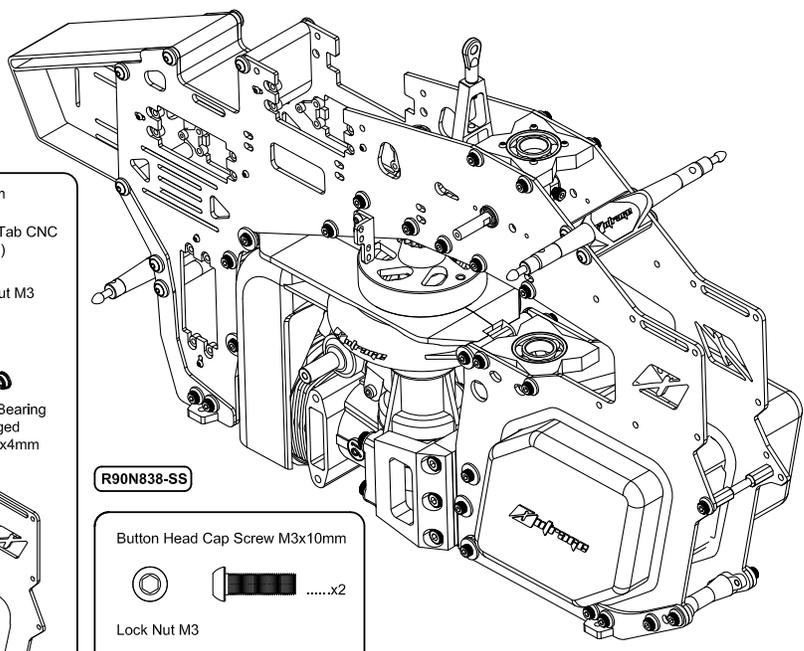
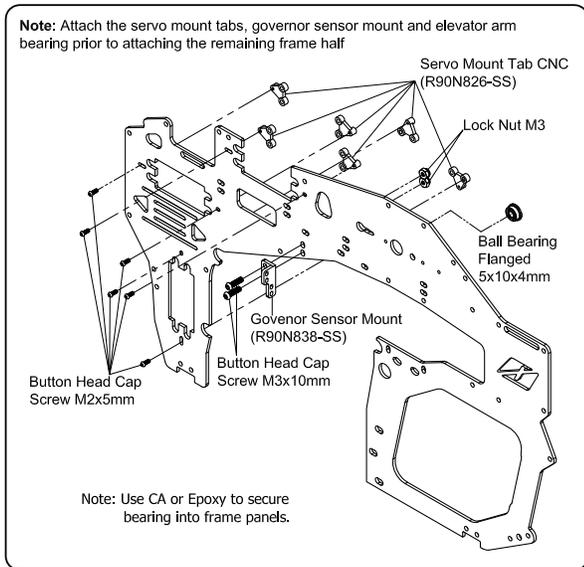
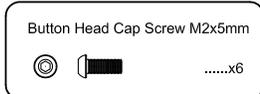


### R90N853-SS



## Now attach the CF left frame using the same bolt pattern as used for the CF right frame

### R90N826-SS



Main Bag 2, 4, 6, 9

R90N833-SS

R90N834-SS

Ball Bearing 5x9x3mm



.....x4

Linkage Ball 4.95x5.5mm



.....x6

R90N828-SS

Cap Screw M3x14mm



.....x4

Flat Washer Ø3xØ7x0.8mm



.....x4

R90N847-SS

Cap Screw M2.5x8mm



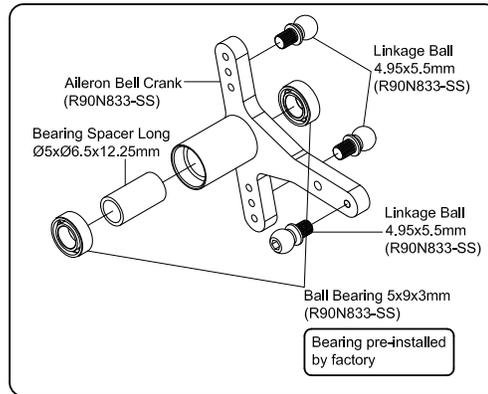
.....x4

Lock Nut M2.5

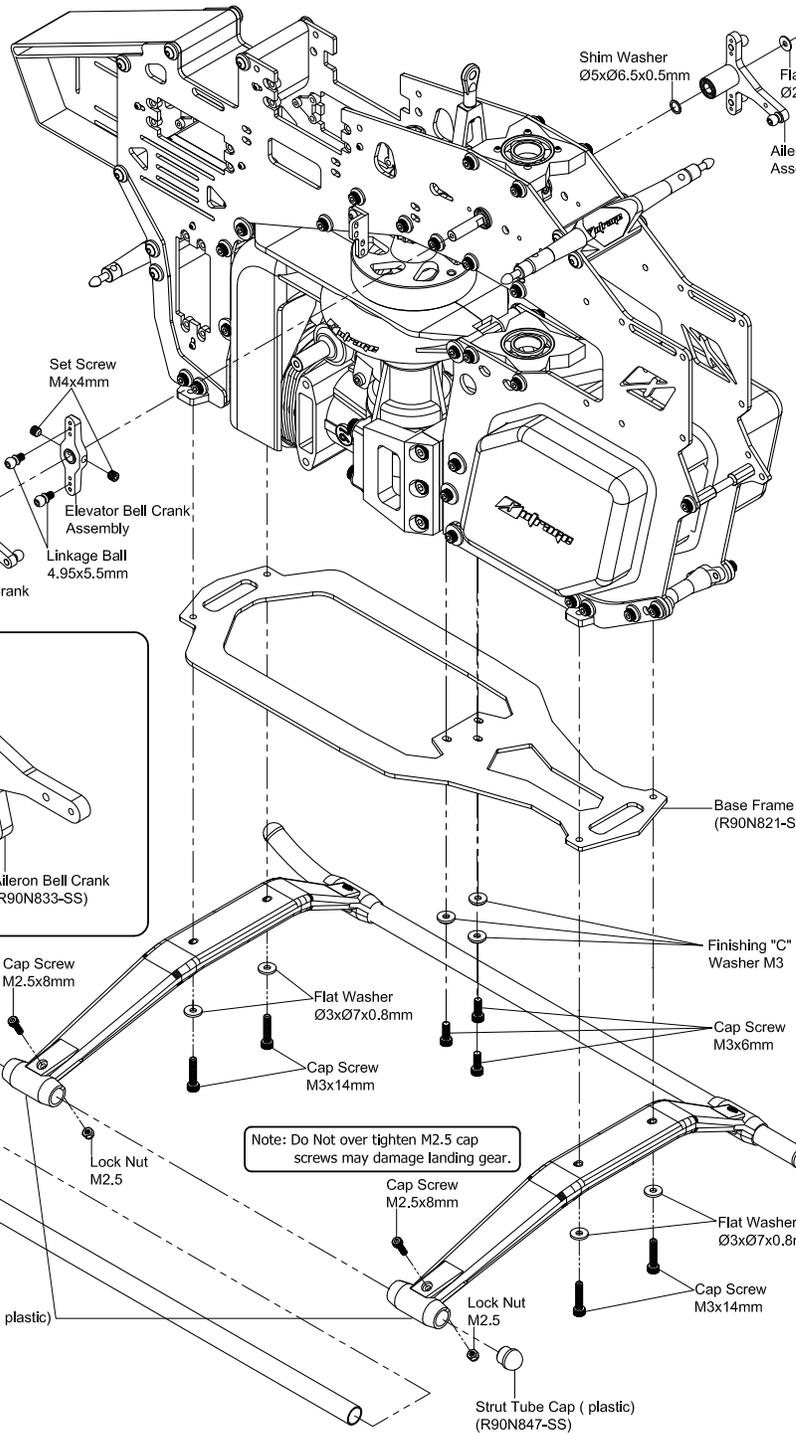
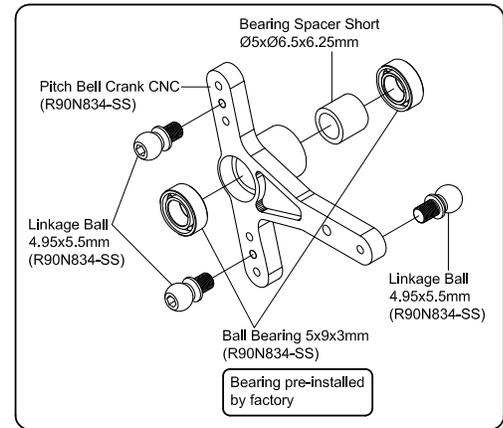


.....x4

### Aileron Bell Crank Assembly



### Pitch Bell Crank Assembly



R90N835-SS

Set Screw M4x4mm



.....x2

Linkage Ball 4.95x5.5mm



.....x2

R90N832-SS

Cap Screw M3x6mm



.....x3

Finishing "C" Washer M3



.....x3

R90N837-SS

Cap Screw M2.5x6mm



.....x2

Flat Washer Ø2.5xØ8x0.5mm



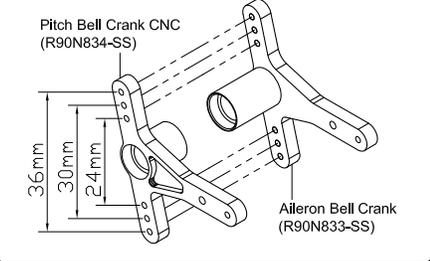
.....x2

Shim Washer Ø5xØ6.5x0.5mm



.....x1

Note: Diagram for linkage ball spacing



Note: Do not over tighten M2.5 cap screws may damage landing gear.

(!) Caution:

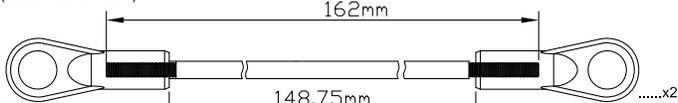
Use medium strength thread lock compound on all screws



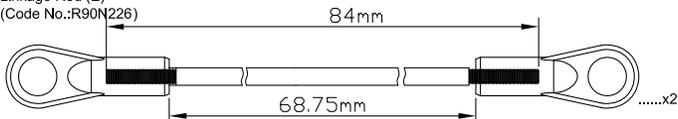
Main Bag 2, 10

R90N848-SS

Linkage Rod (D)  
(Code No.:R90N224)



Linkage Rod (E)  
(Code No.:R90N226)



Note: Drawing Not To Scale

R90N826-SS

Cap Screw M2.5 x15mm



Cap Screw M2.5 x12mm



R90N848-SS

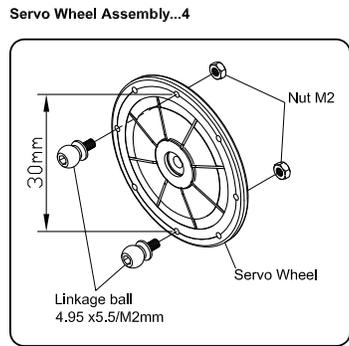
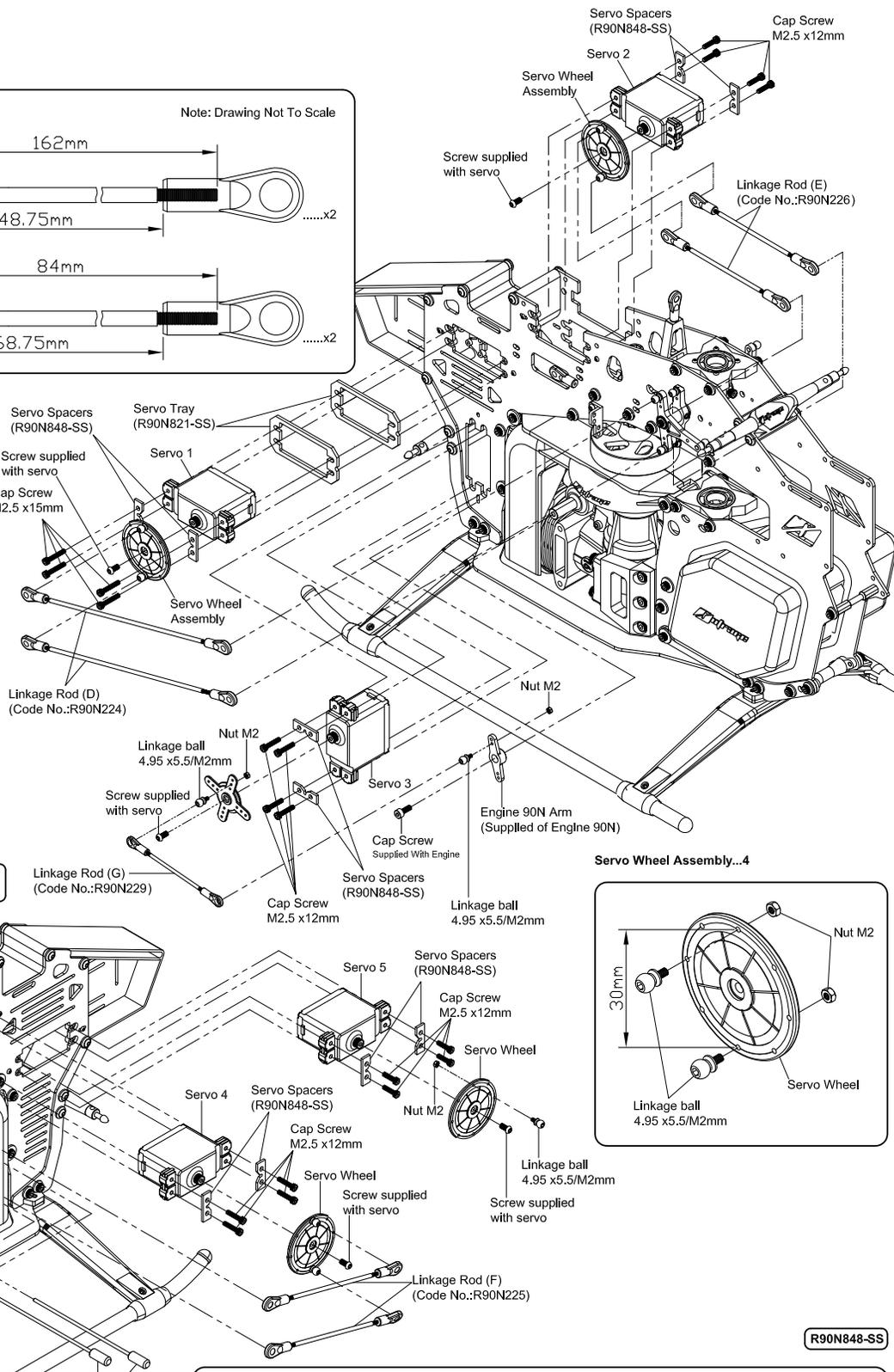
Linkage ball 4.95 x5.5/M2mm



Nut M2



Elevator servo can be install in or outside frame for best linkage rod alignment.

