

## **Assembly Manual / Airframe – 47” Extra SHP**

Thank you for purchasing this 3DHobbyShop ARF RC aircraft. If you have any issues, questions, concerns or problems during assembly, please contact our tech department at: [Info@extremeflightrc.com](mailto:Info@extremeflightrc.com) or 770-887-1794 10am-5pm Eastern Monday thru Friday.

### **SAFETY in Assembly**

During assembly of this aircraft, you will be asked to use sharp knives and hobby adhesives. Please follow all safety procedures recommended by the manufacturers of the products you use, and always follow these important guidelines:

ALWAYS protect your eyes when working with adhesives, knives, or tools, especially power tools.

Safety glasses are the best way to protect your eyes.

ALWAYS protect your body, especially your hands and fingers when using adhesives, knives, or tools, especially power tools. Do not cut toward exposed skin with hobby knives. Do not place hobby knives on tables or benches where they can roll off or be knocked off.

ALWAYS have a first-aid kit handy when working with adhesives, knives, or tools, especially power tools. ALWAYS keep hobby equipment and supplies out of the reach of children.

### **SAFETY in Flying**

This is NOT a toy! It is a very high-performance RC airplane capable of high speeds and extreme maneuvers. It should only be operated by a competent pilot in a safe area with proper supervision. ONLY fly your aircraft in a safe, open area, away from spectators and vehicles and where it is legal to fly. NEVER fly over an unsafe area, such as a road or street.

- NEVER fly near overhead power or utility lines. If your airplane ever becomes stuck in a line or a tree DO NOT attempt to retrieve it yourself. Contact the authorities for assistance in retrieving your aircraft. Power lines are DANGEROUS and falls from ladders and trees CAN KILL!
- Never fly too close to yourself or spectators.
- Spinning propellers are DANGEROUS!  
Never run your motor inside a house or building with the propeller attached Remove the prop for safety. Always fly within your control.
- Always follow manufacturers instructions for your radio system.
- Always preform a pre-flight check of your aircraft to be certain of the aircraft's airworthiness.
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## **Limits of Responsibility**

*3D Hobby Shop provides high-quality aircraft and components to its customers and end users. These aircraft and components are assembled by the end user to produce a flying model. It is beyond 3D Hobby Shop's control to monitor the end user's completed aircraft. Therefore, 3D Hobby Shop in no way accepts or assumes responsibility or liability for damages resulting from the end user assembled product. The end user assumes all responsibility and liability in use of 3D Hobby Shop aircraft and components and agreeing to hold harmless 3D Hobby Shop, its distributors and dealers.*

## **Required Items**

Hobby Knife  
Small Phillips Screwdriver  
Set Metric Allen Wrenches  
Scissors  
Small Pliers  
Wire Cutters  
Adjustable wrench  
Masking tape  
Drill and drill bits  
Threadlocker (Blue Loctite)

Optional:

Heat gun and covering iron  
Dremel tool

## **Assembly Instructions – Read completely before starting assembly!**

### **UNPACK :**

Unpack your airplane and examine the components. Check for damage of any kind. If you have damage, please contact 3DHobbyShop to discuss. Contact info listed above.

### **WRINKLES :**

Your airplane was packed in plastic at the factory without any wrinkles in the covering. You may notice some wrinkles now; more likely, you will notice a few in a day or two or the first time you take the plane out to the flying field. These wrinkles are the result of wood shrinkage and/or expansion. Balsa wood changes size and shape slightly as it is exposed to varying humidity in the air. This is a natural property of balsa wood. As your airplane adjusts to the weather in your part of the world, wrinkles may appear and disappear. Wrinkles may be removed with the gentle application of heat to the covering material on your airplane. The best tools to use are a heat gun and covering iron. Apply the heat gently: the covering material will shrink as you apply the heat, and this will remove the wrinkles. BE CAREFUL! Too much heat applied too quickly can damage the covering, either by

causing it to pull away from the wood at seams and corners or even by melting it. The covering will shrink at low temperature with patient application of heat. Wrinkles in the covering DO NOT affect flight performance. If you must shrink on a color-seam, use the iron and go slowly and carefully to avoid any pulling or lifting at the seam.

Remove the canopy before attempting to use heat on your covering! The canopy is made of thermo-activated plastic and WILL deform with the application of heat. Do not apply heat to the canopy.

