LEGACY AVIATION

70cc Muscle Bipe ARF

Assembly Manual



EXTREME FLIGHT

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Please read the following paragraph before beginning assembly of your aircraft!

THIS IS NOT A TOY! Serious injury, destruction of property, or even death may result from the misuse of this product. Extreme Flight RC is providing you, the consumer, with a very high quality model aircraft component kit, from which you, the consumer, will assemble a flying model. However, it is beyond our control to monitor the finished aircraft you produce. Extreme Flight RC will in no way accept or assume responsibility or liability for damages resulting from the use of this user assembled product. This aircraft should be flown in accordance with the AMA safety code. It is highly recommended that you join the Academy of Model Aeronautics in order to be properly insured and operate your model at AMA sanctioned flying fields only. If you are not willing to accept ALL liability for the use of this product, please return it to the place of purchase immediately.

Extreme Flight RC, Ltd. guarantees this kit to be free of defects in materials and workmanship for a period of 30 DAYS from the date of purchase. All warranty claims must be accompanied by the original dated receipt. This warranty is extended to the original purchaser of the aircraft kit only. Extreme Flight RC in no way warranties its aircraft against flutter. We have put these aircraft through the most grueling flight tests imaginable and have not experienced any control surface flutter. Proper servo selection and linkage set-up is absolutely essential. Inadequate servos or improper linkage set up may result in flutter and possibly the complete destruction of your aircraft. If you are not experienced in this type of linkage set-up or have questions regarding servo choices, please contact us at info@extremeflightrc.com or 770-887-1794. It is *your* responsibility to ensure the airworthiness of your model.

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Congratulations on your purchase of the Legacy Aviation 70cc Muscle Bipe! Inspired by the highly modified Waco known as the Mystery Ship, flown by the late air show legend Jimmy Franklin, the Muscle Bipe delivers timeless and classic looks coupled with modern features and performance. Equally at home flying barnstormer airshow maneuvers as it is flying old school low and slow 3D, the Muscle Bipe's gentle manners inspire confidence for sport flyers and 3D enthusiasts alike.

The 70cc Muscle Bipe features quick connect mechanisms that allow it to be assembled and disassembled in a couple minutes at the flying field-without any tools! No more long and tedious assembly and tear down sessions that are typically associated with biplanes!

The Muscle Bipe features our state-of-the-art construction materials and methods, resulting in a lightweight, rigid and robust airframe. It features carbon fiber wing and stab tubes, carbon fiber landing gear and tailwheel assembly, carbon fiber main wing spars and fuselage longerons, g10/lite ply composite laminated internals and 2 gorgeous genuine Ultracote (Oracover) color schemes. Highly prefabricated, including pre-hinged and sealed control surfaces, the Muscle Bipe can be assembled in a couple evenings.

Because of the work done for you by the skilled workers in our factory, there is very little gluing required during assembly. Once you glue the G10 control horns into the control surfaces, most of the rest of the assembly consists of bolting components into the airframe. This makes for a very quick assembly process, with most experienced modelers able to complete assembly in 2-3 evenings of relaxed and enjoyable work.

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Tips for Success:

1. **We are very pleased with the level of craftsmanship displayed by the builders in our factory. Through hundreds of grueling test flights containing maneuvers that no aircraft should be subjected to, our prototypes have remained rigid and completely airworthy. Having said that, it is impossible for us to inspect every glue joint in the aircraft. Take a few minutes and apply some medium CA to high stress areas such as the aileron servo mounting trays , landing gear mount, anti rotation pins, wing and stab root ribs, etc.**
2. **Having survived the journey half way around the world while experiencing several climate changes, it is not uncommon for a few wrinkles to develop in the covering. Fear not! These are not manufacturing defects, and are easily removed with a little bit of heat. Use a sealing iron to go over all seams, stripes and sharp points in the covering scheme. You may want to apply a drop of clear fingernail polish at the tip of all sharp points to prevent them from lifting. To remove wrinkles use a 100% cotton tee-shirt or microfiber cloth and your heat gun and heat the covering while gently rubbing the covering onto the wood with the t-shirt or cloth. Be careful not to use too much heat as the covering may shrink too much and begin to lift at the edges or even worse, burn a hole in the covering! Take your time, and a beautiful, paint like finish is attainable.**
3. **By the time your aircraft arrives at your door step it will have been handled by a lot of people. Occasionally there are small dings or imperfections on some of the surfaces. An effective method to restore these imperfections to original condition is to use a very fine tipped hypodermic needle to inject a drop of water under the covering material and into the ding in the wood. Apply heat to the area with a sealing iron and the imperfection will disappear. Deeper marks may require that this process be repeated a couple of times to achieve the desired result, but you will be surprised at how well this technique works.**
4. **DO NOT SKIMP ON SERVOS! Your aircraft is equipped with very large control surfaces that may be required to deflect well more than 45 degrees. A lot of servo power is required to prevent flutter and to maintain the required deflection for maneuvers. We absolutely recommend the use of METAL GEARED servos with a minimum of 350 oz. inches of torque.**

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5. **Use a high quality epoxy for installing the composite control horns. We highly recommend the use of Pacer Z-Poxy 30 minute formula. We have used this glue for many years with zero failures. More recently we have started using the Loctite brand of Hysol epoxies and have grown to prefer them for their ease of application and clean up.**
6. **Your aircraft is built using modern construction techniques and is very light weight for its size. As with any high performance machine, regular inspection and maintenance is a must. While disassembling your aircraft after a flying session, pay close attention and inspect glue joints, linkages and loose covering to be sure the airframe is sound. A few minutes spent doing this will help ensure airframe longevity.**
7. **Be sure to put a drop of blue Loctite thread lock on every bolt on this aircraft! Failure to do so may cost you your aircraft! This includes servo arm screws!**
8. **There are several excellent videos that further explain the assembly and setup of giant scale aircraft on our YouTube channel, breaking down each step with in-depth explanations and examples. We highly recommend taking the time to view these videos, especially if you are new to giant scale aircraft assembly and setup. Follow the link below to access our channel.**

https://www.youtube.com/channel/UCC_LyauUOgcTE4oHow93CNA/videos

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Let's get started!

1. When assembling one of our current aircraft, I like to go ahead and get all of the control horns glued into the control surfaces. I start by lightly scuffing both sides of the shanks of each control horn that will be glued into the surface. A sanding block with medium grit sandpaper is ideal for this task.



2. Insert two control horns into a baseplate and temporarily insert them into the slots in the control surface (each surface's horns are affixed using the same method, so choose the surface you want to start with and continue this procedure until all horns are glued in place). Use a fine tipped marker to trace the control horn. Remove the horns and baseplate and use a sharp #11 hobby blade to remove the covering 2mm inside the line you traced. Take great care to only score the covering.