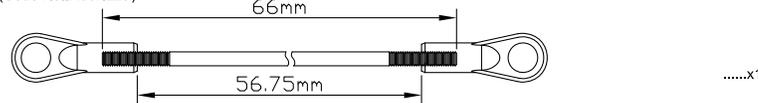


R90N848-SS

Linkage Rod (F)  
(Code No.:R90N225)



Linkage Rod (G)  
(Code No.:R90N229)

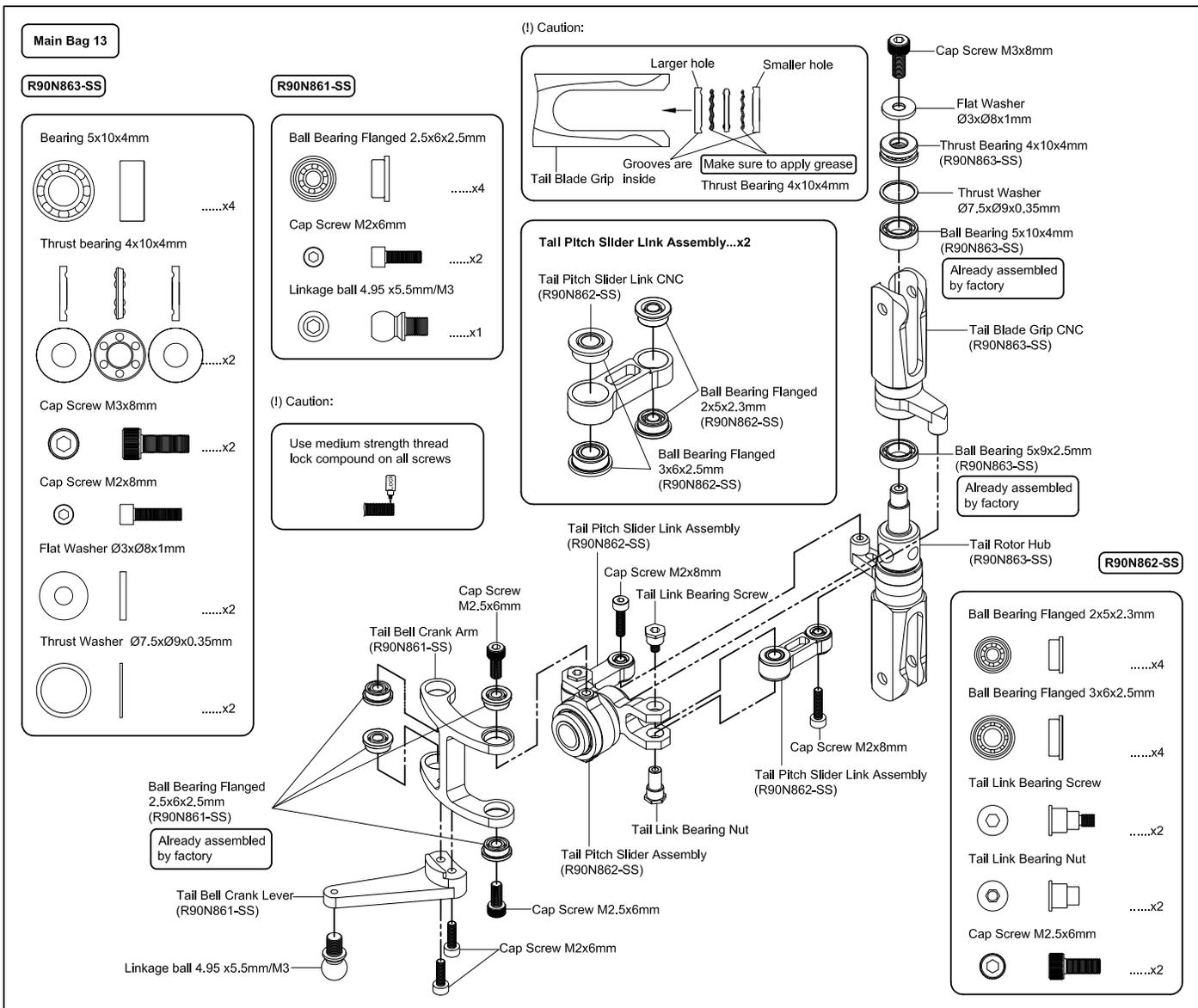
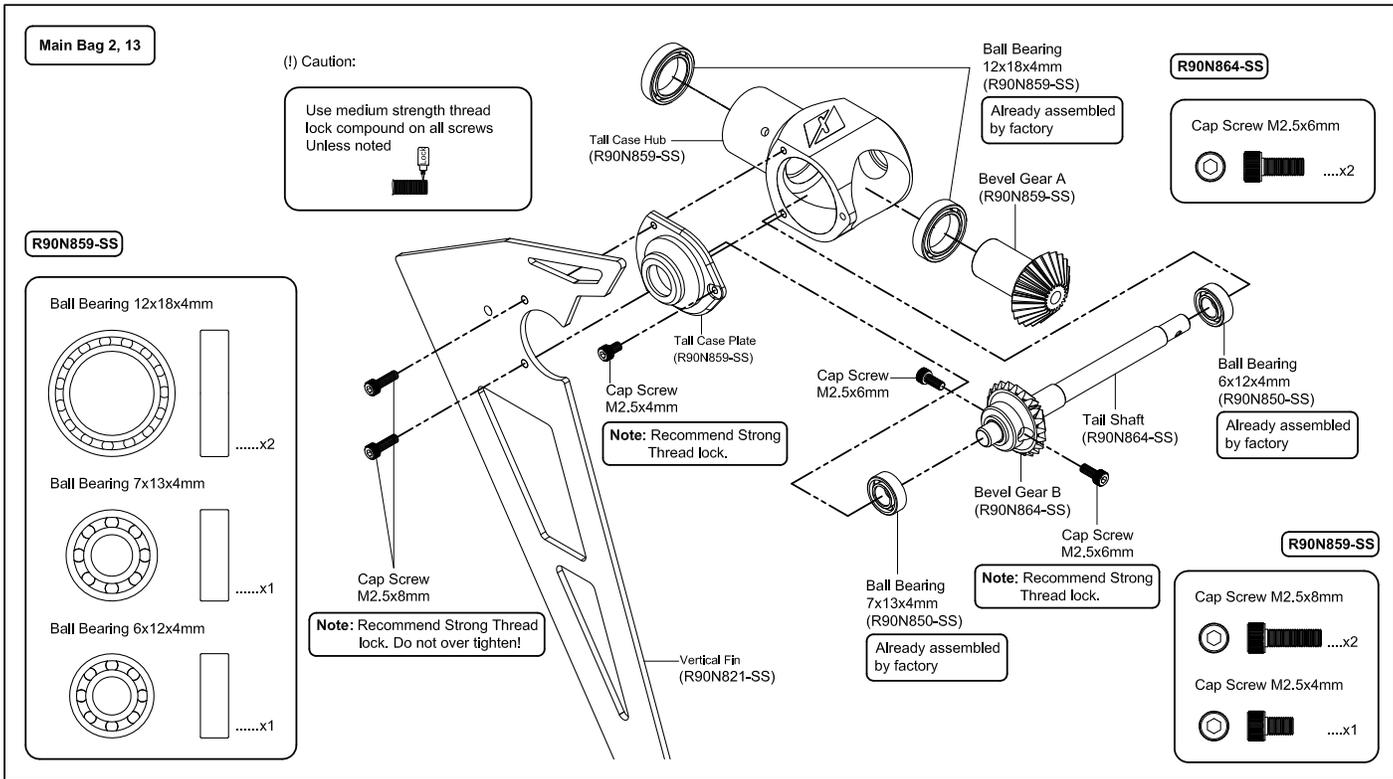


Note: Drawing Not To Scale

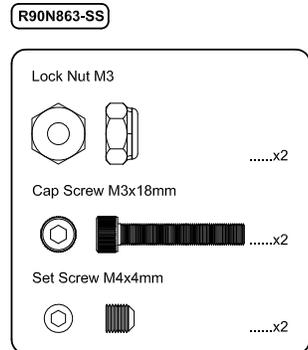
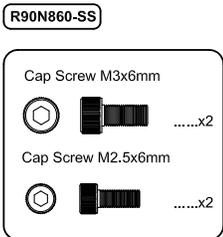
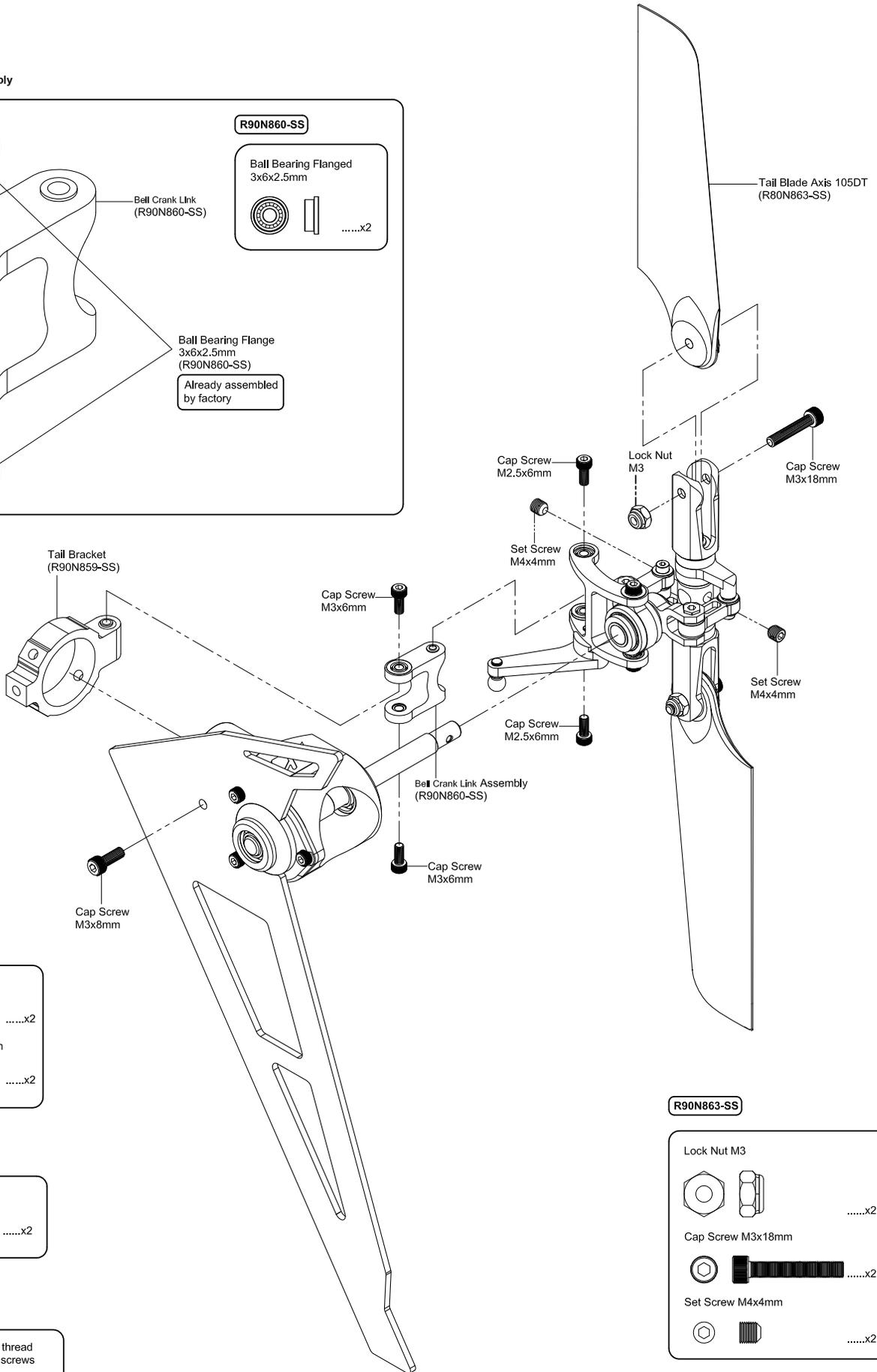
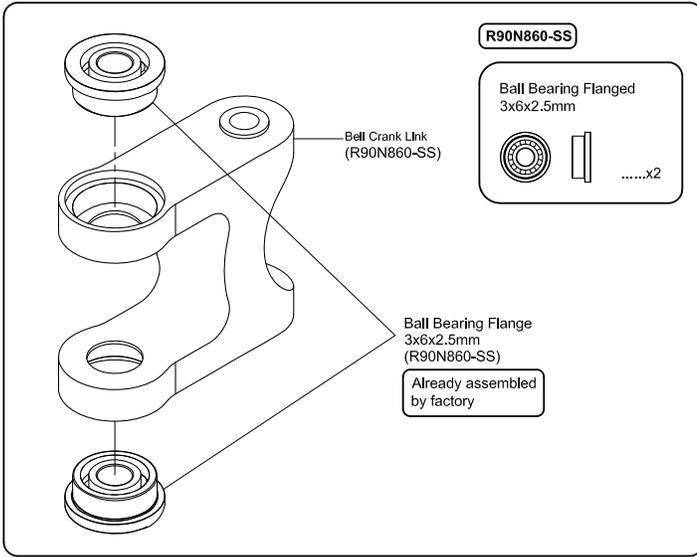
(!) Caution:

Use medium strength thread lock compound on all screws

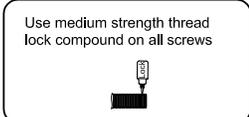




Bell Crank Link Assembly



(!) Caution:



Main Bag 11, 12

R90N851-SS

Button Head Cap Screw  
M2.5x5mm



.....x4

R90N855-SS

Plastic Ball Linkage 4.95mm



.....x2

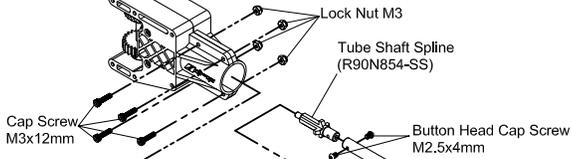
Self Tapping Cap Screw M2x10mm



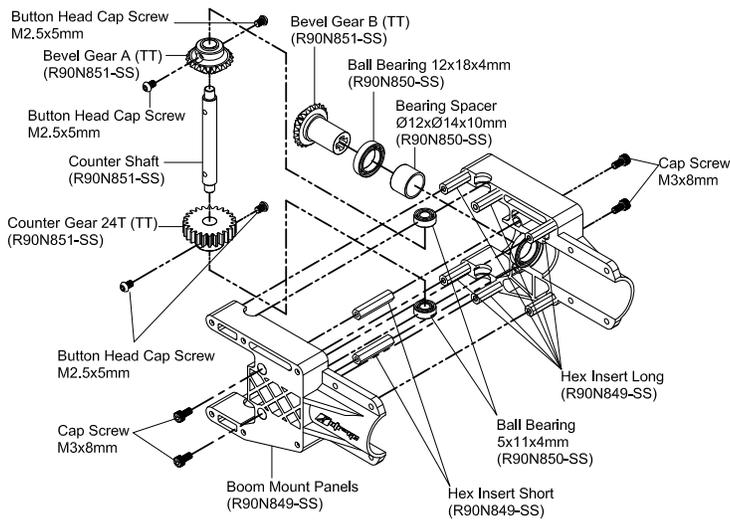
.....x2

Boom Mount Assembly

Already assembled by factory



Boom Mount Assembly



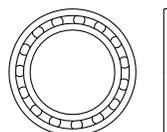
R90N850-SS

Ball Bearing 5x11x4mm



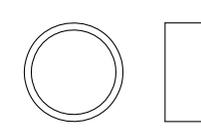
.....x2

Ball Bearing 12x18x4mm



.....x2

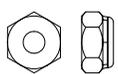
Bearing Spacer 12x14x10mm



.....x1

R90N849-SS

Lock Nut M3



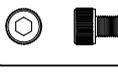
.....x4

Cap Screw M3x8mm



.....x4

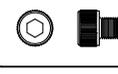
Cap Screw M3x12mm



.....x4

R90N859-SS

Cap Screw M3x6mm



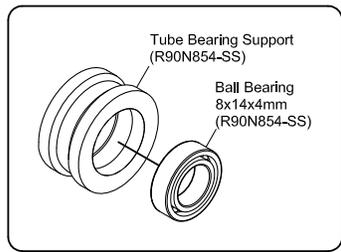
.....x4

(!) Caution:

Use medium strength thread lock compound on all screws

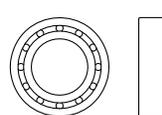


Tube Bearing Support Assembly



R90N854-SS

Ball Bearing 8x14x4mm



.....x2

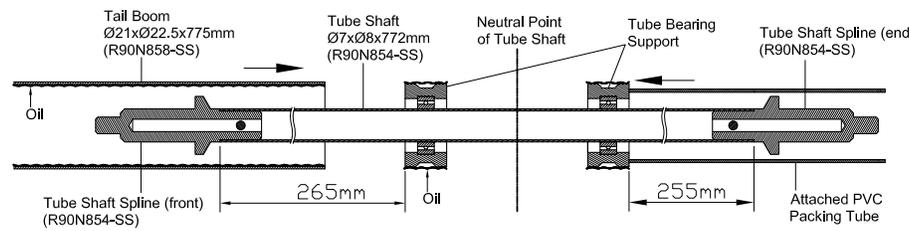
Button Head Cap Screw M2.5x4mm



.....x4

Note: Tube Shaft Assembly

Set bearing positions using the measurement below. Lock bearings in place using a small amount of CA glue only on the inner race of the bearing. Apply lite oil at opening of boom for first rubber bearing support installation then again prior to second support to allow support to slide in place easier. Use packaging tube to aid in installation. Do not use excessive force when pushing into place as this may cause bearings to unseat from supports. Once installed verify all bearings remain seated in place. After installing boom and tail case assemblies verify no binding with any of the bevel gears to prevent premature failure.