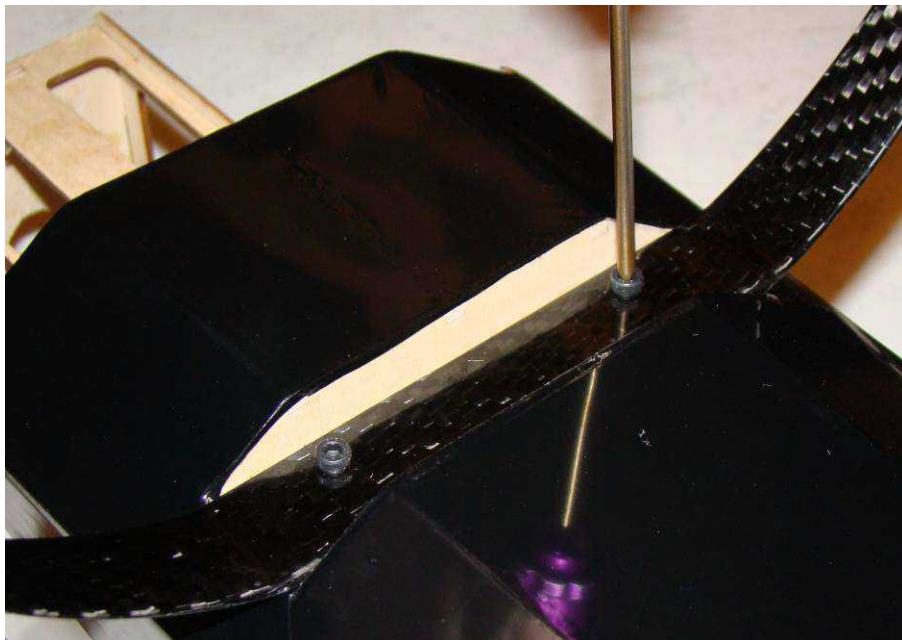
## **PAINT:**

If you need to clean your airplane, we recommend using a damp towel. The paint used on the canopy and cowl is not safe for all cleaners. In particular, DO NOT use alcohol on these parts, it will remove the paint.

**NOTE:** 3DHobbyShop has online build videos for this aircraft hosted at [www.vimeo.com](http://www.vimeo.com) and linked on the 3DHobbyShop website. If you have problems locating the build videos, contact 3DHobbyShop for assistance or consult [www.RCGroups.com](http://www.RCGroups.com) for the latest information on build videos and other news about the 47" Extra SHP.

## **Let's get started!**

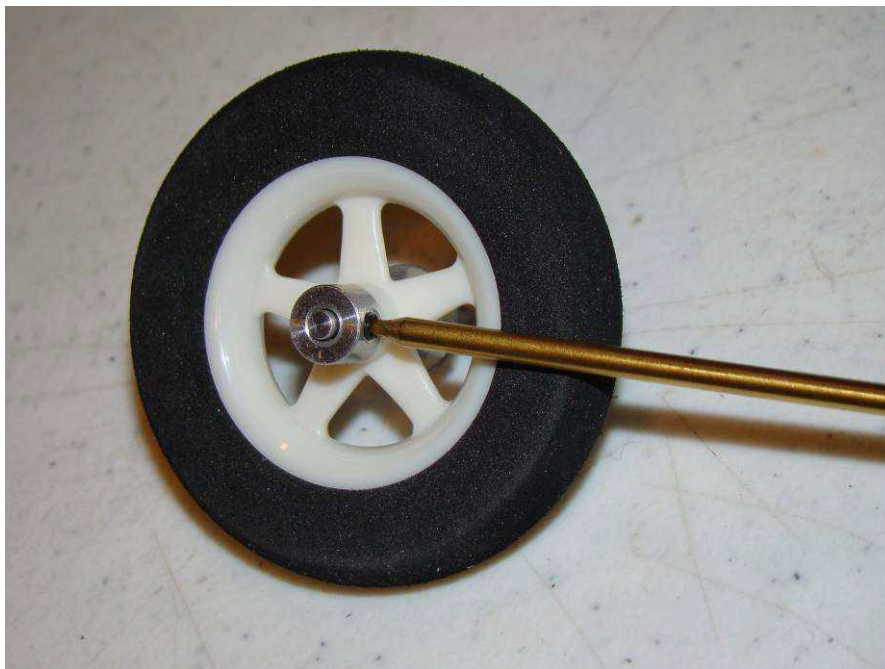
Attach landing gear to fuselage using two 3mm allen-head screws (the two shortest screws in your kit). Use blue Loctite on these screws.



Attach landing gear cover plate. For permanent installation, use medium CA glue. To be able to easily access landing gear screws, use clear tape to attach plate.



Place wheel on aluminum wheel axle and install aluminum wheel collar, using a 1.5mm allen wrench to tighten the set screw.