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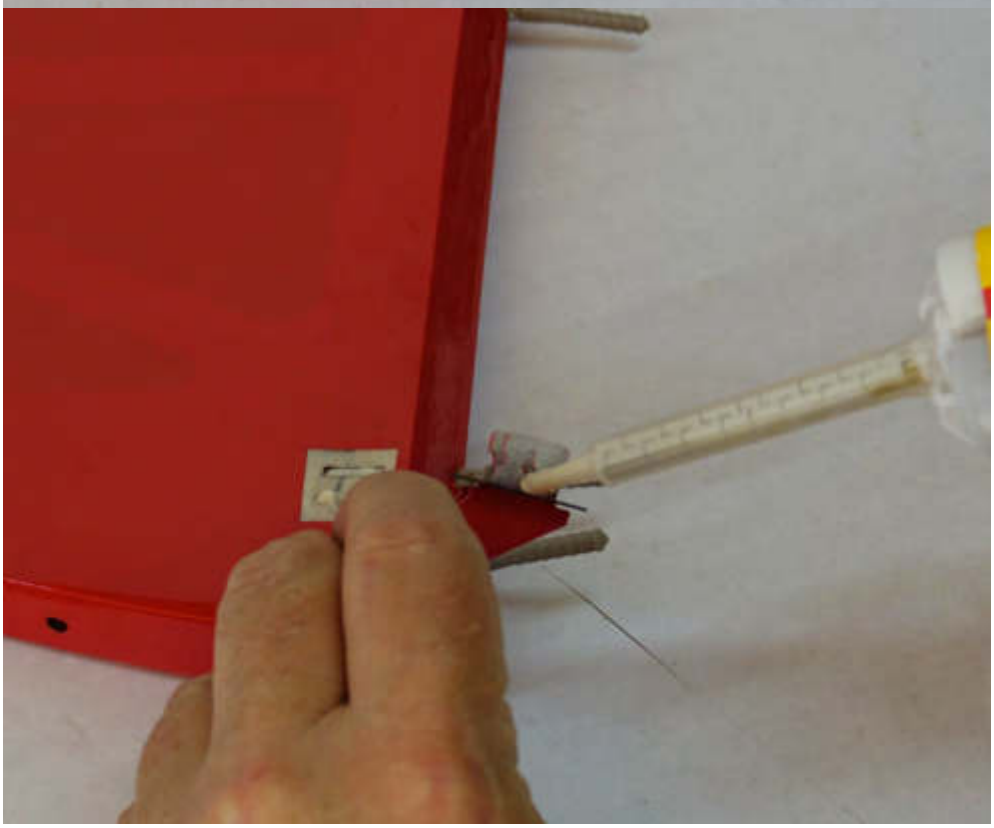


3. Test fit the control horns and baseplate into the surface and make sure everything fits properly. Use a high quality epoxy to glue the horns into the surfaces. I've started using the Loctite Hysol products and glue gun which makes this process so much faster with less clean up required and less waste. I like the slow set EA 9462 for this particular procedure. It allows plenty of time for gluing all of the control horns into place in one sitting.

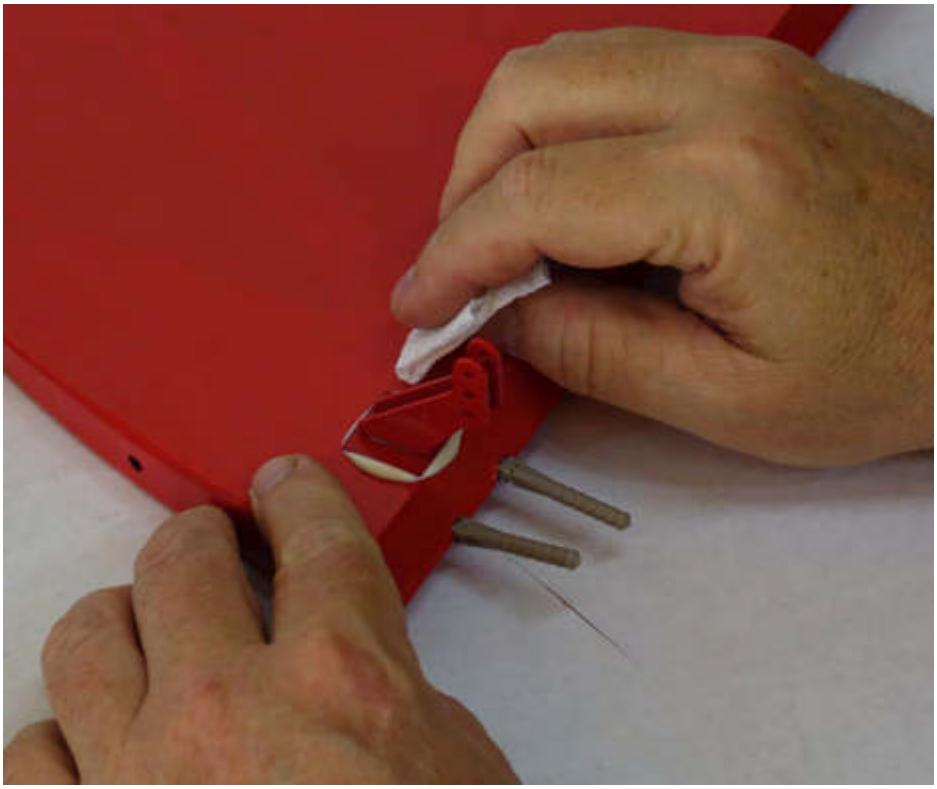
I first apply glue to both slots, then to both sides of each control horn below the baseplate. Once the glue has been applied insert the horns into their slots and press into place firmly against the control surface. Wipe away any excess glue with a paper towel soaked with denatured alcohol. Set aside to dry. Repeat this process for all control surfaces.