Main Bag 2, 3, 11, 12

R90N857-SS

- Cap Screw M4x10mm .....x2
- Cap Screw M3x8mm .....x2
- Cap Screw M2x5mm .....x2
- Flat washer Ø2xØ5x0.5mm .....x2

R90N852-SS

- Cap Screw M3x12mm .....x1
- Linkage ball 4.95 x5.5mm/M3 .....x2
- Ball Bearing 3x8x3mm .....x2
- Washer 3x5x1.5mm .....x2
- Washer 3x5x1.5mm .....x1

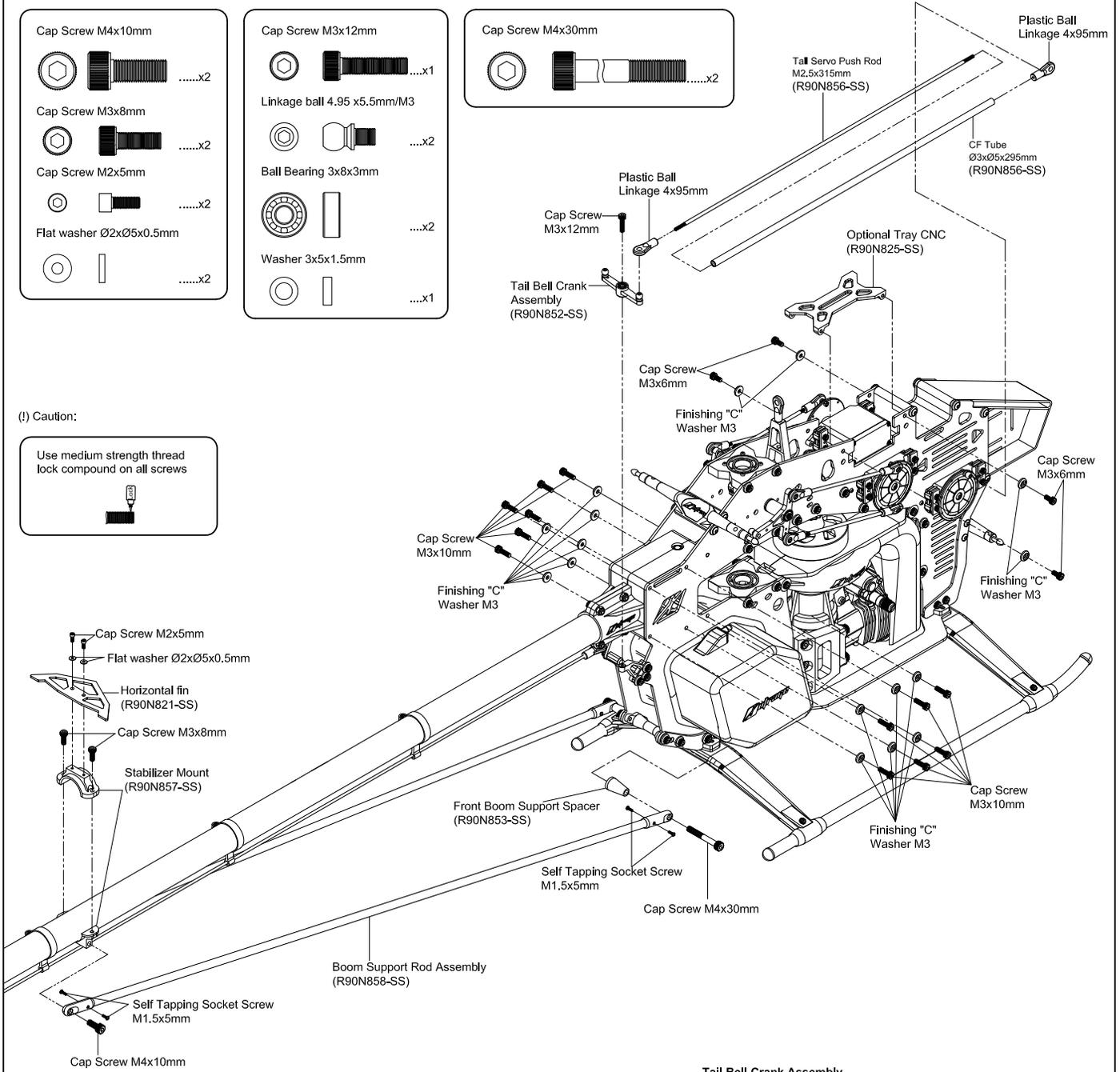
R90N853-SS

- Cap Screw M4x30mm .....x2

**Note:**  
Once the tail linkage is set up, remove this linkage from the model and add some CA down into the CF tube to secure it to the pushrod. Once cured, re-fit to the model.

(!) Caution:

Use medium strength thread lock compound on all screws



R90N856-SS

- Plastic Ball Linkage 4x95mm .....x2

R90N858-SS

- Self Tapping Socket Screw M1.5x5mm .....x8

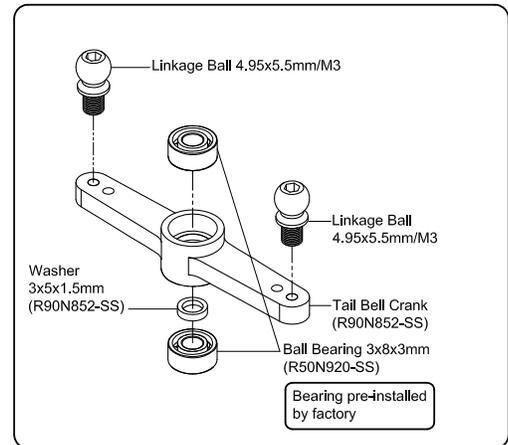
R90N849-SS

- Cap Screw M3x10mm .....x12
- Finishing "C" Washer M3 .....x12

R90N825-SS

- Cap Screw M3x6mm .....x4
- Finishing "C" Washer M3 .....x4

Tail Bell Crank Assembly

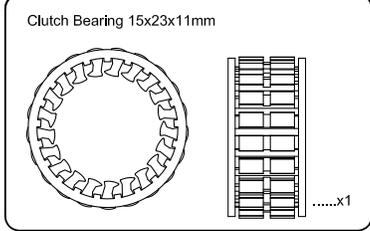


R90N846-SS

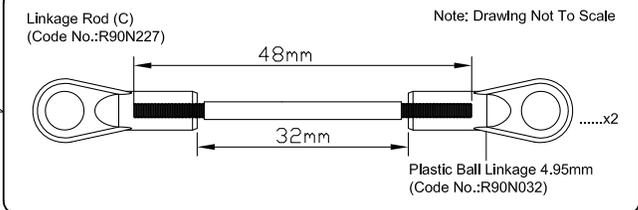
**Note:** These linkage rod lengths also apply for the flybarless head.

R90N846-SS

- Cap Screw M4x26mm shouldered .....X1
- Button Head Cap Screw M3x8mm .....X6
- Button Head Cap Screw M3x6mm .....X6
- Lock Nut M4 .....X1



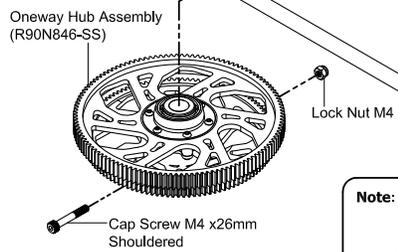
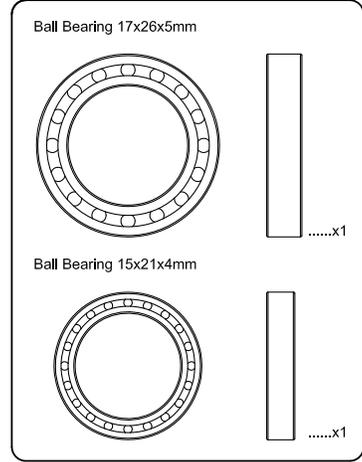
R90N848-SS



**Note:** The engine mount is adjustable front to back to allow for possible future equipment options. Correct setting of the gear mesh is required.

**Correct gear mesh** can be achieved by using a strip of paper of similar thickness to that used in this manual. Install the paper strip between the pinion and main gear and then remove all slop between the teeth by moving the clutch bearing block and engine mount together as one unit toward main gear. Next secure all frame screws, remove the paper strip and verify the mesh setting. A proper mesh setting will have very little to almost zero backlash when slightly rotating the pinion CW / CCW.

R90N846-SS

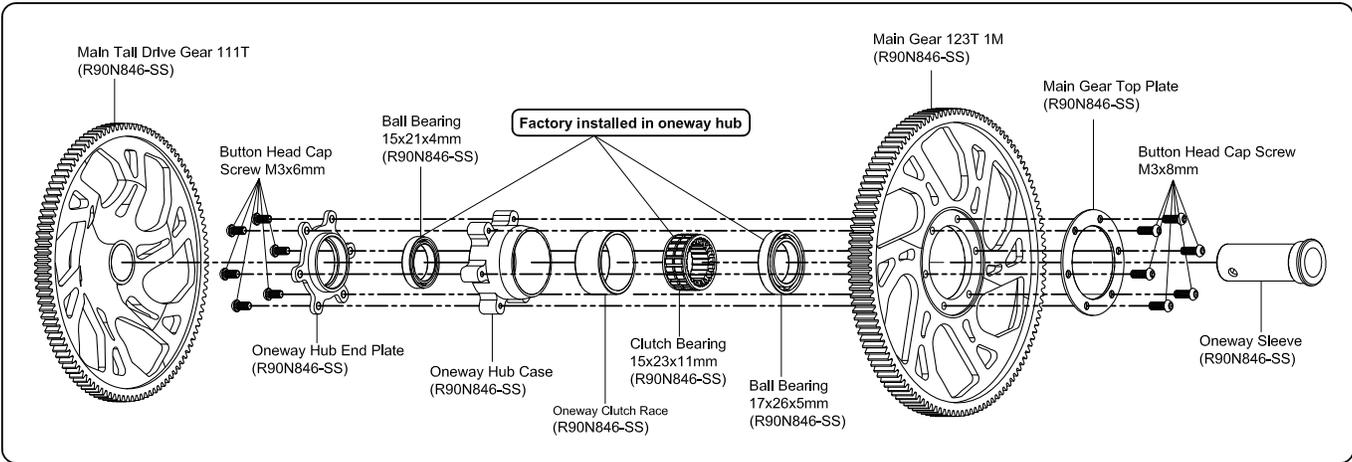


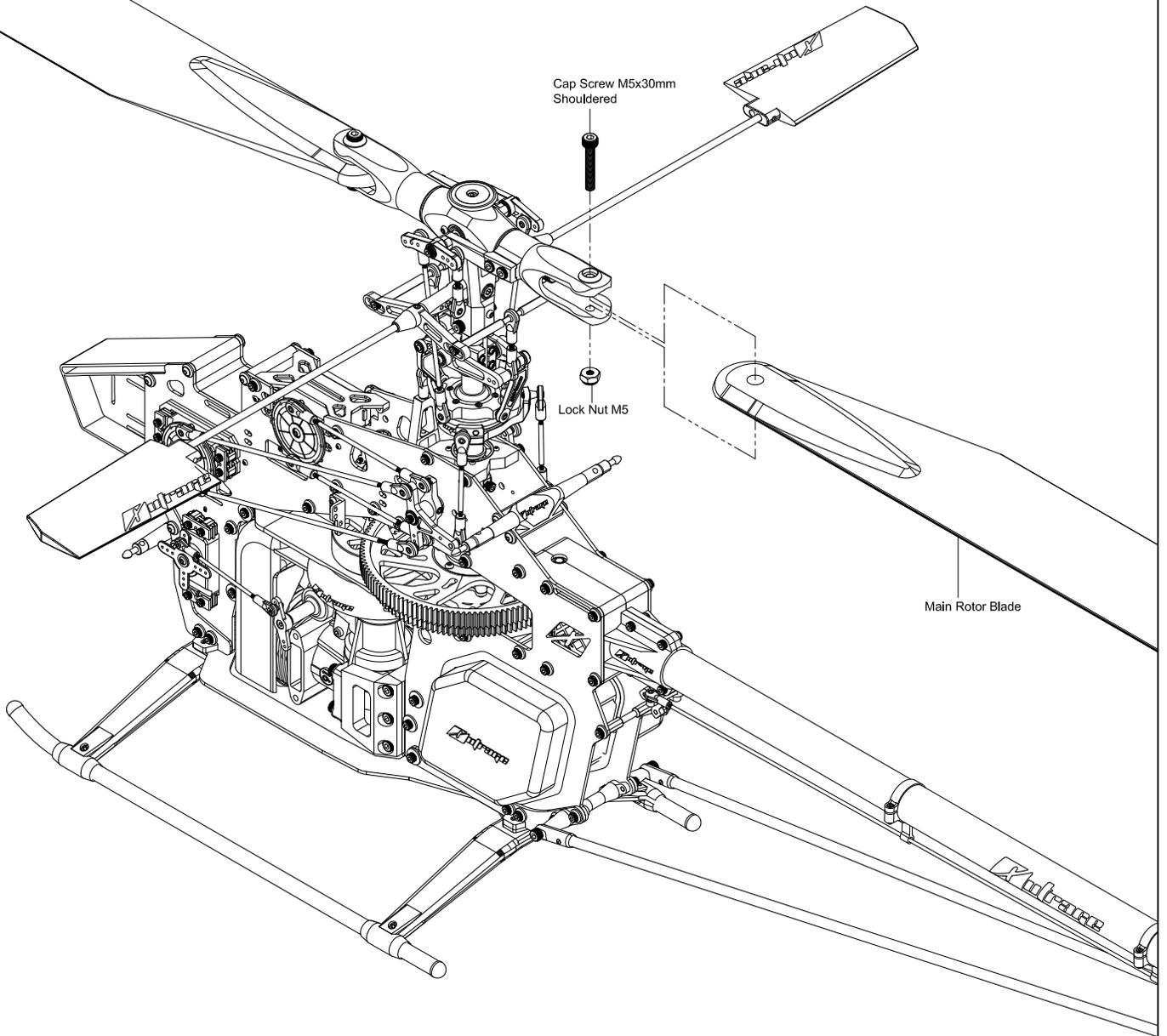
(!) Caution:

Use medium strength thread lock compound on all screws

**Note:** Lower bearing block is adjustable to remove any up / down play in main shaft assembly. Use tool in cut outs below bearing block screws to remove end play.