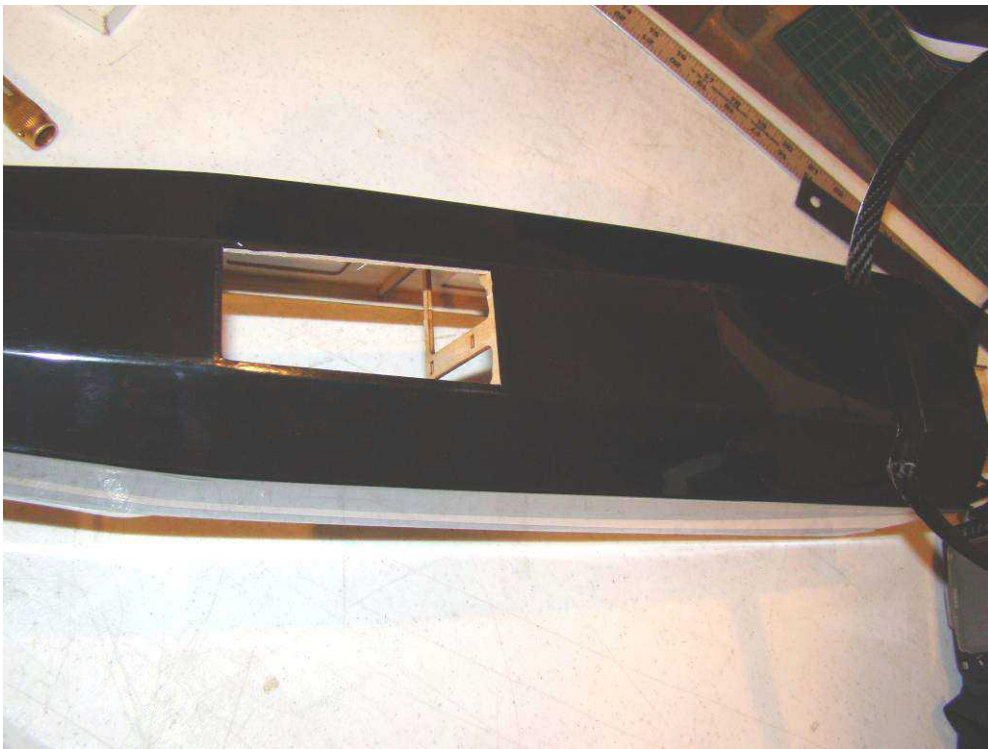


Place wheel and axle assembly inside wheel pant. Attach wheel/pant assembly to carbon landing gear as shown using locking nut. NOTE: The locking nut will be difficult to tighten since it is a locking design. Use a pliers to hold the wheel collar and a nut driver or wrench to turn the nut.





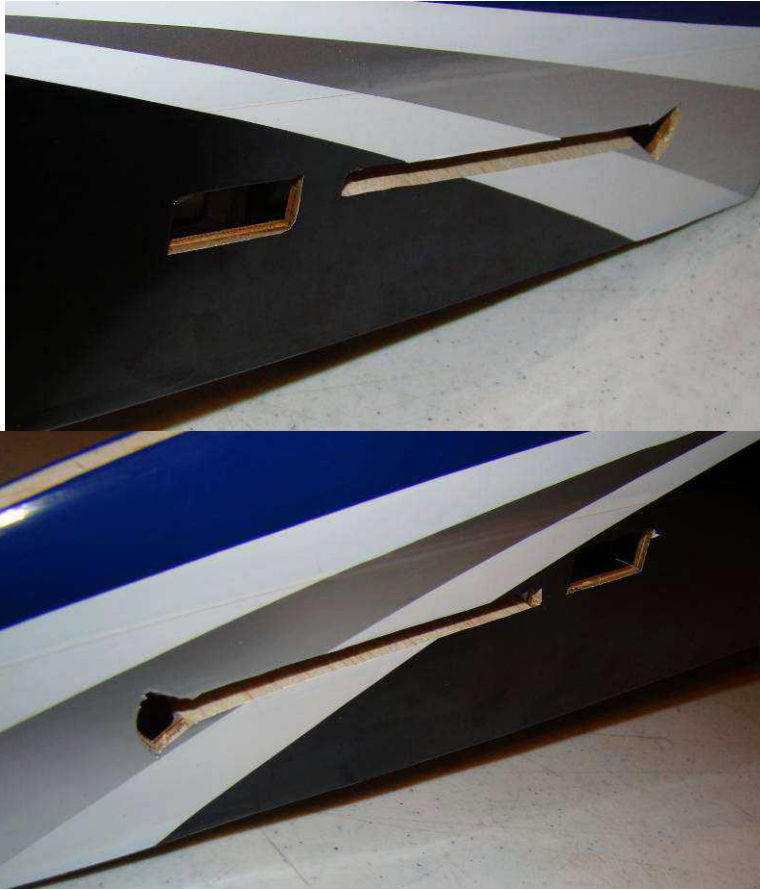
Remove one square of covering from the fuselage bottom behind the wing as shown, for a cooling vent.



Remove covering over wing spar hole, wing bolt hole, aileron wire hole, and anti-rotation pin hole as shown in side of fuselage on both sides.



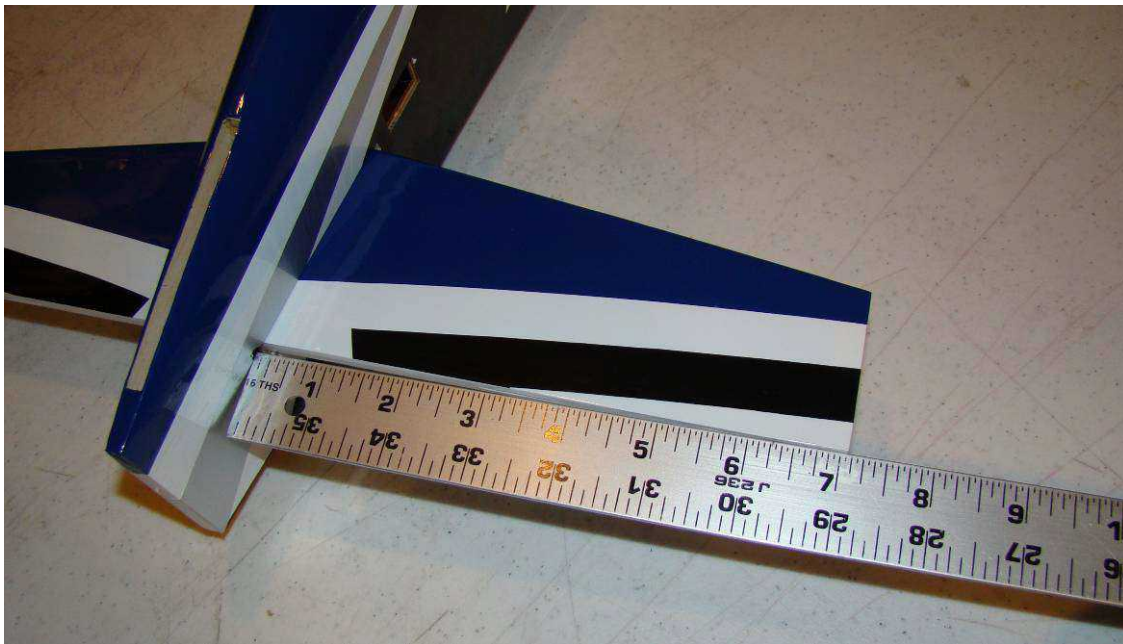
Remove the covering over the horizontal stabilizer opening and servo opening on both sides of the fuselage as shown.