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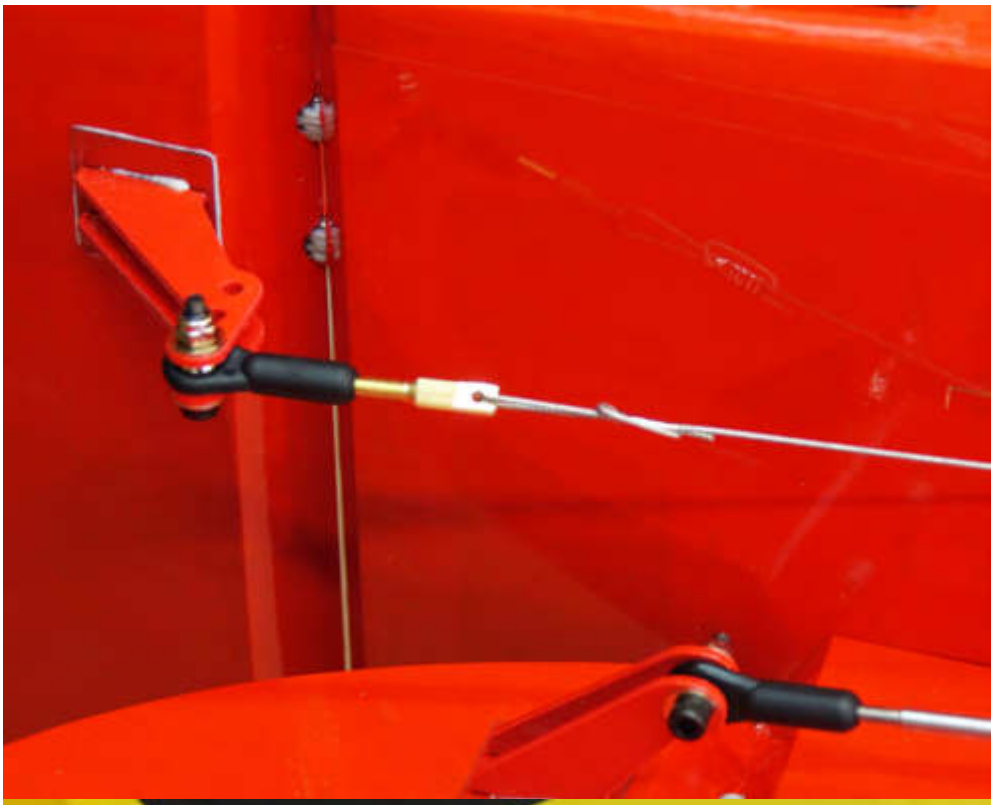
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<u>Please note:</u> If using a twin 70-76cc gas engine or electric setup it is absolutely essential to use a pull-pull rudder system to achieve proper CG. This will require that you glue a set of control horns to each side of the rudder to interface with the pull-pull system cables. There is a plywood jig included in the hardware package that aids achieving proper alignment.

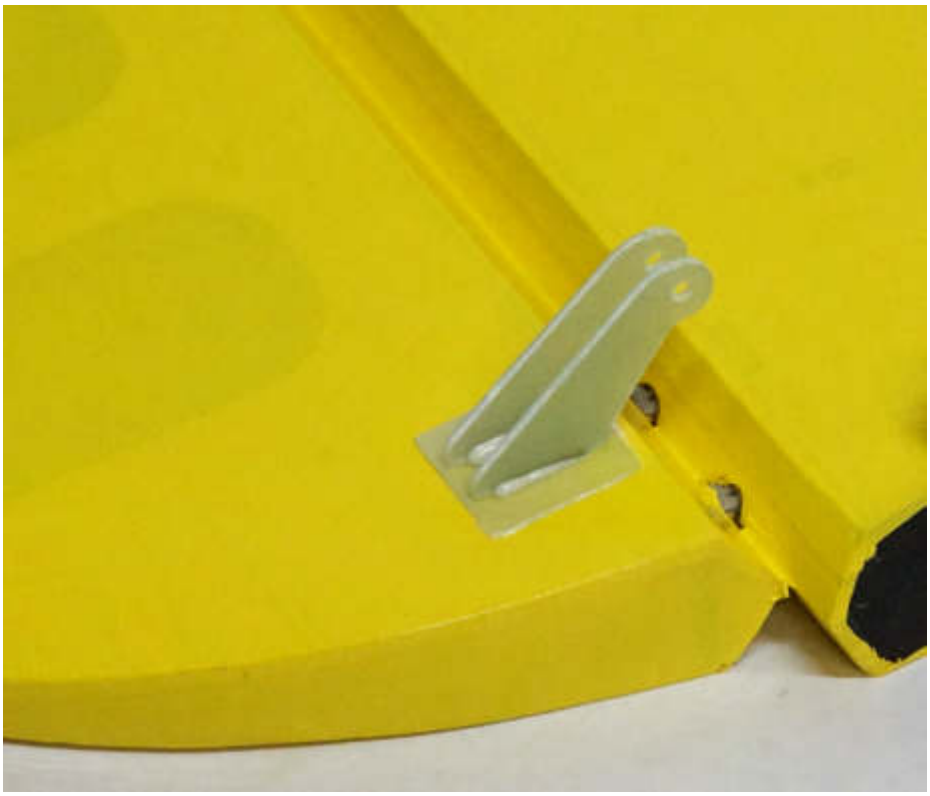


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4. While you are gluing, go ahead and affix the rudder to the fuselage, by applying glue to the hinge holes in the rudder post and to the hinges in the rudder. Push into place, ensuring minimal gap, and wipe away any excess glue, paying close attention to the hinge knuckles.

5. Next we'll install servos into the elevators and ailerons and assemble the linkages as shown in the pictures. We use the Extreme Flight Xcessories black socket head servo screws to affix the servos to the airframe (link below).

https://extremeflightrc.com/Socket-Head-Servo-Screws--Qty-100_p_3488.html

While the upper wing servos require no servo extensions for the servo lead to reach the root, the bottom wings will require a 12 inch extension. Attach this extension to the servo lead and secure with a servo safety clip or heat shrink tubing before installing the aileron servo into the wing.

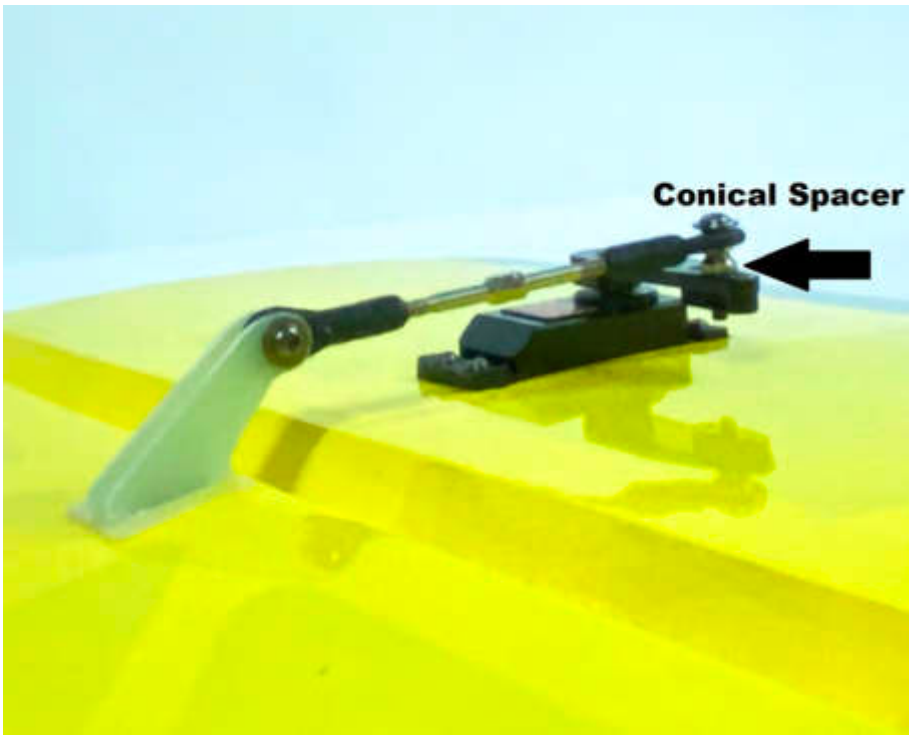
<u>Be sure to apply Blue Loctite to all nuts and bolts!</u> There are conical spacers included in the linkage kits which go between the ball link and metal servo arm to prevent binding. Also be sure to place a washer on the outer side of each G10 control horn.