Oneway Hub Assembly



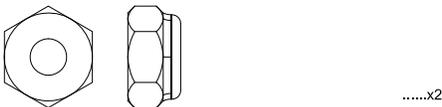


R90N807-SS

Cap Screw M5x30mm shouldered



Lock Nut M5



(I) Caution:

Use medium strength thread lock compound on all screws



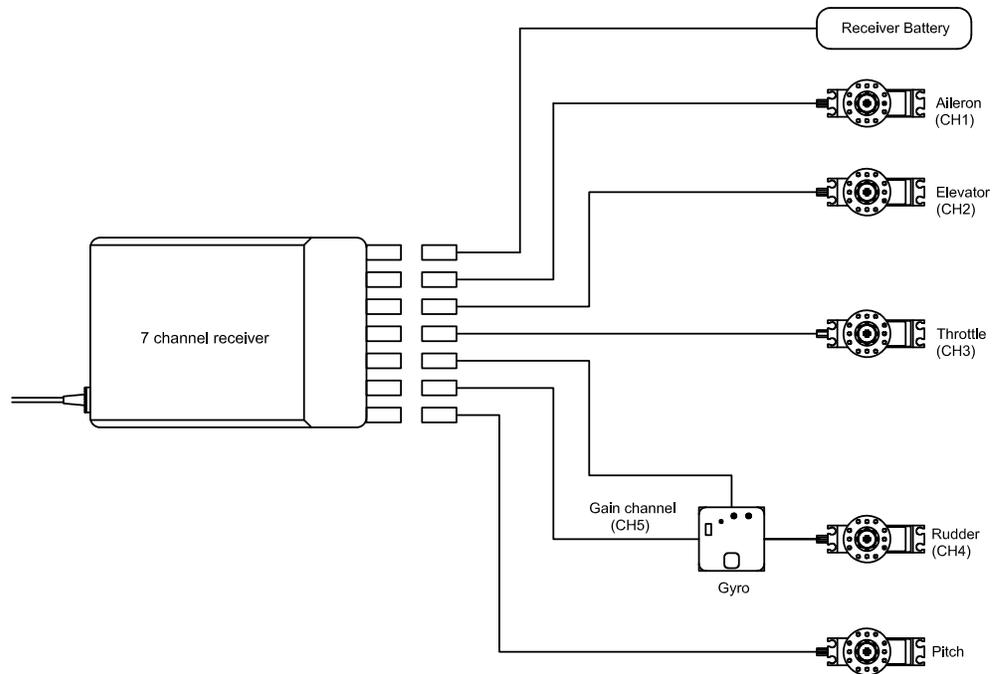


Diagram 1: FUTABA, HITEC 7CH receiver wiring

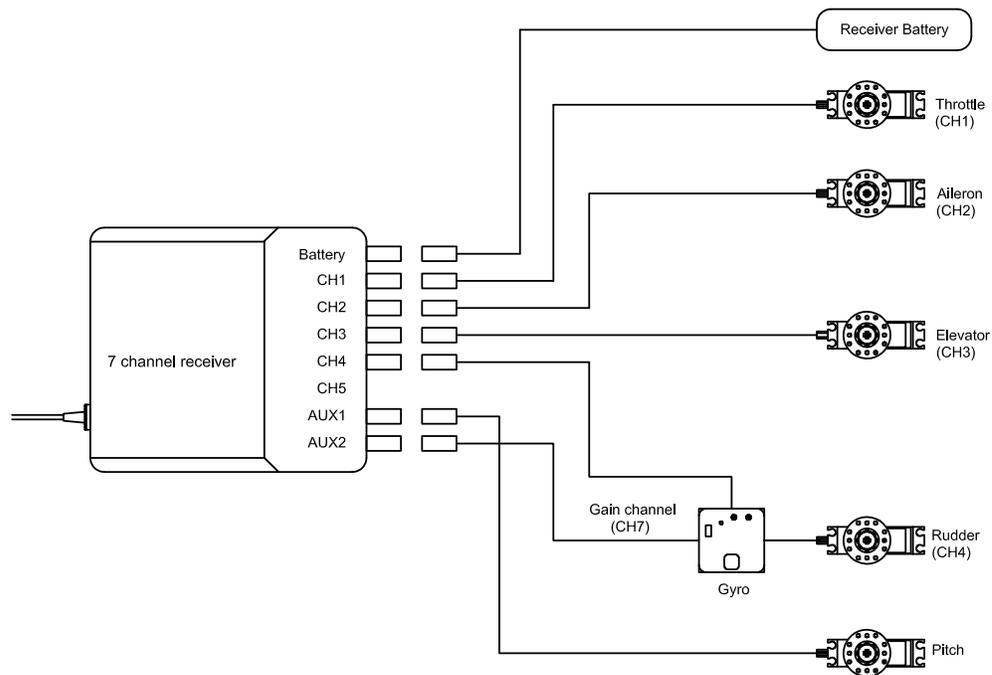
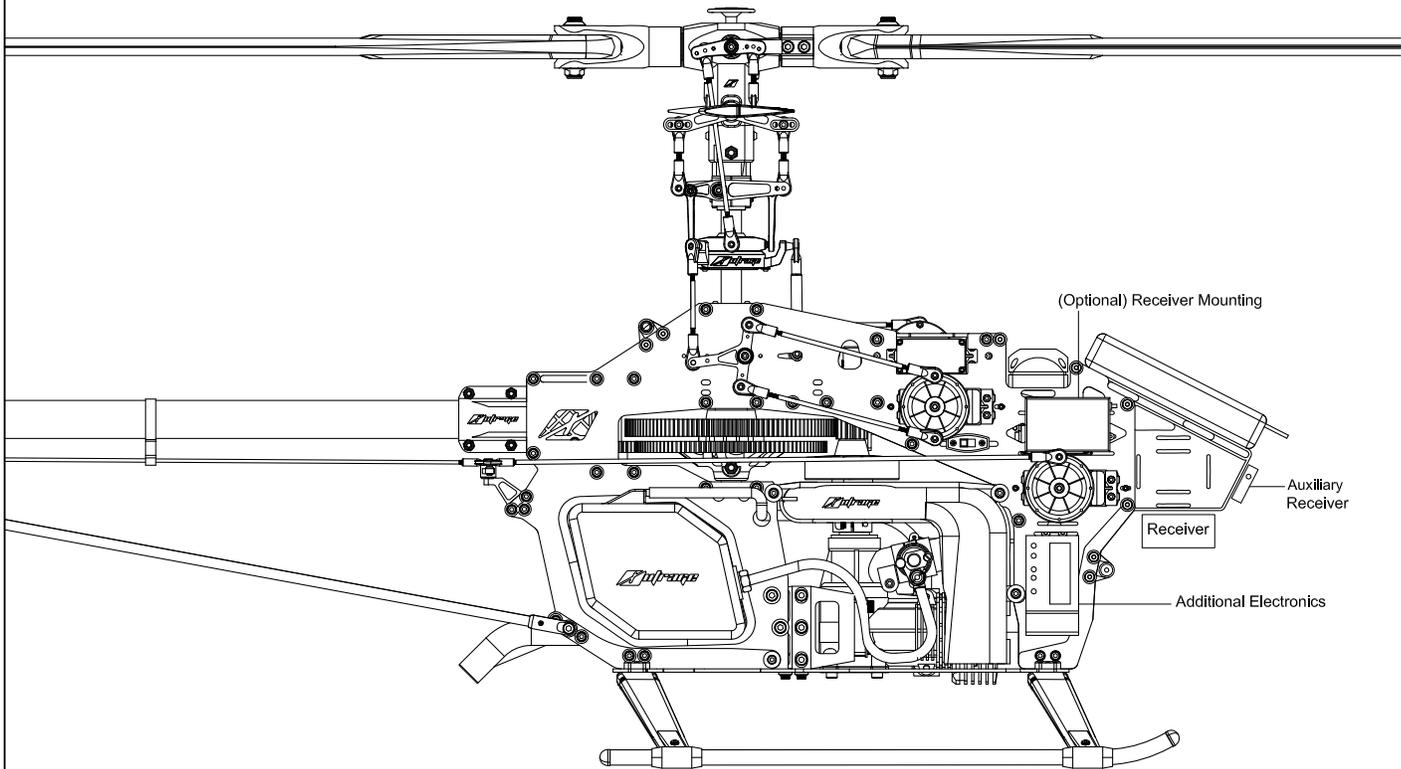
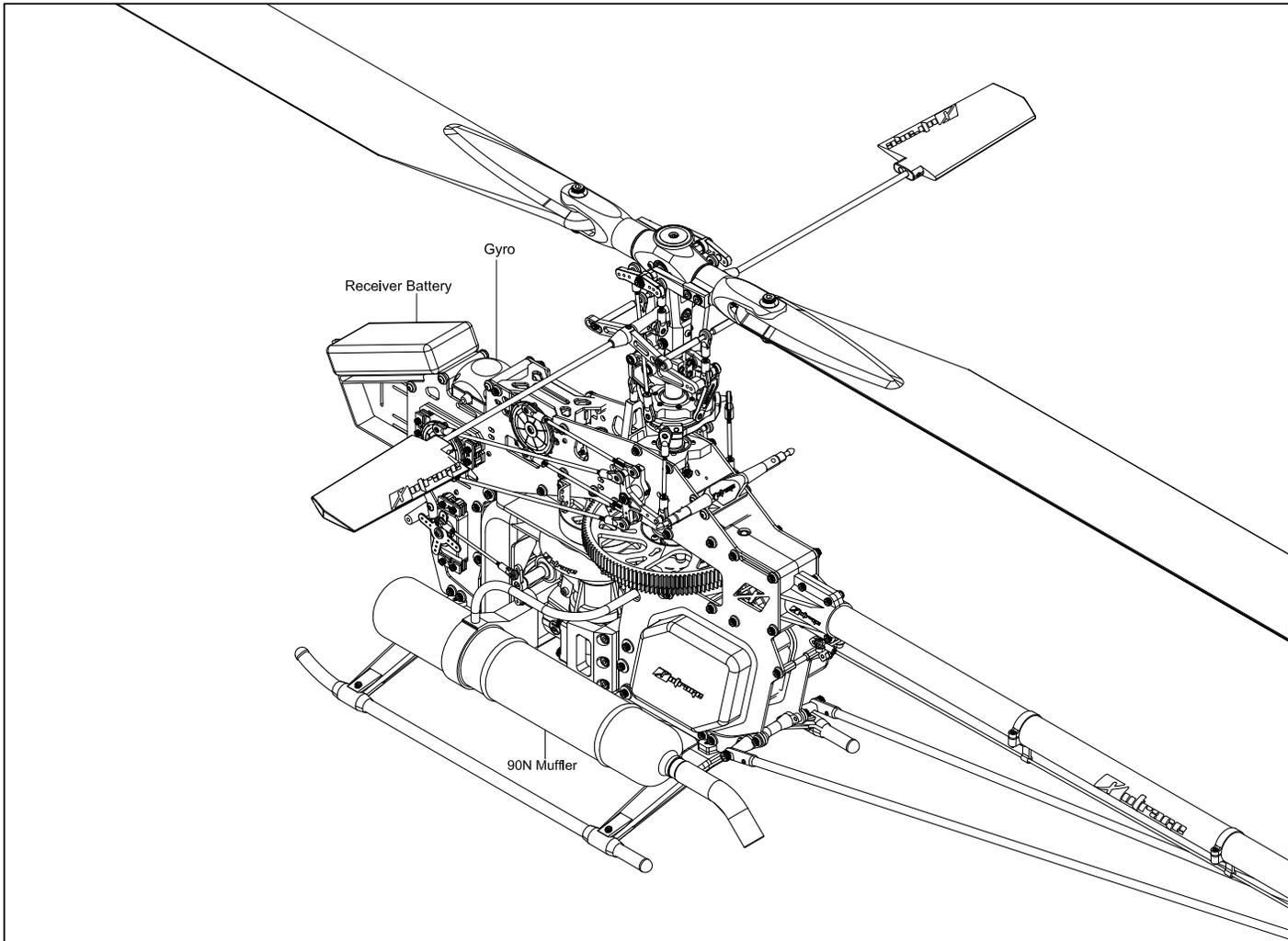
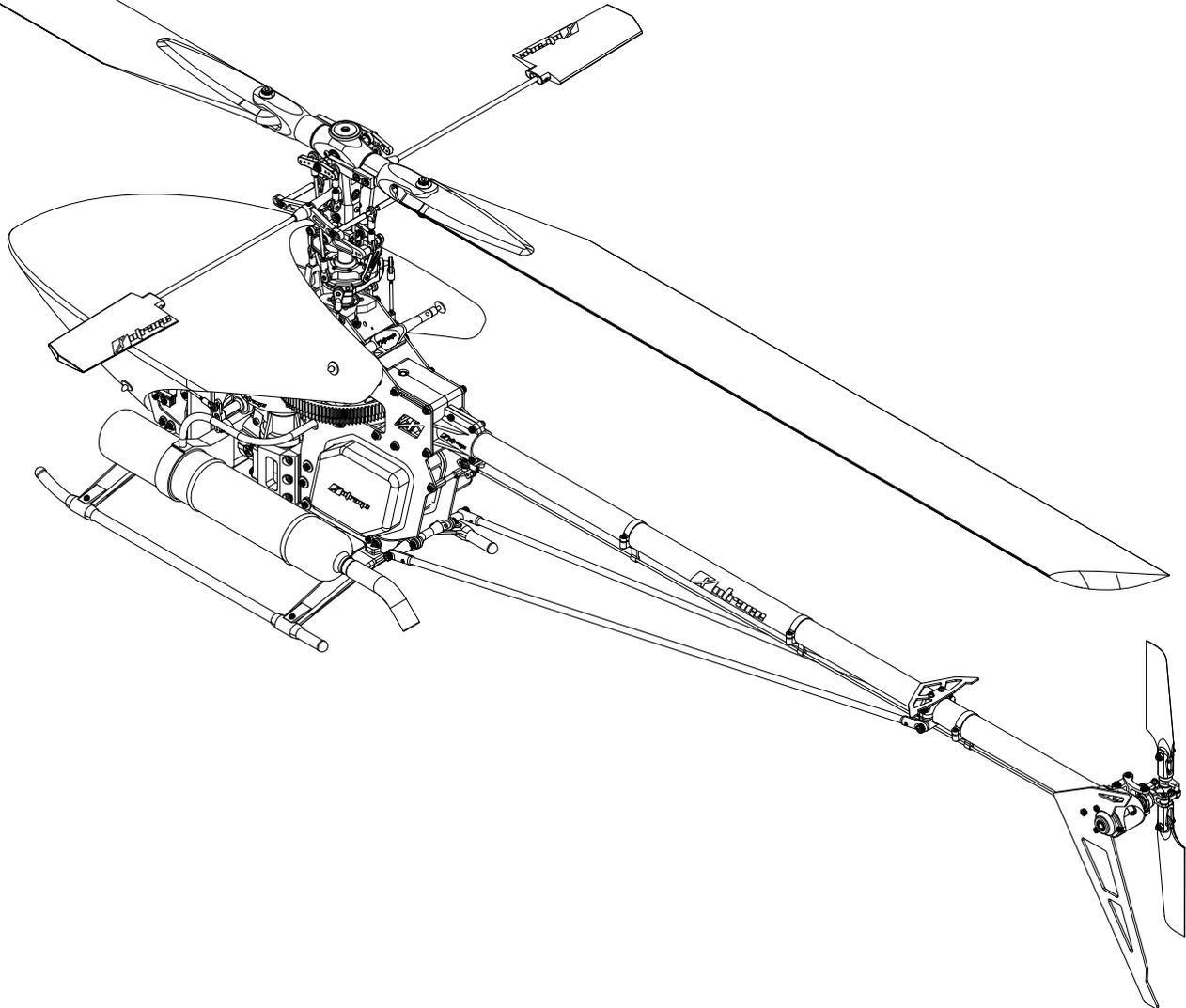
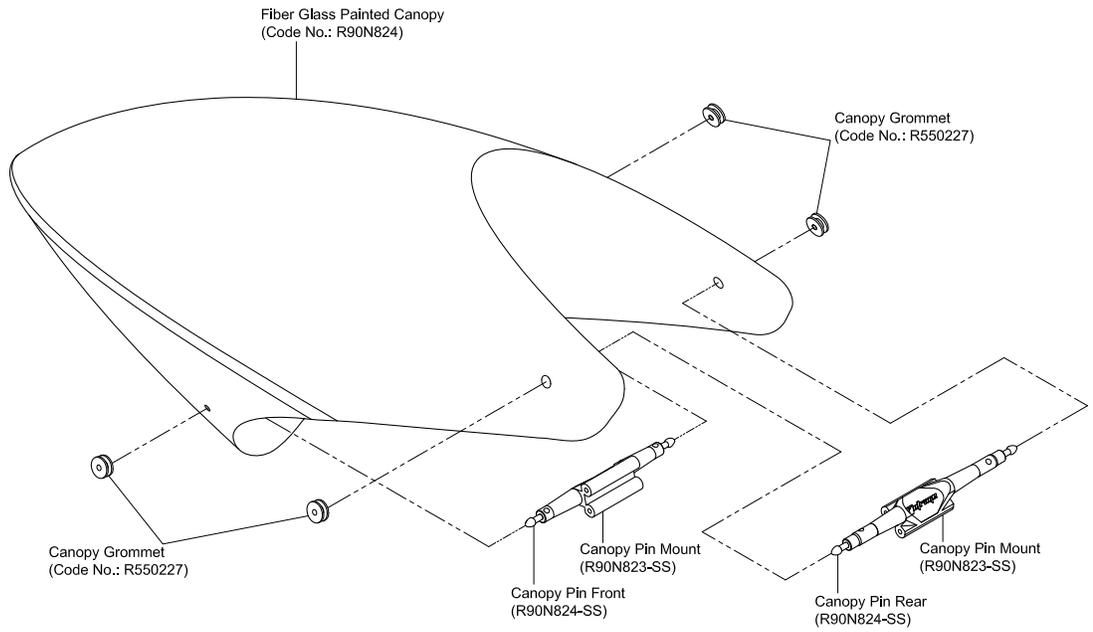