Trim rear section of stabilizer opening to ensure good clearance for elevator joiner.



Insert horizontal stabilizer (note the color scheme on top). Use a ruler to square the stabilizer side to side as shown.





Insert carbon wing tube into fuselage. Measure from tube to horizontal stabilizer on both sides of fuselage. Equalize measurements to square the stabilizer.



Drip thin CA glue into the stabilizer-fuselage joint. Do not remove any covering from the horizontal stabilizer.

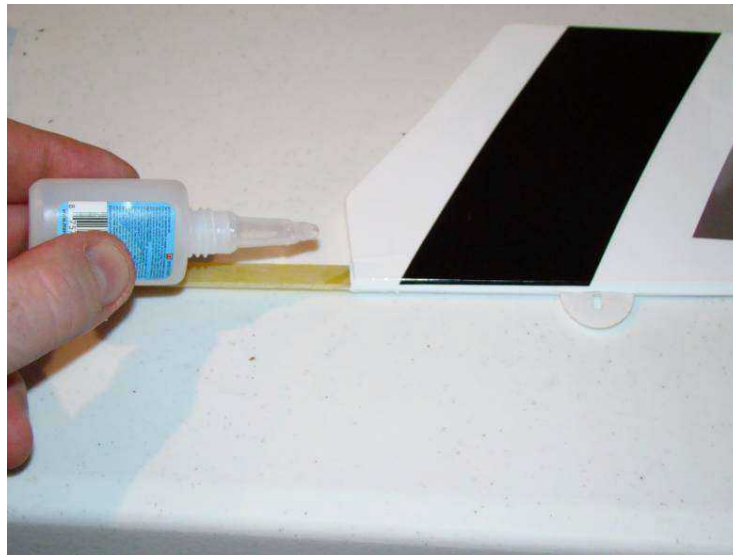




Apply medium CA into the slot in fuselage and install vertical stabilizer.



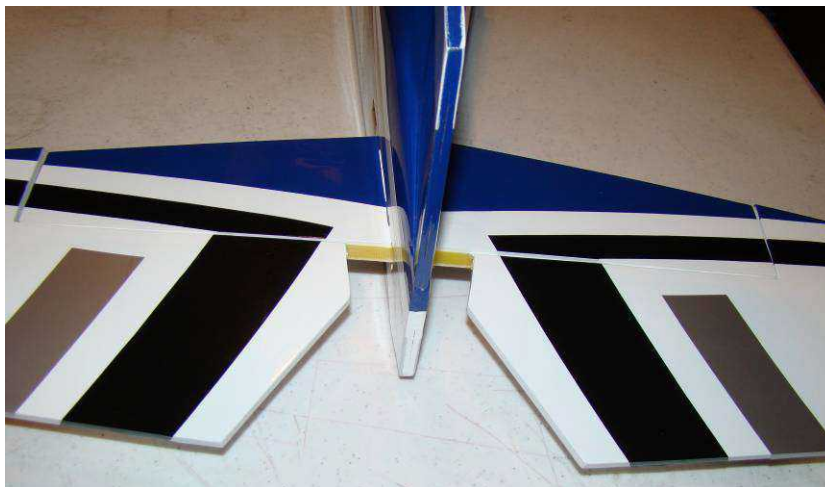
Drop a few drops of thin CA onto the elevator joiner rod at the factory joint of elevator and rod. Allow to soak in for a few minutes, then wipe off excess.



Install elevator half with joiner rod onto horizontal stabilizer, sliding hinges into slots in stabilizer DO NOT GLUE HINGES YET. Apply a generous amount of medium CA into joiner slot on second elevator.



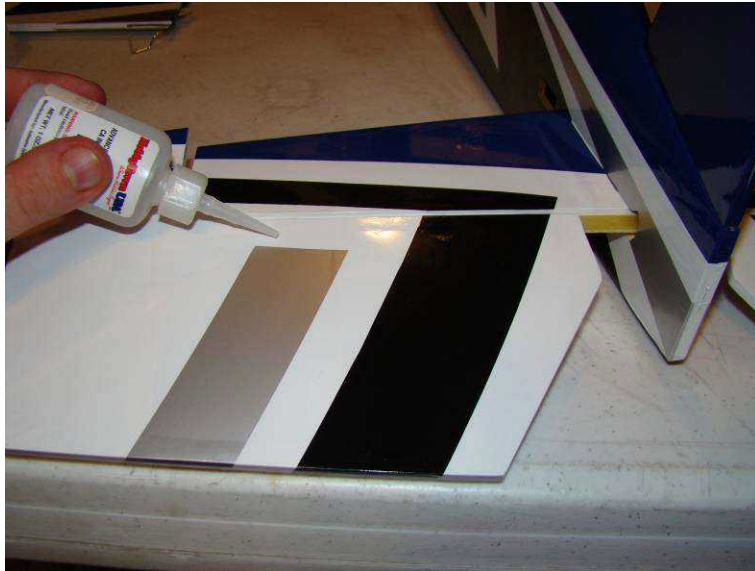
Install second elevator onto elevator joiner rod and slide hinges into stabilizer. DO NOT GLUE HINGES YET. Allow joiner rod to cure.