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6. Next let's get the landing gear mounted. There are pre-installed nylon insert locking nuts in the landing gear mount, making it very fast and easy to install the main landing gear. Attach the carbon fiber landing gear using 4 4mm socket head cap bolts, inserted through washers, through the gear and into the locking nuts. Be sure to place a drop of Blue Loctite on each bolt and tighten securely.



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7. Slide the landing gear fairings into place and mark the landing gear with a felt tip marker to show where they fit. Remove the cuffs and lightly scuff the carbon gear for maximum glue adhesion. Use epoxy or "Goop" silicon adhesive to permanently attach the fairings to the gear. I suggest using blue painters tape to keep the fairings securely in place while the adhesive sets.



8. Attach the axles to the main landing gear as shown. Place a wheel collar on the axle and slide the wheel into place.



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9. Attach the aluminum wheel pant bracket to the wood spacer with the included black wood screws. Retain the wheel with the bracket assembly as shown. Be sure to use Blue Loctite on the grub screw.





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10. Slide the wheel pant into position and secure with 2 3mm socket head cap bolts, inserted through a washer, the carbon gear and into the blind nuts in the wheel pant. Again, use Blue Loctite on these bolts and tighten securely.

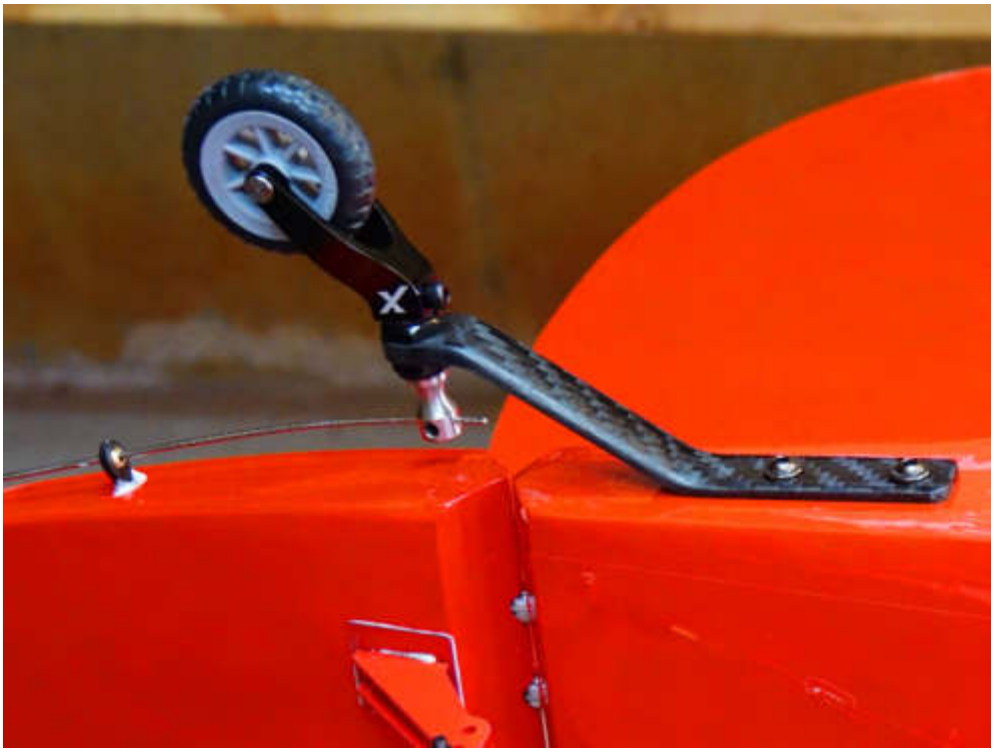


11. Pull the outer side of the pant away from the wood bracket and apply a bead of epoxy to the bracket. This will secure the pant mounting bracket to the fiberglass wheel pant, making a much stronger assembly.