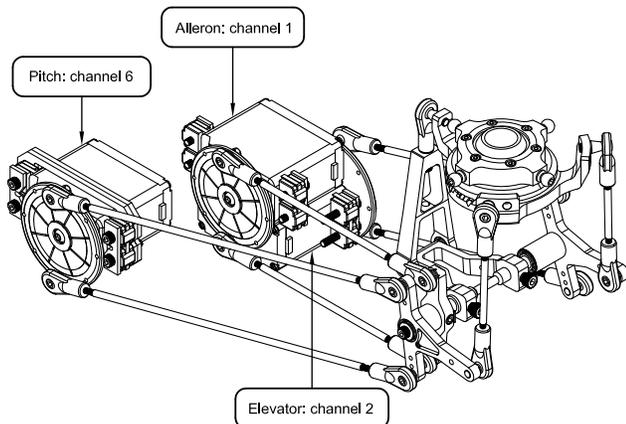
Diagram 2: JR 7CH receiver wiring





## Servo setting and adjustment

To perform servo setup and adjustment, turn on your transmitter and then power up the receiver



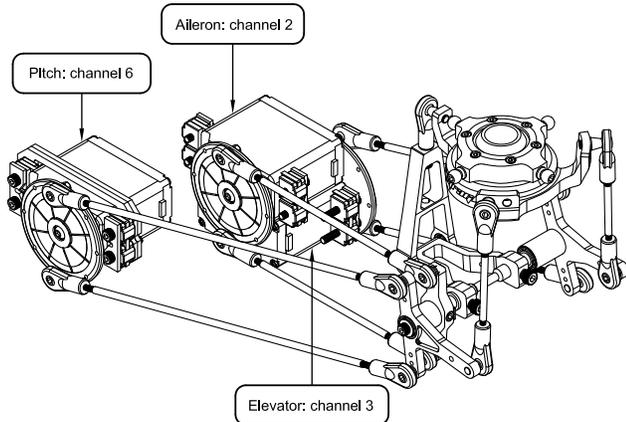
### Futaba/Hitec transmitter servo position

Set transmitter to 120 (standard) or 140(Optional, Upgrade) Degree CCPM mode, ensure all sub trims set to zero.

Set all servo travel values to 100. In the swash menu set values for pitch, Aileron, and Elevator to 50 initially (these values are only basic your final setup may vary). Move the throttle stick up and down all 3 servos must move together in the correct direction. If not use servo reverse or swash menu setting for proper operation. Move the Aileron / Elevator stick up / down, left / right if swash does not move in the correct direction reverse settings in the swash menu by dialing + or - values.

(Note: Channels 6 and 1 servos are interchangeable).

Level the swash plate using a leveling tool, and then add or subtract sub trim while the throttle stick is at center position. Move throttle stick to top use travel adjustment values to level swash. Move throttle stick down repeat travel adjustments.



### JR/Spektrum transmitter servo position

Set transmitter to 120 (standard) or 140(Optional, Upgrade) Degree CCPM mode, ensure all sub trims set to zero.

Set all servo travel values to 100. In the swash menu set values for pitch, Aileron, and Elevator to 50 initially (these values are only basic your final setup may vary). Move the throttle stick up and down all 3 servos must move together in the correct direction. If not use servo reverse or swash menu setting for proper operation. Move the Aileron / Elevator stick up / down, left / right if swash does not move in the correct direction reverse settings in the swash menu by dialing + or - values.

(Note: Channels 6 and 1 servos are interchangeable).

Level the swash plate using a leveling tool, and then add or subtract sub trim while the throttle stick is at center position. Move throttle stick to top use travel adjustment values to level swash. Move throttle stick down repeat travel adjustments.

## Adjustment for gyro and tail neutral setting

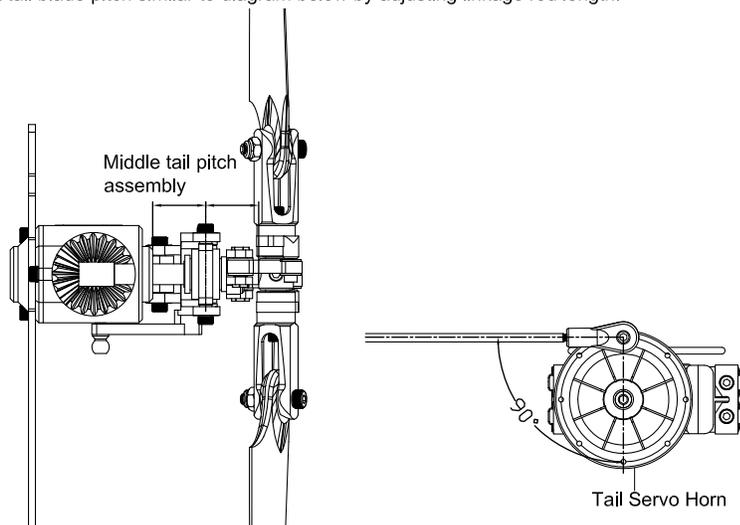
Note: We recommend using a heading hold gyro for best performance

### Tail Neutral Setting

In your transmitter disable revolution mixing. Activate gyro mode in radio, set the gyro gain to a starting point of 65-75% this is a basic setting, results may vary depending on brand of equipment used reference manufacturers recommended settings.

When connecting power to helicopter reduce all movement to model, do not move transmitter rudder stick, and allow 3-5 seconds for gyro to initialize. Upon gyro initialization the servo horn should position itself to 90 degrees to servo center line. See diagram below.

Set tail blade pitch similar to diagram below by adjusting linkage rod length.

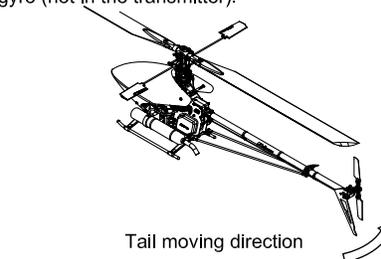


Next set the direction of the transmitter rudder function - when you move the rudder stick to the right, the ball on the tail rotor servo horn should travel toward the rear of the helicopter. Use the transmitter reversing function to correct this.

Now check the gyro responds to helicopter movement in the correct manner.

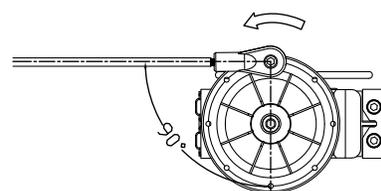
To check correct gyro setting turn the nose of helicopter left, the linkage ball on tail rotor servo horn should travel towards the rear of the helicopter.

If it does not, change direction switch (normal or reverse) on gyro (not in the transmitter).



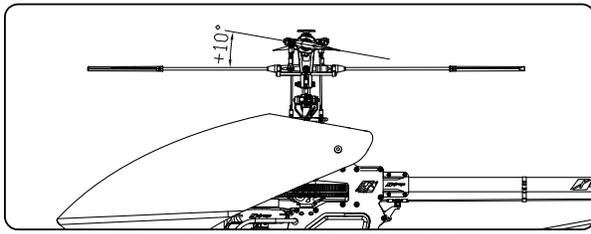
Tail moving direction

Trim direction for tail servo horn.

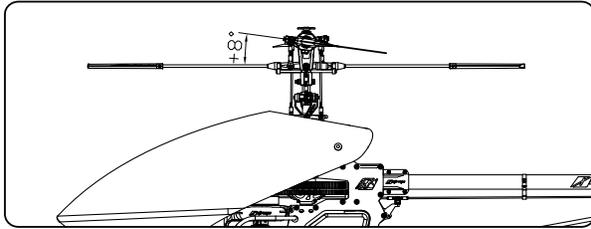


# PITCH AND THROTTLE SETTING

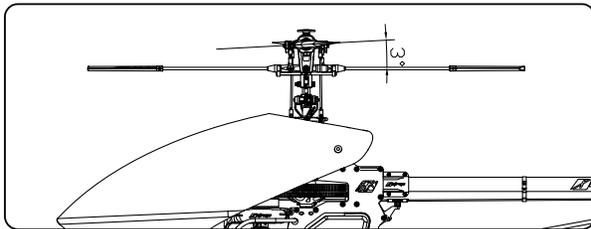
## General Flight



Stick position at high/Throttle 100%/Pitch +9°

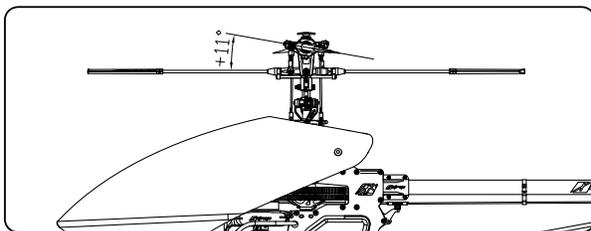


Stick position at Hovering/Throttle 70%~75%/Pitch +7°

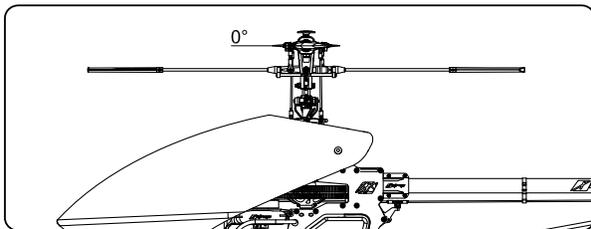


Stick position at low/Throttle 0%/Pitch -3°

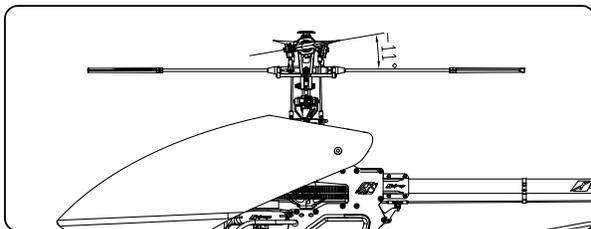
## 3D Flight



Stick position at high/Throttle 100%/Pitch +11°



Stick position at middle/Throttle 80~85%/Pitch 0°



Stick position at low/Throttle 100%/Pitch -11°

**NOTE!**

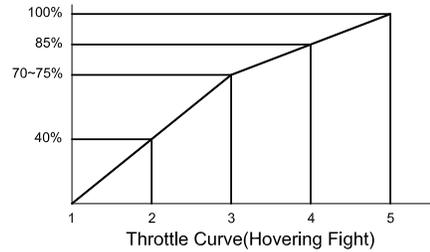
- Recommended Head speed for 3D flight 1950-2000 RPM

! Caution: For safety of flight and helicopter structure. Main rotor speed should not Exceed 2100 RPM or maximum RPM set by rotor blade manufacturer.

### GENERAL FLIGHT

	Throttle	Pitch
5	100%High Speed	+10°
4	85%	
3	70~75%Hovering	+8°
2	40%	
1	0% Low Speed	-3°

Note: Recommend head speed for general flight for beginner / intermediate 1650-1900 rpm



### Pitch curve setting

1. Refer to you radio transmitter's instruction manual for specific curve setting descriptions.
2. Adjust your radio's pitch curve percentages so the following suggested pitch curve degrees are measured on your helicopter at low, mid and high points using a pitch gauge.

**Note:** Flight results may vary depending on engine, servos, battery, etc...

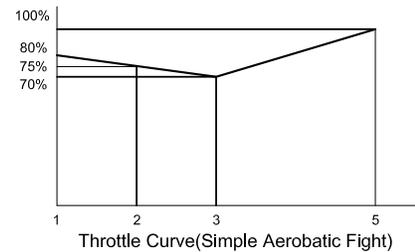
This data is to be used as a general guideline only.

### Throttle Curve Setting

Throttle curve may vary due to engine, muffler/tuned pipe, weather, etc... graphs and data provided in this manual are basic starting points only and may require fine tuning after first flight has been made.