Adjust elevators left-to-right to align with stabilizer. You may notice some twist of the elevator assembly. This will not affect flight performance. If you wish to remove any twist for cosmetic reasons, have a helper twist the assembly slightly the opposite way, and shrink out the resulting covering wrinkles with a heat gun. This will remove any twist.

Make sure the elevator can flex 45 degrees up and 45 degrees down without binding. Correct any binding by leaving a slightly larger gap between the stabilizer and elevator. This is called "hinge gap" and typically the 47" SHP needs about 1/16<sup>th</sup> inch of gap.

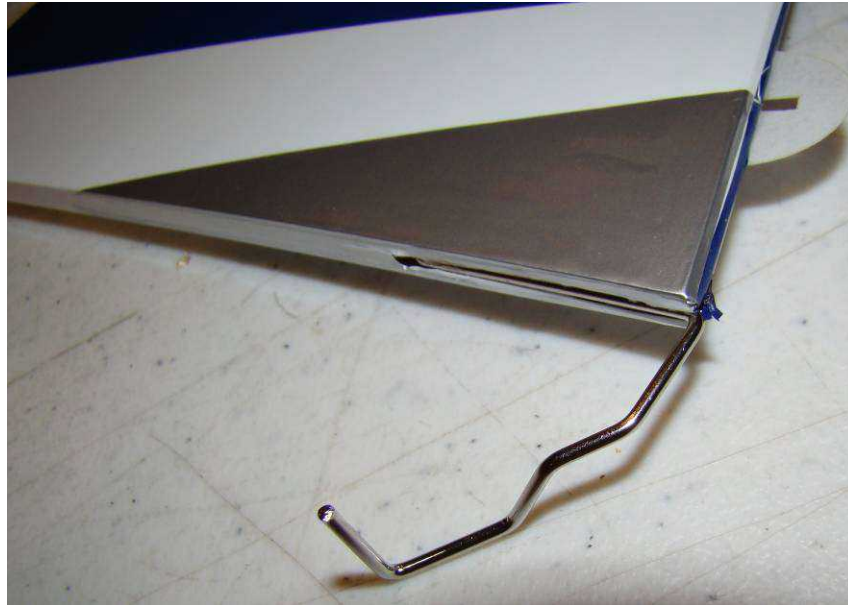
Apply two large drops of thin CA glue to each elevator hinge. Allow to soak in and cure. Do not use any accelerator on this glue, allow the glue to fully soak in.



Remove covering over slot in bottom of rudder as shown.



Use small drill bit, small screwdriver, or end of tailwheel wire to make a hole in the rudder at the appropriate spot and insert tailwheel wire into rudder. Check location against manual photo, and if the wire is in the correct location, remove and put a generous amount of medium CA glue into slot. Install wire and allow to cure.



Install rudder onto fuselage, sliding hinges into slots in rear of fuselage and vertical stabilizer. Check alignment of bottom of rudder and fuselage as shown. Drip two large drops of thin CA glue onto each hinge. Allow to cure.





Install tailwheel bracket with two small wood screws. Check for free swinging of rudder. Adjust bracket as necessary to allow rudder to swing freely. Install tailwheel and tighten tailwheel collar with 1.5mm allen wrench.



Locate the 4 control horns in your kit. The three on the left are for the elevator and ailerons. The double control horn is for the rudder.



Note: if installing the rudder servo in the aft position (for push-pull), you may cut off one side of the rudder control horn. Otherwise, install the double control horn for pull-pull installation.



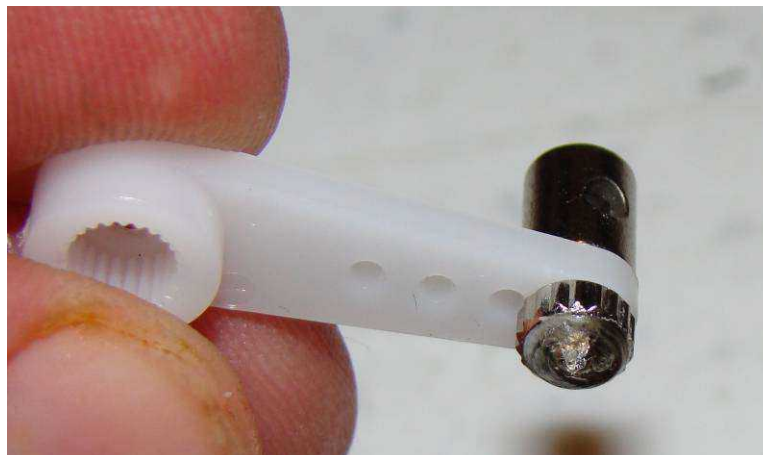
Remove the covering over the slot in the rudder on the RIGHT side as shown, apply a generous amount of medium CA into the slot and onto the bottom of the control horn. Insert horn into slot fully as shown and allow to cure.