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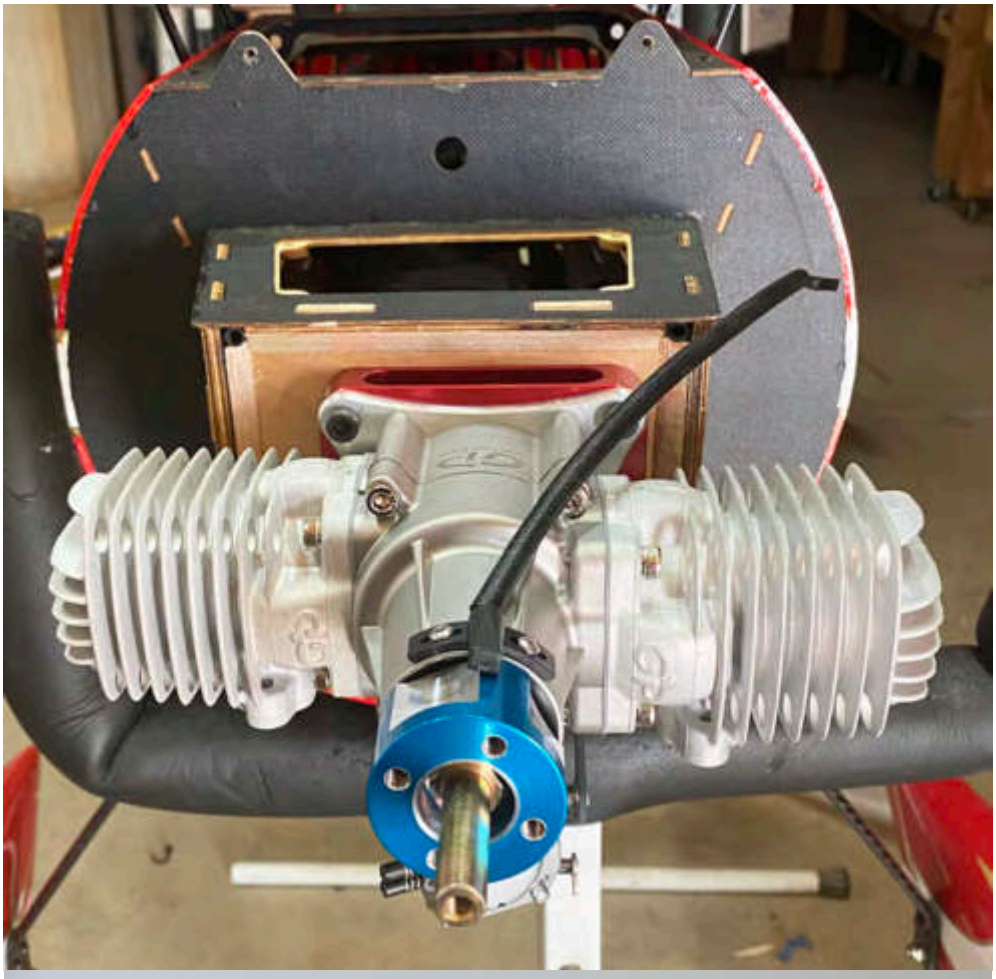
12. Drill a hole in the bottom of the rudder to accept the ball link included in the tailwheel assembly package. Scuff the shank of the ball link with sandpaper and glue it into the hole with epoxy or medium CA. Slide the tailwheel tiller arm into the hole in the ball link and bolt the assembly to the bottom of the fuselage.



13. Now we can turn over the fuselage and place it on its gear and start mounting components. First we'll install our choice of power plant. If using a 70-76cc twin gas engine, we'll use the Blazing Star 70cc mount. If using the Xpwr 60 we'll use the Blazing Star XL Standoff set. If mounting the Saito FG90-R3 we'll use the Blazing Star Standard Standoff set. Drill the motorbox to accept your chosen power system. The Xpwr 60 and DA-70/GP-76 all share the same mounting bolt pattern. We used the stock mufflers for our 70cc install and the Keleo Exhaust ring for the Saito FG90 R-3 radial.

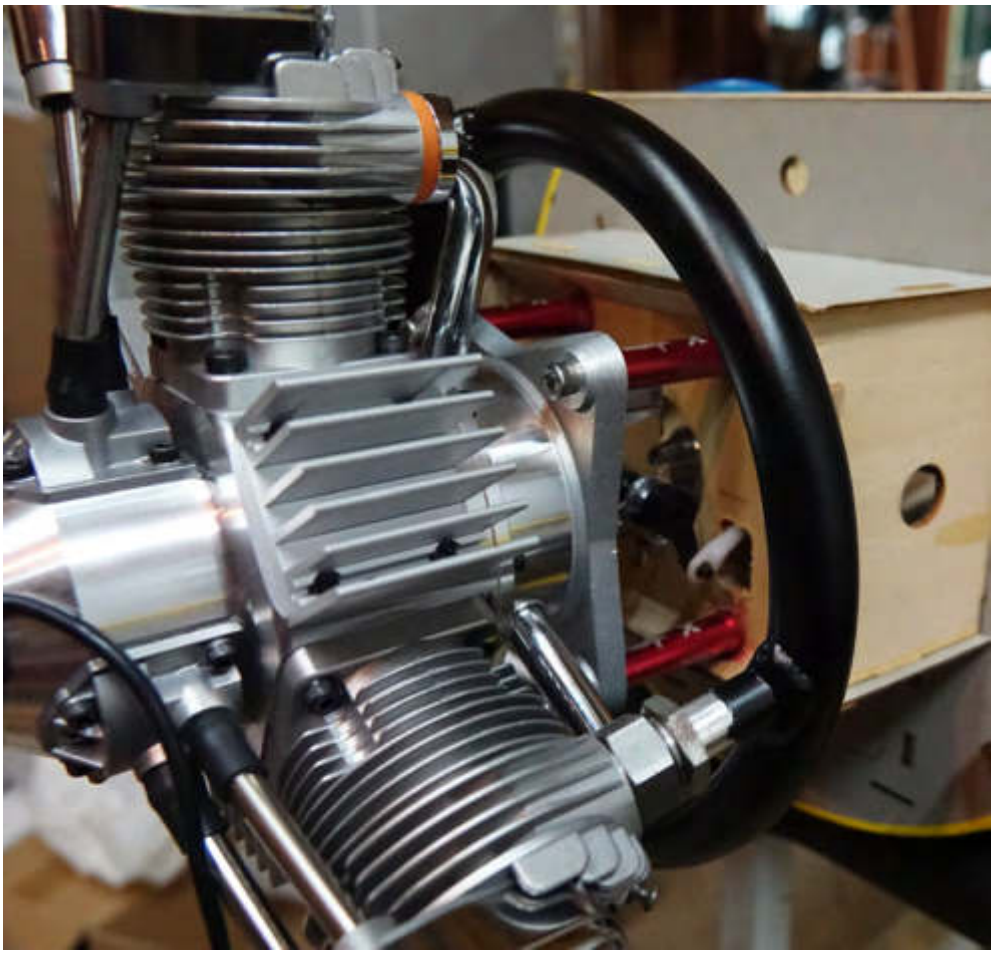
https://ch-ignitions.com/product/keleo-saito-fg-84r3-fg-90r3-radial-exhaust-ring/