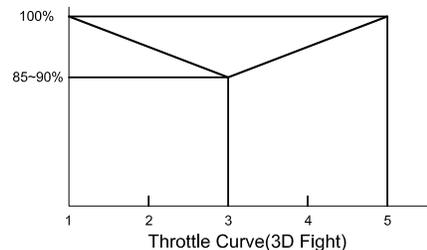
### IDLE 1: SPORT FLIGHT

	Throttle	Pitch
5	100%	+11°
4	75%	
3	70%	+5°~ +6°
2	75%	
1	80%	-6°~ -5°



### IDLE 2: 3D FLIGHT

	Throttle	Pitch
5	100% High	+11°
3	85%~90% Middle	0°
1	100% Low	-11°

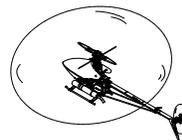


## GENERAL FLIGHT INFORMATION FOR BEGINNERS

For new pilots we highly recommend the use of computer aided flight simulation software. If you use such programs you will increase the chances of successfully flying your Helicopter. This software can aid any level of pilot - from beginner or intermediate to advanced 3D flight practice - all aiding to reduce crash costs!



For beginner pilots we recommend the use of flight Training gear to help reduce the possible of tipping the helicopter over on landings.



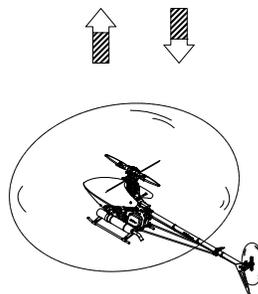
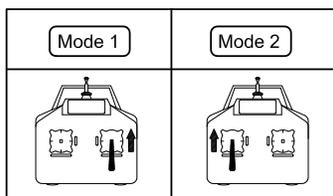
Please stand approximately 5m diagonally behind the helicopter.

### CAUTION

Make sure that there are no obstacles, animals or people are in the vicinity. You must first practice hovering. (keeping the helicopter in mid air in a fixed position) as a prerequisite to safe flying. This is a basic flight action.

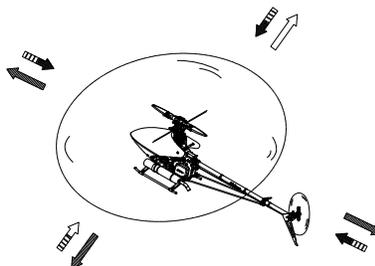
## Throttle Practice

1. Slowly increase the throttle - when the helicopter begins to lift off the ground, slowly lower the throttle stick and land the helicopter.
2. Continue to practice raising and lowering the helicopter from the ground until you feel comfortable with the procedure.



## Aileron and elevator practice:

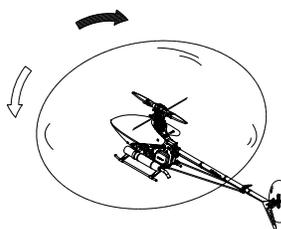
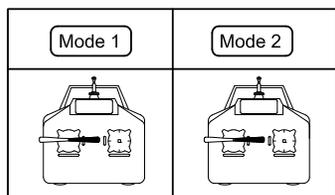
1. Slowly raise the throttle stick
2. If the Helicopter moves in any direction (forward, back, left, or right) gently move the aileron and elevator sticks in the opposite direction to return the Helicopter to it original position.



Mode 1	Mode 2	Illustration
		<p>Move left      Move right</p> <p>Rotate left      Rotate right</p>
		<p>Fly forward      Fly backward</p> <p>Forward Rotate      backward rotate</p>

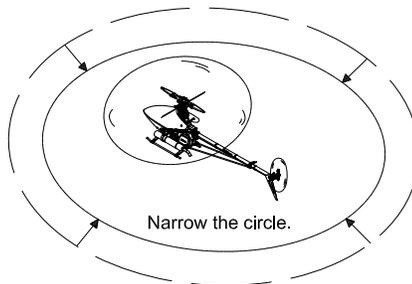
## Yaw practice:

1. Slowly increase the throttle to lift the helicopter from the ground.
2. If the nose of the Helicopter moves left or right, gently move the rudder stick in the opposite direction to get the nose of the helicopter back to its original position.



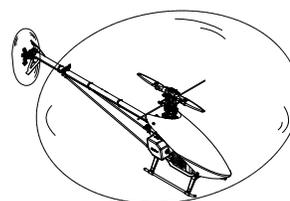
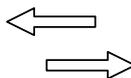
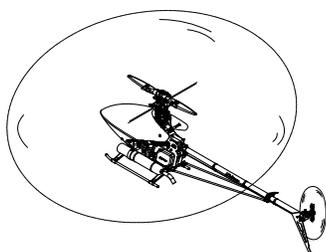
**Practice an Accurate Hover :**

After you feel comfortable with the above procedures, you can draw a circle on ground and practice flying the helicopter within that circle to increase your flying skills and accuracy. As your skill increases you can narrow the circle.



**Changing Helicopter Orientation During Hover:**

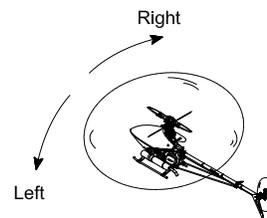
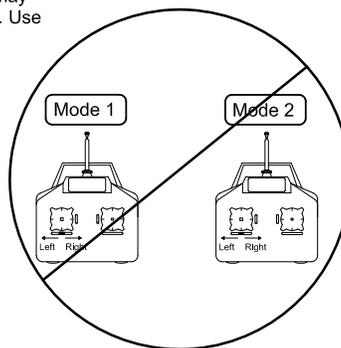
After you feel comfortable with the above practice procedures, stand and face the helicopters left side - hover in this position until comfortable. Next use rudder and turn helicopter so you are looking at its right side. After you are comfortable in these orientations slowly transition to a nose in hover. Achieve this by incrementally progressing to the point that the nose is pointing directly at you. Think of this as digits on a clock - You should be able to already fly comfortable with nose facing 12:00, 3:00, and 9:00 slowly turn nose of helicopter to 8:00, 7:00, 6:00. and also rotate from opposite 4:00, 5:00, 6:00. Practice this until you are comfortable and you are able to rotate helicopter 360 degrees in both directions either left or right.



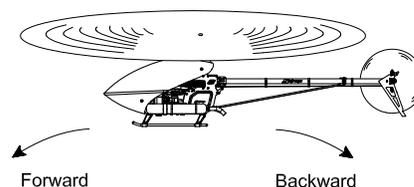
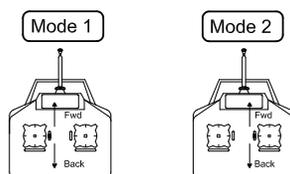
**ADJUSTMENT OF EACH TRIM**

-Performing trim adjustments is better achieved if there is little wind.  
 -Slowly increase the throttle and as helicopter lifts off the ground you may notice leaning towards one side or the other, or tilting forward or back. Use the trim levers on your transmitter to correct this as required.

1. Adjust of yaw (rudder) trim: With today's heading hold gyros th use of sub trim or slide action trims on transmitter is not needed nor recommended. Refer to the instructions provided by your gyro manufacturer for proper installation and setup (or seek assistance).

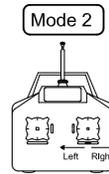
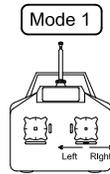


2. Adjustment for elevator trim. Just as the helicopter lifts - off, note if the nose moves forward or back. If the nose leans forward move the trim lever back toward you. If the helicopter moves backward move the trim lever forward (away from you).



3. Adjustment for aileron trim. Just as the helicopter lifts off note if the body leans left or right.

- For left movement move the trim lever toward the right.
- For right movement move the trim lever left.



**CAUTION**

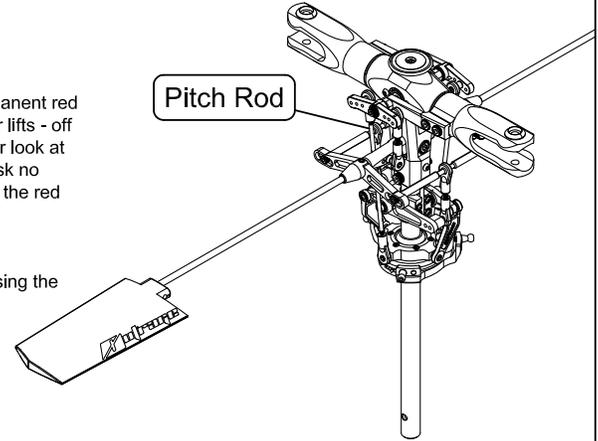
Blade tracking adjustment can be very dangerous, maintain a minimum distance of 5 feet from the helicopter while performing this action!

Prior to adjusting blade tracking we recommend affixing a piece of red tape (or using a permanent red marker) to mark one blade tip. Increase the throttle slowly and stop just before the helicopter lifts off the ground. Carefully look at the spinning blades from the side of the helicopter - in particular look at the path of the tips of the rotor blades. If both blades rotate in same path forming a single disk no adjustment is necessary. If they do not travel in same path two blades will be seen. Look for the red tape or mark at the blade tip and note if it is higher or lower than the non marked blade.

-If it is higher decrease pitch rod length on marked blade.

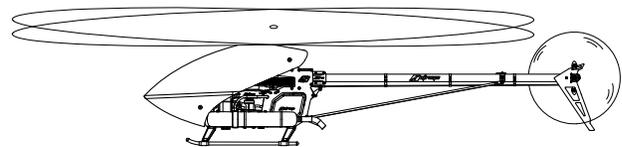
-If it is lower increase pitch rod length on marked blade.

For large variations in tracking adjustment of both blade pitch rods may be required - increasing the length of one and decreasing the length of the other.



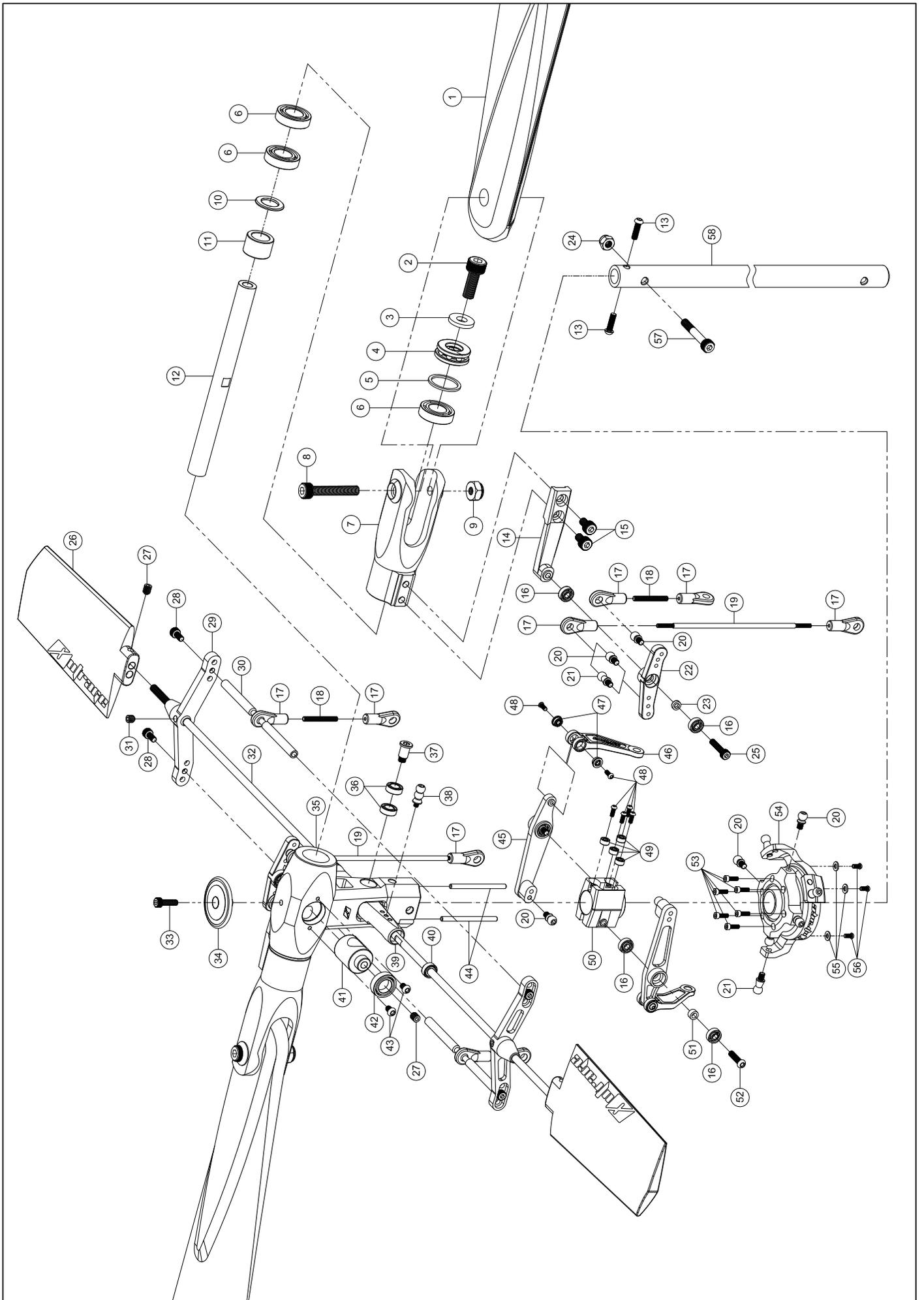
**CAUTION**

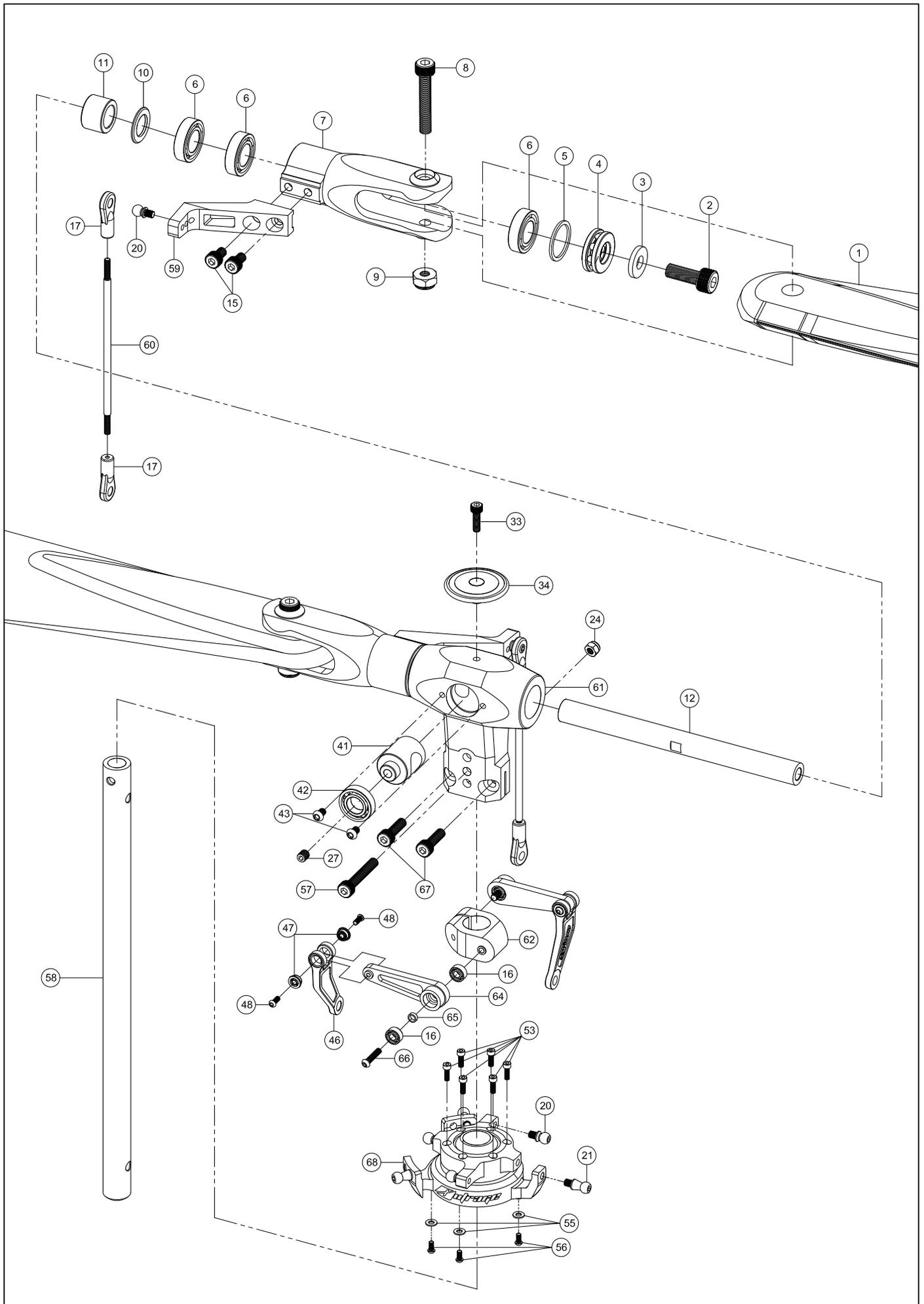
Incorrect tracking may cause vibration. Repeat the tracking adjustment until both rotor blades rotate in the same plane. After adjusting the tracking confirm the pitch angle while hovering remains at approximately +6 degrees.