Pushrod connectors – The pushrod connectors attach to the servo arm with a nut, as shown. When you install these pushrod connectors, do not tighten the nut all the way, the connector must be free to rotate. Place a drop of medium CA on the end of the nut and apply CA accelerator to lock it to the threads. You must lock the nuts on your servo connectors, otherwise the nuts will vibrate loose and your plane will crash.

On the HS-65 servo stock arm, you must open the diameter of the hole in the servo arm for the pushrod connector, use a drill bit or you can rotate the point of a hobby knife in the hole to open it.

Make sure your connectors rotate freely after installation.



Attach servo extension onto rudder servo, use tape or a commercial servo plug lock to be sure that the extensions does not become unplugged in flight. Using servo mounting screws which come in the servo package, install the rudder servo as shown.

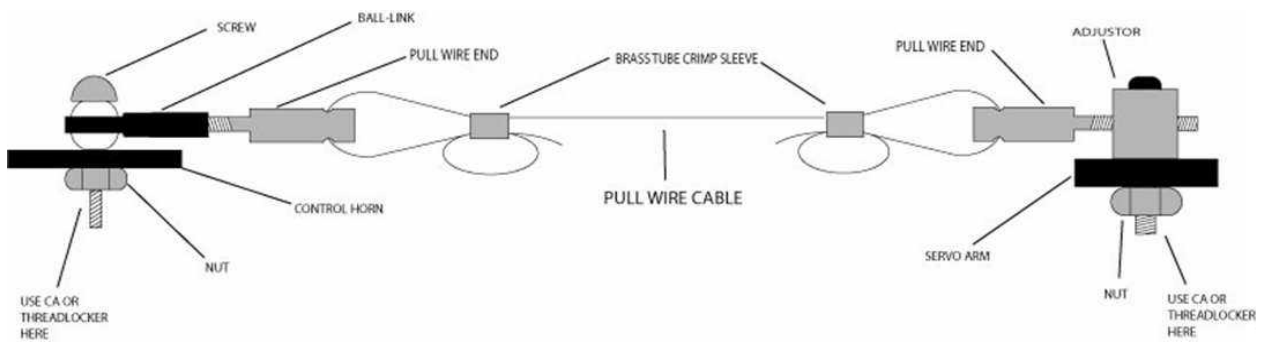


Use the longest pushrod in your kit for the rudder. Install as shown

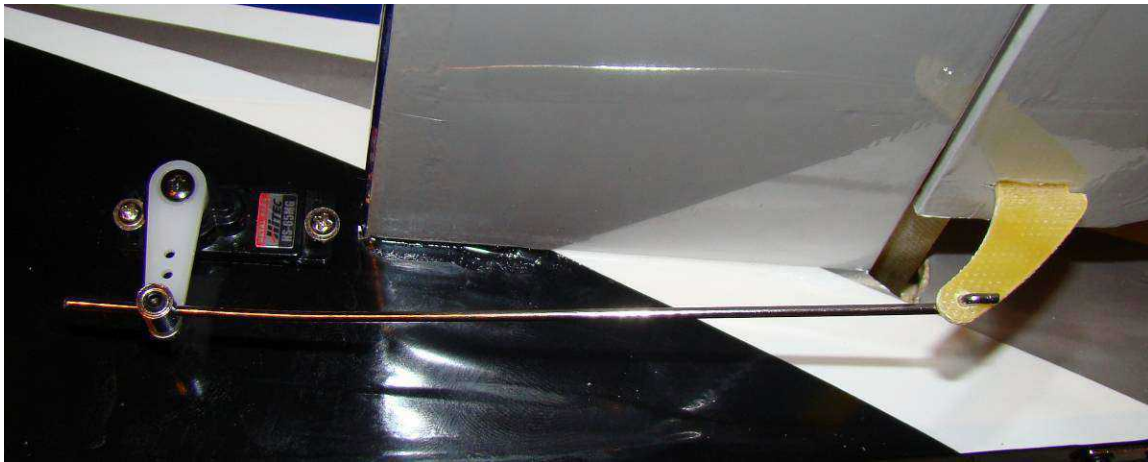
**NOTE:**

We have included the parts in your kit to install the rudder servo in the forward fuselage under the canopy hatch with pull-pull cable rudder actuation if desired. Pull-pull rudder actuation is used **ONLY** to correct CG on an airplane, and so on the 47" extra, you should only use it if you are using a light power system. If you are using the the Omega 130g 870 KV motor, put your rudder servo in the tail location with the pushrod system to actuate the rudder. It will be simpler to install and easier to maintain.