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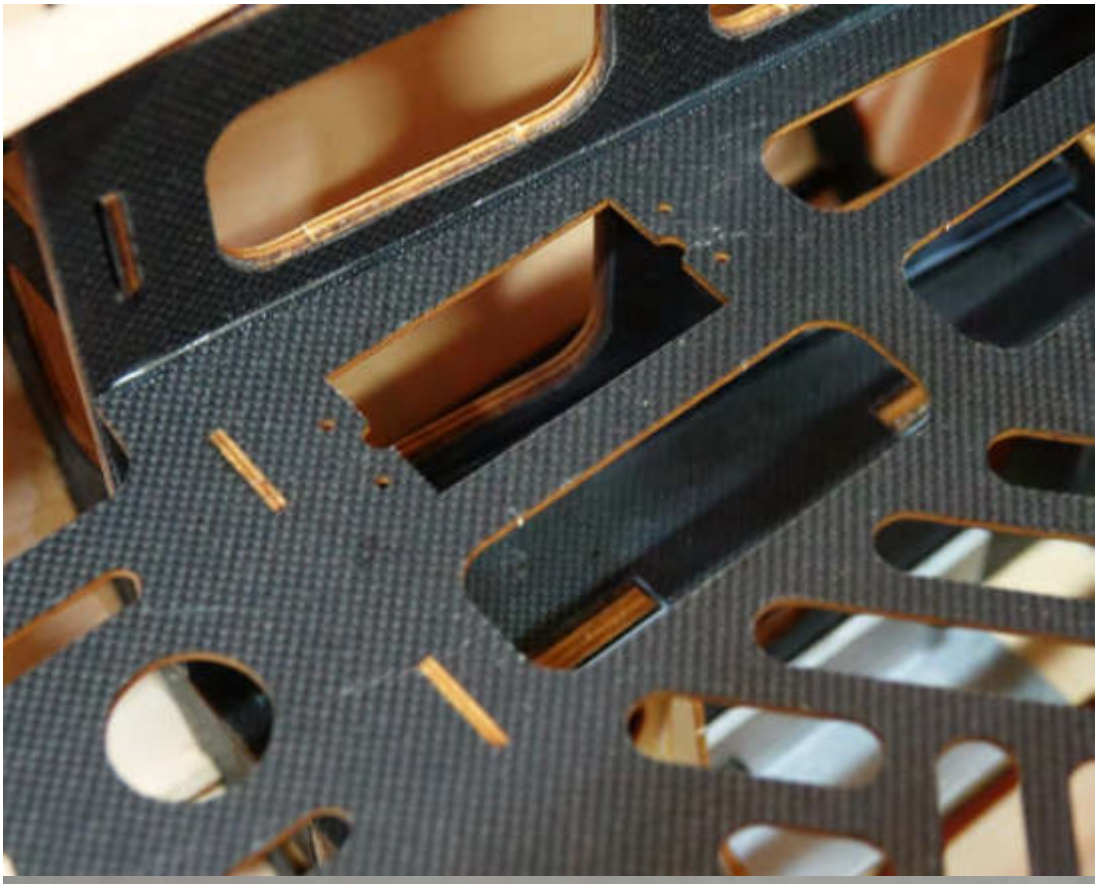
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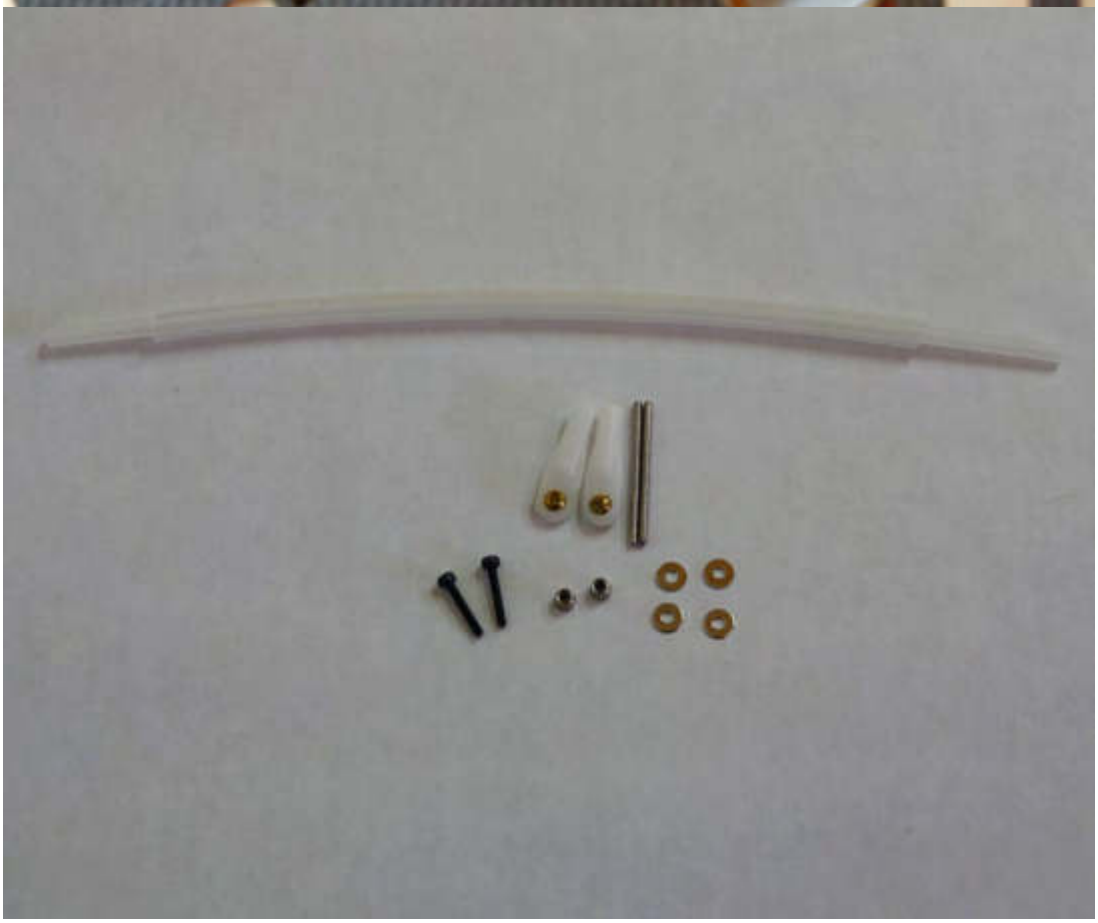


14. After mounting your engine, install your ignition module or ESC. For those using a 70-76cc gas engine, install your ignition module as far forward as possible on the motor box top. If using the FG90-R3 radial engine, mount your ignition module inside the motor box directly behind the engine, in front of the gas tank. If using the Xpwr 60 brushless outrunner, mount your ESC on the bottom of the motor box.