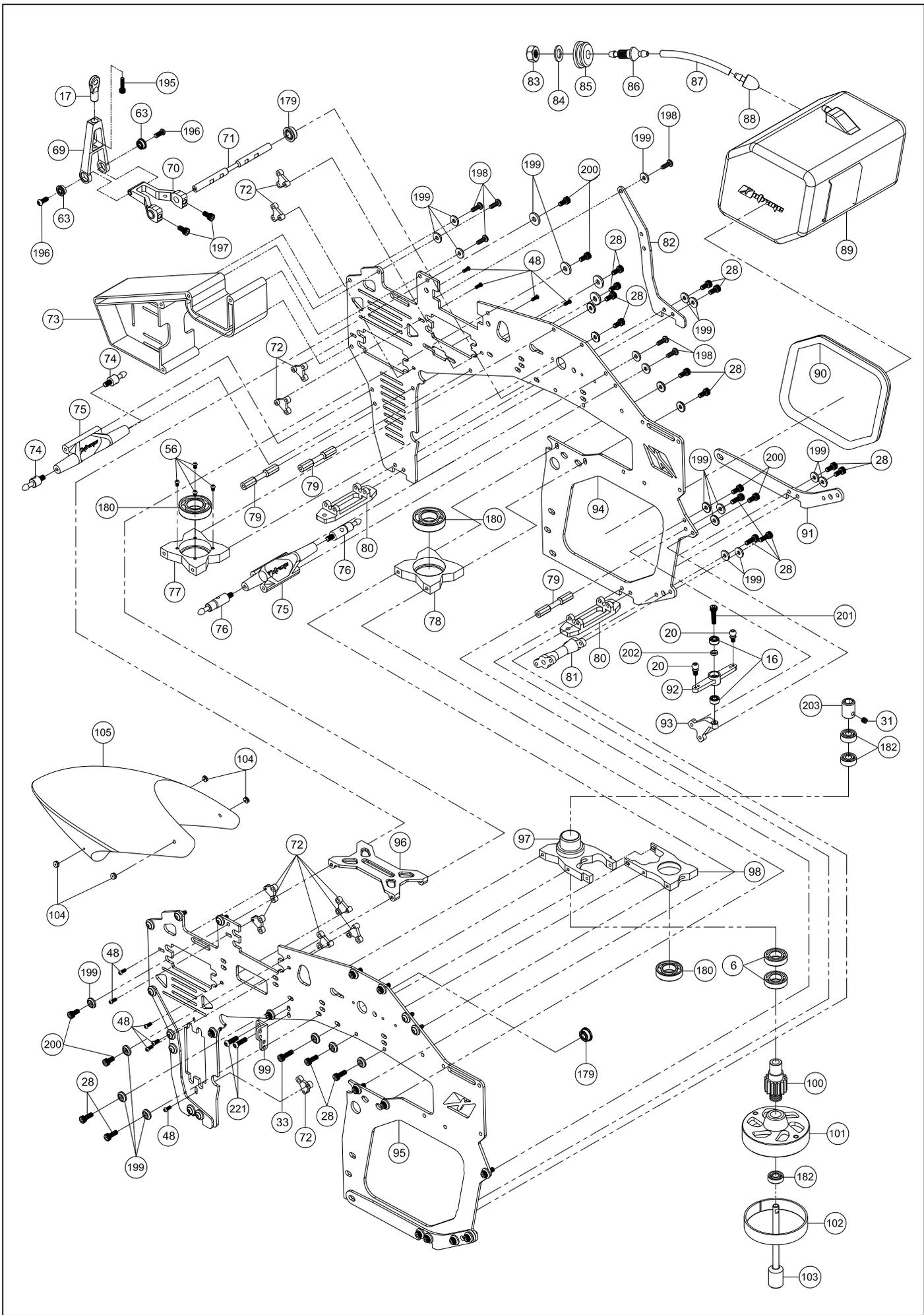


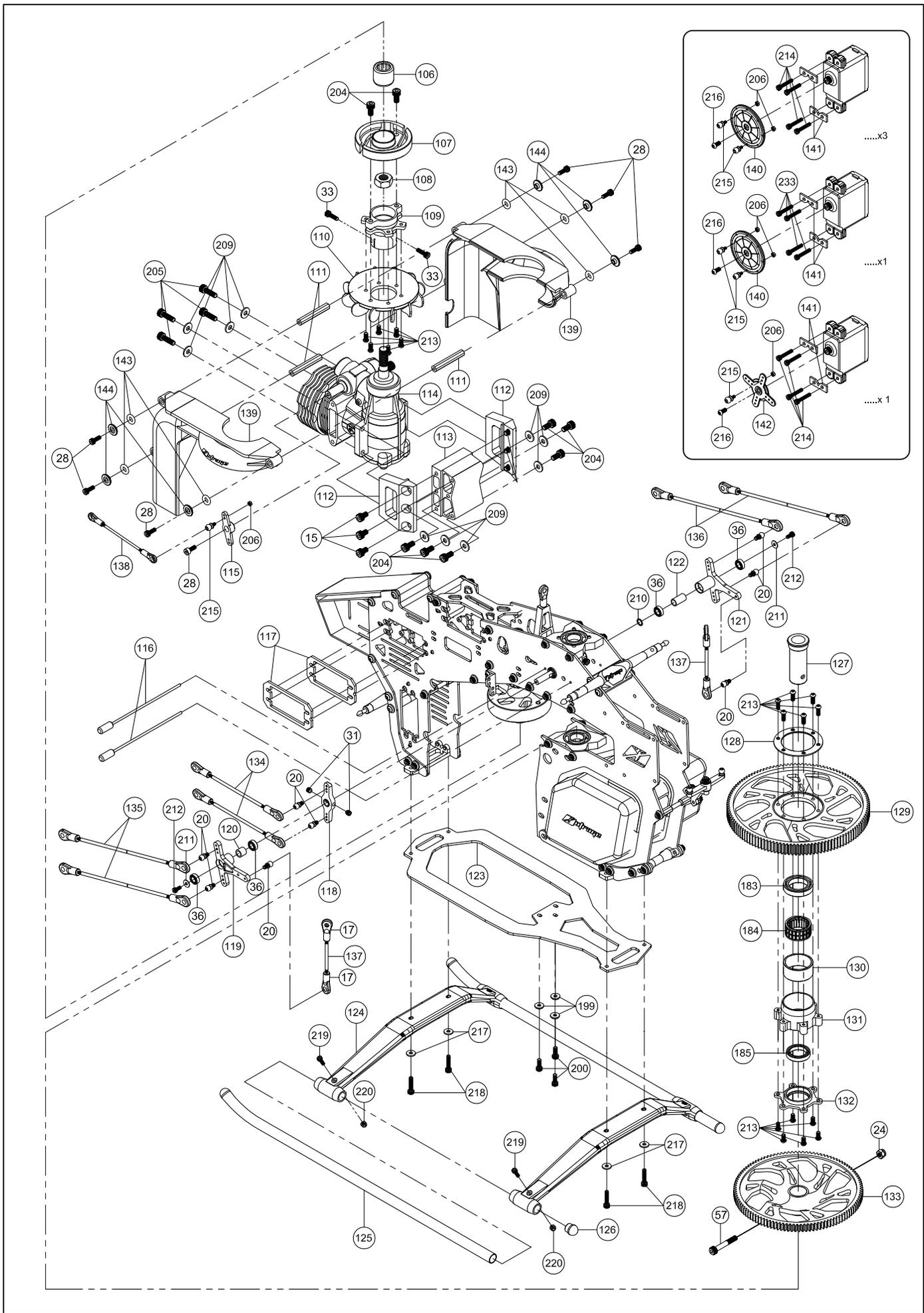
**TROUBLE SHOOTING DURING FLIGHT**

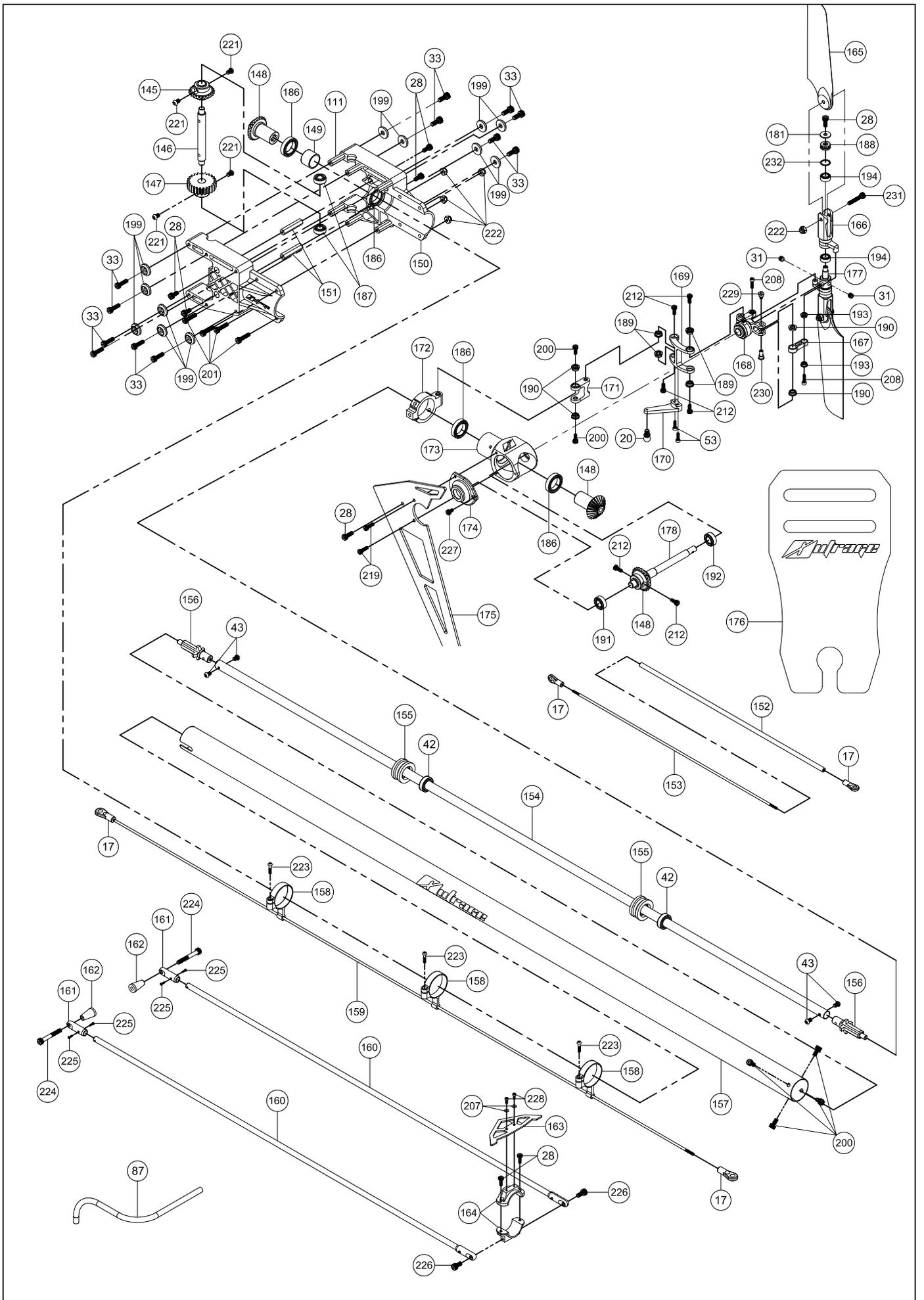
	Problem	Possible Cause	Possible fix
<b>Blade Tracking</b>	Blades out of track	<ul style="list-style-type: none"> <li>• Pitch rod adjustment has not been done.</li> <li>• Incorrect length of linkage rods.</li> <li>• Faulty or mismatched blade balance.</li> <li>• Damaged radial or thrust bearings.</li> <li>• Bent spindle shaft.</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust pitch rod(s).</li> <li>• Verify rotor head linkage set up &amp; verify fly bar paddles are installed correctly.</li> <li>• Verify blade balance, install a new set of blades.</li> <li>• Replace the spindle shaft and replace the blade grip radial or thrust bearings as necessary.</li> </ul>
<b>During Hovering</b>	Low rotation speed of the main rotor	<ul style="list-style-type: none"> <li>• Main blade pitch is too high.</li> <li>• Throttle curve is too low during hovering.</li> </ul>	<ul style="list-style-type: none"> <li>• Lower the pitch 5-6° during hovering (the rotor rpm should be about 2000 - 2,200rpm during hovering).</li> <li>• Increase the throttle curve at the hovering position.</li> </ul>
	High rotation speed of the main rotor	<ul style="list-style-type: none"> <li>• The pitch of main blades is too low.</li> <li>• The throttle curve is too high during hovering.</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust the pitch rod(the rotor rpm should be about 2000 - 2,200rpm during hovering).</li> <li>• Lower the throttle curve at the hovering position.</li> </ul>
<b>Tail rotor Stability</b>	During hover the tail moves or drifts one way.	<ul style="list-style-type: none"> <li>• Failure to set the tail neutral point.</li> <li>• The sensitivity of the gyro is low.</li> <li>• Improper gyro installation</li> </ul>	<ul style="list-style-type: none"> <li>• Reset the tail neutral point.</li> <li>• Increase the gyro sensitivity.</li> <li>• Use approved gyro mounting tape and verify gyro instructions as recommended by the gyro manufacturer.</li> </ul>
	The tail wags left and right during flight at hovering or full speed.	The sensitivity of the gyro is too high.	Decrease the sensitivity.