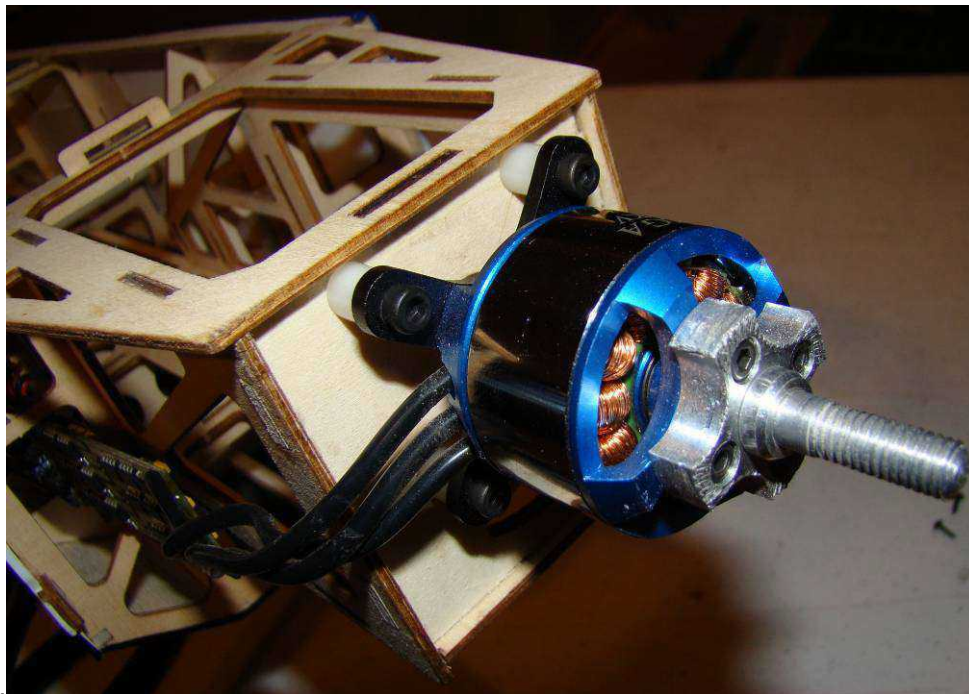
If you are using a 103g Omega motor or a similar lightweight motor, you can use the pull-pull rudder installation if desired. If you aren't sure which to use, you can always leave this decision until the rest of the aircraft is finished, drop your rudder servo into the forward location and balance your airplane to see if it is correct for you. Then you can finish your rudder installation.



Install elevator horn, servo, arm, and pushrod on the LEFT side of the aircraft using the same procedure as the rudder components. The elevator pushrod is the 2<sup>nd</sup> longest in your kit. The elevator pushrod will require a slight bend near the servo for alignment.



Assemble your brushless motor for mounting \*in front of\* the firewall (many brushless motors have more than one mounting option). Mount the motor to the firewall as shown using the 4 longer 3mm allen-head screws in your kit. If you are using the recommended motor, you will need to use the 4 white nylon motor spacers included in your kit. Use blue Loctite on these screws. Attach your speed controller to the side of the motor box with plastic Zip-ties or Velcro



The motor and the speed control are connected together with 3 wires. If you need to reverse the direction of rotation of your brushless motor, disconnect and switch any two of these wires.

**NOTE: NEVER RUN YOUR MOTOR WITH A PROP INSTALLED INDOORS OR ON YOUR WORKBENCH. DO NOT INSTALL YOUR PROP UNTIL YOU ARE PREPARED FOR AN OUTDOOR TEST.**

Install your receiver onto the receiver mount in the fuselage as shown using Velcro or a Zip-tie.

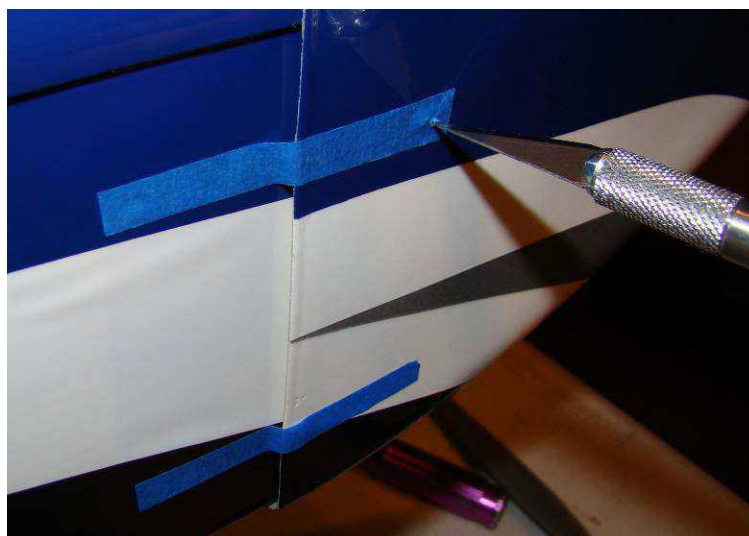




The cowl mounts using 4 small wood screws which screw through the cowl into small plywood rectangles at the front of the fuselage. In order to know where to make the holes in the cowl for the screws, place tape strips on the fuselage over the plywood as shown.



Install cowl and align, use tape to hold the cowl in position while you work. Use the tape strips to locate the position for the holes in the cowl. Use a small drill or a hobby knife to make holes in the cowl.



Remove cowl, place a drop of thin CA glue into each hole in the fuselage, allow to cure, and re-install cowl with 4 small wood screws as shown.



Align covering stripes on ailerons with stripes on wings. Apply two large drops of thin CA glue to each aileron hinge. Allow to cure.



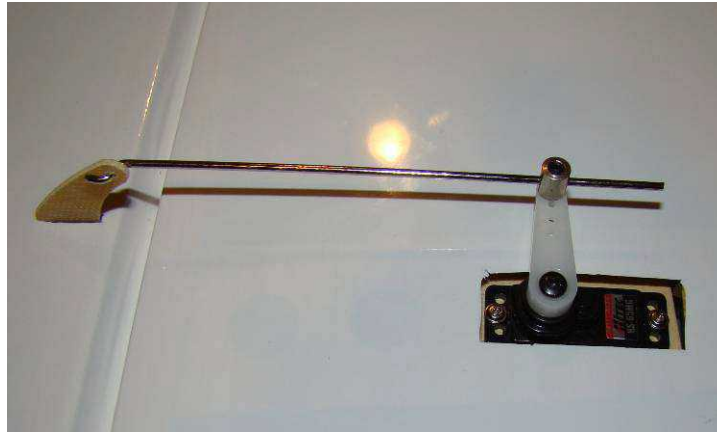
Remove covering over servo opening and aileron control horn slot as shown.