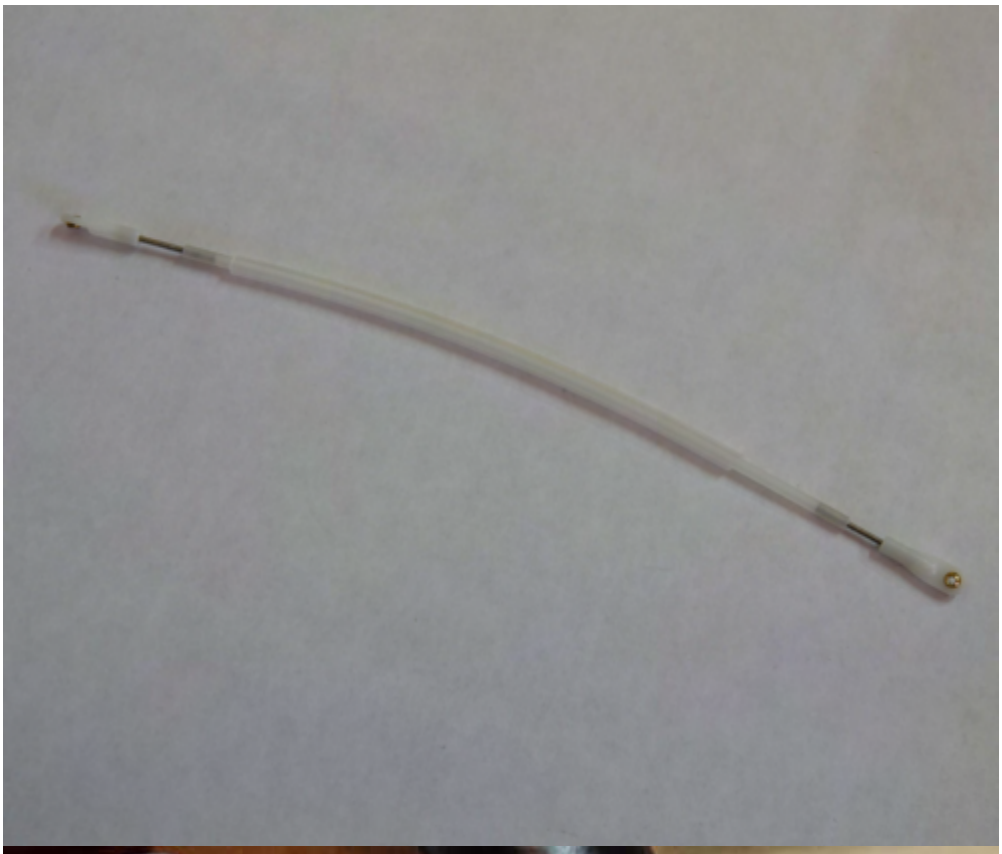
15. The twin gas version of the Muscle Bipe has a location on the bottom of the motor box to mount your throttle servo, along with a pushrod and hardware to fabricate the linkage. For the radial version the throttle servo is mounted inside the fuselage in the designated area on the side of the tank tray and a sleeved flexible plastic pushrod with fittings is provided. You will need to drill a hole in the firewall for the pushrod to pass through and secure the outer sleeve in a couple locations along the tank tray.

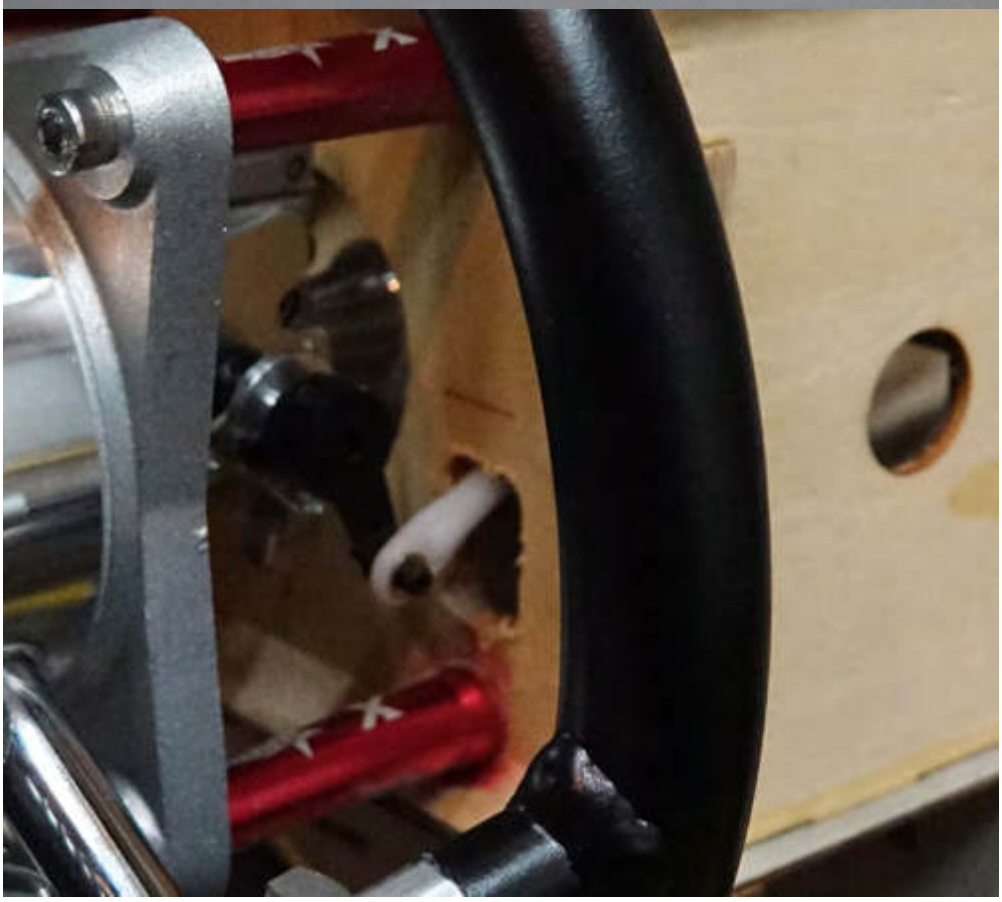
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16. Before installing your tank and plumbing, slide the 4 cabane struts into position as shown and secure with 2 3mm socket head cap bolts per strut. Again, apply Blue Loctite to all bolts.