Exploded views contain both Flybar and Flybarless versions part quantities and included componets will vary depending on your chosen kit.

No.	Code No.	Name	Specification	Quantity	Remarks
1		Main Rotor Blade		4	
2	R90N469	Cap Screw	M6x16mm	4	
3	R90N470	Flat Washer	Ø6xØ14x2mm	4	
4	R90N406	Thrust Bearing (F10-18M)	Ø10xØ18x5.5mm	4	
5	R90N455	Thrust Washer	Ø15 x Ø18 x 1mm	4	
6	R550602	Ball Bearing	Ø10 x Ø19 x 5mm	14	
7	R90N001	Blade Grip		4	
8	R90N466	Cap Screw	M5 x 30mm	4	
9	R90N467	Lock Nut	M5	4	
10	R90N030	Damper Spacer	Ø10 x Ø14.8 x 1mm	4	
11	R90N029	Damper 70	Ø10 x Ø15 x 10mm	4	
	R90N028	Damper 80	Ø10 x Ø15 x 10mm	4	
12	R90N019	Spindle Shaft	Ø10x112.8mm / M6	2	
13	R90N464	Button Head Cap Screw	M4 x 10mm	2	
14	R90N002	Blade Grip Arm		2	
15	R90N457	Cap Screw	M4 x 6mm	14	
16	RG50335	Ball Bearing	Ø3 x Ø8 x 3mm	12	
17	R90N032	Plastic Ball Link	4.95mm	35	
18	R90N228	Linkage Rod	M2.5 x 21mm	4	
19	R90N021	Linkage Rod	M2.5 x 97mm	2	
20	R90N023	Linkage Ball	4.95 x 5.5mm / M3	25	
21	R90N024	Linkage Ball	4.95 x 8mm / M3	6	
22	R90N003	Upper Mixing Arm		2	
23	R90N026	Shim Washer	Ø3 x Ø5 x 1.5mm	2	
24	R550715	Lock Nut	M4	3	
25	R550742	Cap Screw	M3 x14mm	2	
26	R90N031	Paddle Plastic		2	
27	R90N453	Set Screw	M4 x 5mm	6	
28	R550722	Cap Screw	M3 x 8mm	53	
29	R90N006	Flybar Carriage Base		2	
30	R90N007	Flybar Control Rod		2	
31	R550718	Set Screw Flat	M4 x 4mm	7	
32	R90N005	FlyBar Rod	M4 x 540mm	1	
33	R550738	Cap Screw	M3 x 10mm	18	
34	R90N035	Head Button		2	
35	R90N008	Center Hub		1	
36	R550613	Ball Bearing	Ø5 x Ø9 x 3mm	8	
37	R90N009	Shoulder Screw	M5x9.5mm	2	
38	R90N022	Double Linkage Ball	4.95 x 9.75mm / M3	2	
39	R90N004	Seesaw		1	
40	RG50102	Ball Bearing	Ø4 x Ø8 x 3mm	2	
41	R90N018	Spindle Driver		2	

No.	Code No.	Name	Specifcation	Quantity	Remarks
42	R50N401	Ball Bearing MR148ZZ	Ø8 x Ø14x4mm	6	
43	R50N452	Button Head Cap Screw	M2.5 x 4mm	8	
44	R90N013	Phasing Pins		2	
45	R90N014	Lower Mixing Arm		2	
46	R90N025	Radius Arm (Plastic)		2	
47	R90N404	Ball Bearing Flanged	Ø2 x Ø5 x 2.5mm	4	
48	R550745	Button Head Cap Screw	M2x5mm	22	
49	RG50116	Ball Bearing	Ø2 x Ø5 x 2.5mm	8	
50	R09N015	Washout Base		1	
51	R90N026	Shim Washer	Ø3xØ5x2.7mm	2	
52	R90N454	Button Head Cap Screw	M3x14mm	2	
53	R550732	Cap Screw	M2x6mm	14	
54	R90N806	Swash Plate Assembly		1	
55	R550707	Flat Washer	Ø2xØ5x0.5mm	6	
56	R550731	Button Head Cap Screw	M2x3mm	10	
57	R550174	Cap Screw Shouldered	M4 x 26mm	3	
58	R90N033	Main Shaft	Ø12 x 217.9mm	2	
59	R90N036	Flybarless Grip Arm		2	
60	R90N039	Linkage Rod	M2.5 x 88mm	2	
61	R90N040	Flybarless Center Hub		1	
62	R90N037	Swash Driver Base		1	
63	R550617	Ball Bearing Flanged	Ø3 x Ø7 x 3mm	2	
64	R90N038	Swash Driver Arm		1	
65	R90N026	Shim Washer	Ø3 x Ø7 x 2.7mm	2	
66	R90N468	Button Head Cap Screw	M3 x 12mm	2	
67	R90N480	Cap Screw	M4 x 13mm	2	
68	R90N815	Swash Plate Flybarless Assembly		1	
69	R90N213	"A" Arm		1	
70	R90N212	Elevator Arm		1	
71	R90N219	Control Rod 120 Degree		1	
72	R90N259	Servo Mount Tab CNC		10	
73	R90N204	Electronics Tray		1	
74	R90N230	Canopy Pin Front		2	
75	R90N220	Canopy Pin Mount		2	
76	R90N231	Canopy Pin Rear		2	
77	R90N201	Mainshaft Bearing Block Top		1	
78	R90N203	Mainshaft Bearing Block Bottom		1	
79	R90N208	Frame Spacer	M3 x 35mm	3	
80	R90N210	Landing Gear Mount		2	
81	R90N242	Front Boom Support Spacer		1	
82	R90N277	Front Frame Stiffener	1.5mm	2	
83	R50N235-A	Hex Nut		1	

No.	Code No.	Name	Specifcation	Quantity	Remarks
84	R50N235-B	Washer	Ø7 x Ø12x1mm	1	
85	R90N234	Tank Grommet		1	
86	R50N235-C	Fuel Tank Nipple		1	
87	R90N235-460	Fuel Tubing	460mm	1	
88	R50N236	Fuel Tank Clunk		1	
89	R90N221	Fuel Tank	650cc	1	
90	R90N222	Tank Damper		2	
91	R90N274	Rear Frame Brace	1.5mm	2	
92	R50N257	Tail Bell Crank		1	
93	R90N207	Tail Bell Crank Mount		1	
94	R90N270	CF Left Frame Panel	2mm	1	
95	R90N272	CF Right Frame Panel	2mm	1	
96	R90N232	Optional Tray CNC		1	
97	R90N247	Clutch bearing block		1	
98	R90N202	Midshaft Bearing Block		1	
99	R50N251	Governor Sensor Mount		1	
100	R90N110	Pinion	15 Tooth - 1Module	1	
101	R90N107	Clutch Bell		1	
102	R90N115	Clutch Liner		1	
103	R90N120	Oneway Start Shaft		1	
104	R550227	Canopy Grommet		4	
105	R90N824	Fiber Glass Painted Canopy		1	
106	R550601	Oneway Bearing	Ø12 x Ø18 x 16mm	1	
107	R90N108	Clutch		1	
108		Prop Nut	Supplied With Engine	1	
109	R90N111	Clutch Hub		1	
110	R90N112	Fan		1	
111	R90N236	Hex Spacer Insert Long		3	
112	R90N211	Engine Mount Plate		2	
113	R90N206	Engine Mount Base		1	
114		Engine 90N		1	
115		Engine 90N Arm	Supplied of Engine 90N	1	
116	R90N465	Set Up Pin		2	
117	R90N273	Servo Tray	2mm	2	
118	R90N216	Elevator Bell Crank		1	
119	R90N214	Left Bell Crank		1	
120	R90N218	Bearing Spacer Short	Ø6.25 x Ø6.5 x 5mm	1	
121	R90N217	Right Bell Crank		1	
122	R90N215	Bearing Spacer Long	Ø12.25 x Ø6.5 x 5mm	1	
123	R90N271	Base Frame	2mm	1	
124	R550217	Landing Gear Strut (Plastic)		2	
125	R50N267	Landing Gear Strut Tube	M4 x 13mm	1	

No.	Code No.	Name	Specification	Quantity	Remarks
126	R550223	Strut Tube Cap		4	
127	R90N104	OneWay Sleeve		1	
128	R90N103	Main Gear Top Plate		1	
129	R90N105	Main Gear	123T 1 Module (Injection)	1	
130	R90N114	Oneway Clutch Race		1	
131	R90N101	Oneway Hub Case		1	
132	R90N102	Oneway Hub End Plate		1	
133	R90N106	Main Drive Gear	111T 1 Module (Injection)	1	
134	R90N226	Linkage Rod (Elevator)	M2.5 x 84mm	2	
135	R90N224	Linkage Rod (Pitch)	M2.5 x 162mm	2	
136	R90N225	Linkage Rod (Aileron)	M2.5 x 94mm	2	
137	R90N227	Linkage Rod (Swash)	M2.5 x 48mm	2	
138	R90N229	Linkage Rod (Throttle)	M2.5 x 66mm	1	
139	R90N209	Fan Shroud Left and Right		1	
140		Servo Wheel		4	
141	R550005	Servo Spacers	1.5mm	10	
142		Servo Horn		1	
143	R90N233	Shroud Retainer		6	
144	R90N482	Shroud Damper O-ring		6	
145	R90N117	Bevel Gear A (TT)		2	
146	R90N116	Counter Shaft (TT)		1	
147	R90N119	Counter Gear (TT)	24 Teeth	1	
148	R90N118	Bevel Gear B (TT)		2	
149	R90N239	Bearing Spacer (TT)	Ø12 x Ø14 x 10mm	1	
150	R90N238	Boom Mount Panels		2	
151	R90N240	Hex Spacer insert Short		2	
152	R90N241	CF Tube	Ø3 x Ø5 x 295mm	1	
153	R90N223	Tail Servo Push Rod	M2.5 x 315mm	1	
154	R90N304	TT Shaft	772mm	1	
155	R50N318	Tube Bearing Support		2	
156	R90N320	Tube Shaft Spline		2	
157	R90N303	Tail Boom	ID 19.8 x OD 21 x 787mm	1	
158	R90N301	Tail Rod Push Rod Guide		3	
159	R90N302	Boom Tail Push Rod	M2.5x730mm	1	
160	R90N307	Boom Support CF Rod		2	
161	R90N306	Boom Support End		4	
162	R90N242	Front Boom Support Spacer		2	
163	R90N276	Horizontal Fin	1.5mm	1	
164	R90N305	Stabilizer Mount		1	
165	R90N318	CF Tail Blade 105mm		2	
166	R90N316	Tail Blade Grip CNC		2	
167	R90N314	Tail Pitch Slider Link		2	

No.	Code No.	Name	Specification	Quantity	Remarks
168	R90N862	Tail Pitch Slider Assembly		1	
169	R90N311	Tail Bell Crank Arm		1	
170	R90N315	Tail Bell Crank Lever		1	
171	R90N312	Bell Crank Link		1	
172	R90N310	Tail Bracket		1	
173	R90N308	Tail Case Hub		1	
174	R90N309	Tail Case Plate		1	
175	R90N275	Vertical Fin	2mm	1	
176	R90N478	Main Blade Holder		1	
177	R90N317	Tail Grip Hub		1	
178	R90N319	Tail Shaft		1	
179	R550617	Ball Bearing Flanged	Ø3 x Ø7 x 3mm	2	
180	R90N408	Ball Bearing	Ø12 x Ø24 x 6mm	3	
181	R550723	Flat Washer	Ø3 x Ø8 x 1mm	2	
182	R90N409	Ball Bearing	Ø5 x Ø14 x 5mm	3	
183	R90N410	Ball Bearing	Ø17 x Ø26 x 5mm	1	
184	R90N401	Clutch Bearing	Ø23 x Ø15 x 11mm	1	
185	R90N402	Ball Bearing	Ø15 x Ø21 x 4mm	1	
186	R50N406	Ball Bearing	Ø12 x Ø18 x 4mm	4	
187	R90N411	Ball Bearing	Ø5 x Ø9 x 11mm	2	
188	R90N417	Thrust Bearing	Ø4 x Ø10 x 4mm	2	
189	R90N414	Ball Bearing Flanged	Ø2.5 x Ø6 x 2.5mm	2	
190	R550615	Ball Bearing Flanged	Ø3x Ø6 x 2.5mm	6	
191	R90N419	Ball Bearing	Ø7 x Ø13 x 4mm	1	
192	R90N412	Ball Bearing	Ø6 x Ø12 x 4mm	1	
193	R550614	Ball Bearing Flanged	Ø2 x Ø5 x 2.3mm	4	
194	R90N416	Ball Bearing	Ø5 x Ø10 x 4mm	4	
195	R550747	Cap Screw	M2.5 x 10mm	1	
196	R90N459	Button Head Cap Screw	M3 x 8mm	8	
197	RG50330	Cap Screw	M3 x 5mm	2	
198	R550726	Self Tapping Socket Screw	M3 x 10mm	12	
199	R550721	Finishing "C" Washers	M3	65	
200	R550724	Cap Screw	M3 x 6mm	12	
201	R550728	Cap Screw	M3 x 12mm	5	
202	R90N483	Washer	Ø3 x Ø5 x 1.5mm	1	
203	R50N101	Hex Start Adapter		1	
204	R90N452	Cap Screw	M4 x 8mm	8	
205	R90N461	Cap Screw	M4 x 14mm	1	
206	R550739	Nut	M2	10	
207	R550707	Flat Washer	Ø2 x Ø5 x 0.5mm	2	
208	R550717	Cap Screw	M2 x 8mm	2	
209	R90N456	Flat Washer	Ø4 x Ø10 x 1mm	4	

No.	Code No.	Name	Specification	Quantity	Remarks
210	R90N460	Shim Washer	Ø5 x Ø6.5 x 0.5mm	1	
211	R550746	Flat Washer	Ø2.5 x Ø8 x 0.5mm	2	
212	R550743	Cap Screw	M2.5 x 6mm	8	
213	R550451	Button head Cap Screw	M3 x 6mm	12	
214	R50N462	Cap Screw	M2.5 x 12mm	16	
215	R90N237	Linkage Ball	4.95 x 5.5mm / M2	10	
216		Button head Cap Screw	Screw supplied with servo	5	
217	R550723	Flat Washer	Ø3 x Ø7 x 0.8mm	1	
218	R550742	Cap Screw	M3 x 14mm	4	
219	R550712	Cap Screw	M2.5 x 8mm	3	
220	R90N479	Lock Nut	M2.5	4	
221	RG50334	Button head Cap Screw	M2.5 x 5mm	4	
222	R550729	Lock Nut	M3	6	
223	R50N456	Cap Screw Self Tapping	M2 x 10mm	3	
224	R90N463	Cap Screw	M4 x 30mm	2	
225	R50N461	Self Tap Screw	M1.5 x 5mm	8	
226	R550710	Cap Screw	M4 x 10mm	2	
227	R90N474	Cap Screw	M2.5 x 4mm	1	
228	R550753	Cap Screw	M2 x 5mm	2	
229	R550178	Tail Link Bearing Screw		2	
230	R550179	Tail Link Bearing Nut		2	
231	R90N481	Cap Screw	M3 x 18mm	2	
232	R90N471	Thrust Washer	Ø7.5 x Ø9 x 0.35mm	2	
233	SM2.5x15	Cap Screw	M2.5 x 15mm	4	

--	--	--	--	--	--