Install aileron control horn as you installed the other horns. Use the installed pull-string to pull the servo wire through the wing.



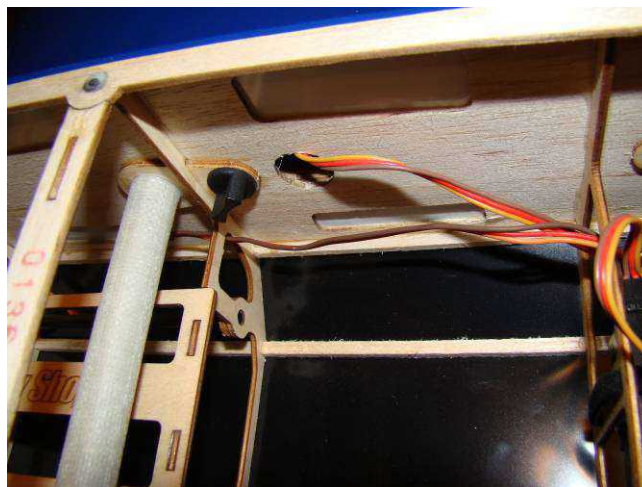
Install the servo using the servo screws which come in the servo package. Install pushrods and servo arms as shown.



Install SFG's on each wingtip using the 4 large wood screws as shown.



Attach wings to fuselage with nylon wing screws. NOTE – the carbon wing tube is designed to be removable, and is not meant to be glued in place.





Balancing: The recommended starting balance (CG) point of the 47" Extra is 3.5 inches behind the leading edge of the wing measured at the root of the wing, where the wing meets the fuselage. This is a conservative CG location, excellent for sport flying or precision flight. For 3D flying, you may wish to move your CG back. If you do so, move it in small increments, a small change can have a large effect.

An easy way to verify your CG settings during tuning is to do the "roll inverted" test. Trim your plane for perfect upright hands-off flight. Then, with sufficient altitude, at ¾ throttle, roll inverted and release the controls. Your airplane should very gently descend. If instead, it climbs, it is far too tail-heavy. If it dives sharply, it is too nose heavy.

***Scott's Tip:***

## **Control Throws and Exponential**

Setting appropriate control throws is a critical step in matching your model to your flying style. Personally, I use two different flight "modes"—precision and 3D. Depending upon your radio, you may be able to combine all three dual rate functions onto a single switch, which is the technique I use. Regardless, be sure to use a common assignment scheme to prevent being in the wrong rate at the wrong time. I prefer my switches to be higher for high rates and lower for low rates, but virtually any combination will work—just be comfortable with your setup.

### Low/Precision Rates (in degrees and inches) and Corresponding Exponential

Aileron	15 degrees	.75"	30% Expo
Elevator	13 degrees	1.25"	30% Expo
Rudder	45 degrees	3.5"	75% Expo

### High/3D Rates (in degrees and inches) and Corresponding Exponential

Aileron	28 degrees	1.25"	75% Expo
Elevator	45 degrees	3"	85% Expo
Rudder	45 degrees	3.5"	75% Expo

The above throw measurements were taken at the aft edge of the ailerons and elevator, and from the bottom aft edge of the rudder. Keep in mind that even the low throws mentioned here are relatively aggressive, so be sure to also program the matching exponential listed to help soften the model's feel around center stick.

One of the things you may notice is that my low rates are dramatically lower than you might expect. I find that I have such great control authority that I need to minimize the elevator in particular or the snap rolls will be far too deep into the stall for clean recoveries. You should also note that even the high aileron rates are also relatively sedate compared to the extreme 45 degree throws common to 3D models. I set my 3D rate aileron throw for a comfortable roll rate during the slowest rolling maneuver I fly—the rolling harrier. I prefer to hold full aileron throw during the rolling harrier, so excess throw results in excess roller rate, which is detrimental to not only the maneuver's appearance, but also the maneuver's timing.

After you have completed all of your radio setup, take the model outside and install your propeller. Test run your power system in a safe manner. Recommended power level for the Extra is 350-440 watts.

NOTE: Small brushless motors typically have aluminum prop adaptors with aluminum screws threads. These threads are easily stripped or broken. **DO NOT apply too much torque when tightening your prop.** A wrench is not necessary, it applies too much torque. We prefer a nut-driver or pliers.

Be sure to check the motor manufacturer's recommendations for help in selecting a prop.  
Recommended Equipment for the 47" Extra:

Motor:           Omega 103g1030KV (12 x 6 prop)  
                      Omega 130g 870KV (14 x 7 prop)

ESC:             Castle Creations Edge 50 Lite

Spinner:        40mm

Servo:           Hitec HS-65MG

Extensions:    2 x 12", 2 x 4" 1 x 6"

Battery:         3S 2200-2650mah 25C lipo

Special note about servo arms:

3DHS manufactures longer servo arms for the Hitec HS-65 servo. Some transmitter setups require longer servo arms to achieve full 3D throw.