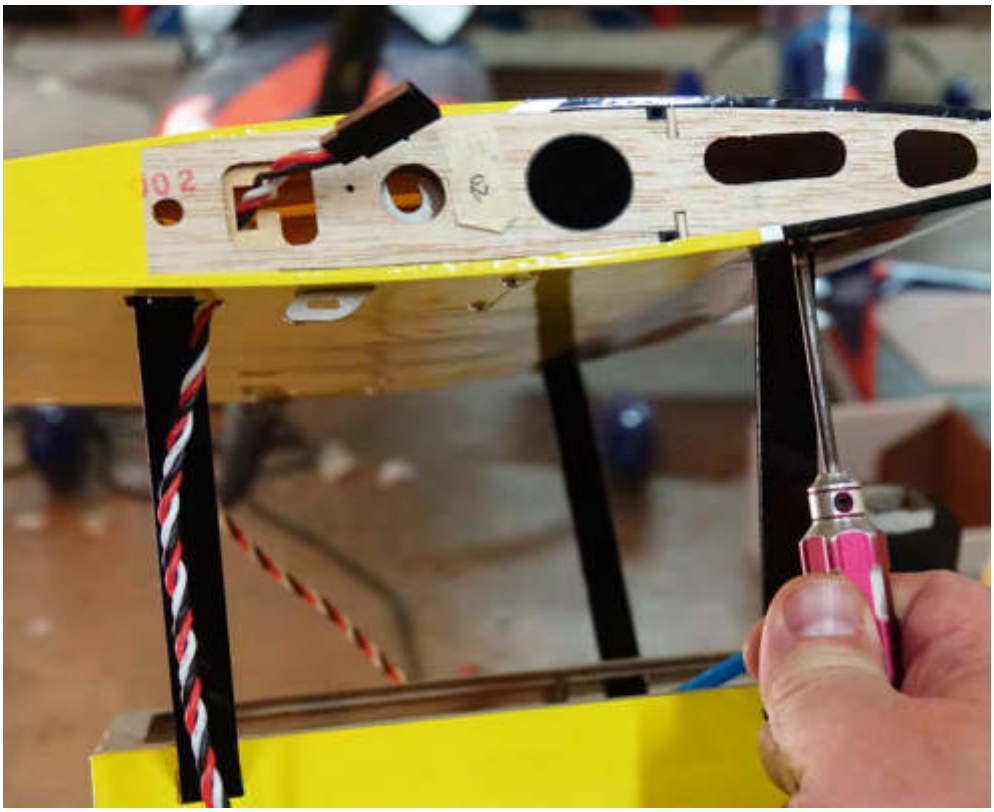


17. Mount a 24 ounce Flowmaster gas tank on the tank tray and run your fuel line (carb feed, fill tube, overflow). Install an EF Fuel Dot for easy fueling/de-fueling.



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18. Insert 2 24" Extreme Flight 20AWG servo extensions into the center wing section and secure it to the cabane struts with 4 4mm socket head cap bolts. Secure the servo extension to the struts with a nylon cable tie or Velcro wrap.

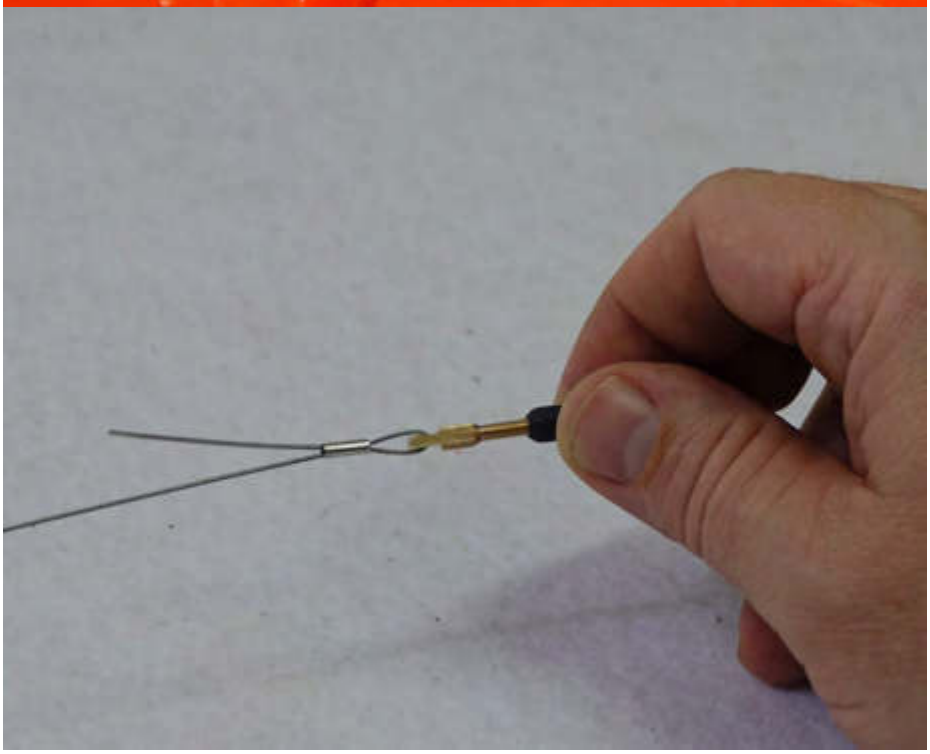


19. Next lets set up our rudder control system. If using a gas 70-76cc twin it is <u>absolutely imperative</u> that you install your rudder servo under the canopy hatch and use the supplied pull-pull cable system. Failure to do so will result in difficulty achieving the correct center of gravity. If running the heavier radial engine, mount your servo in the rear of the model and fabricate your linkage from the supplied pushrod, ball links and 3mm hardware. <u>PLEASE NOTE:</u> Mount the ball link and conical spacer on the interior side of the EF 1.5" servo arm as shown to prevent interference with the elevator linkages. Assemble the pull-pull cable linkage as shown in the following series of pictures by inserting the end of the pull-pull cable into one of the aluminum crimp tubes. Insert the cable through the hole in the brass fitting and back through the crimp tube. Loop the cable one more time through the crimp tube and pull it tight. Use a crimping tool or set of side cutters to carefully crimp the tube in multiple places, taking care not to cut through (continued)

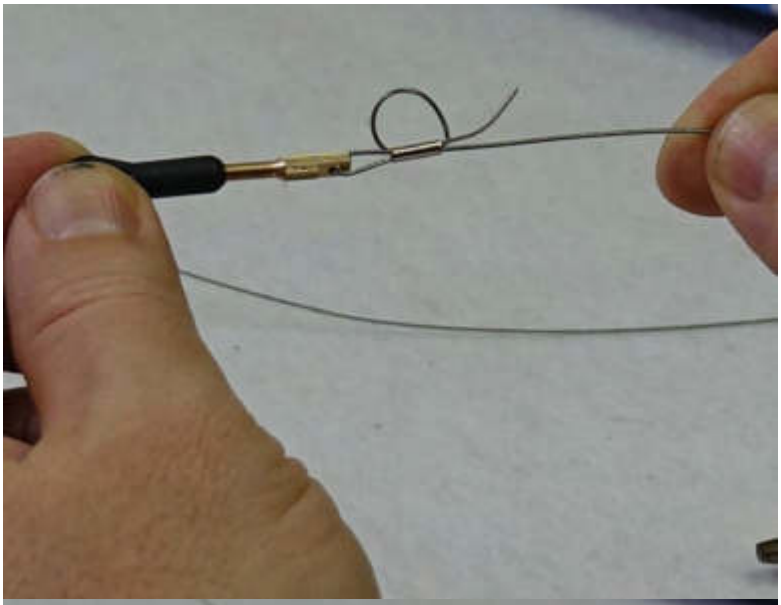
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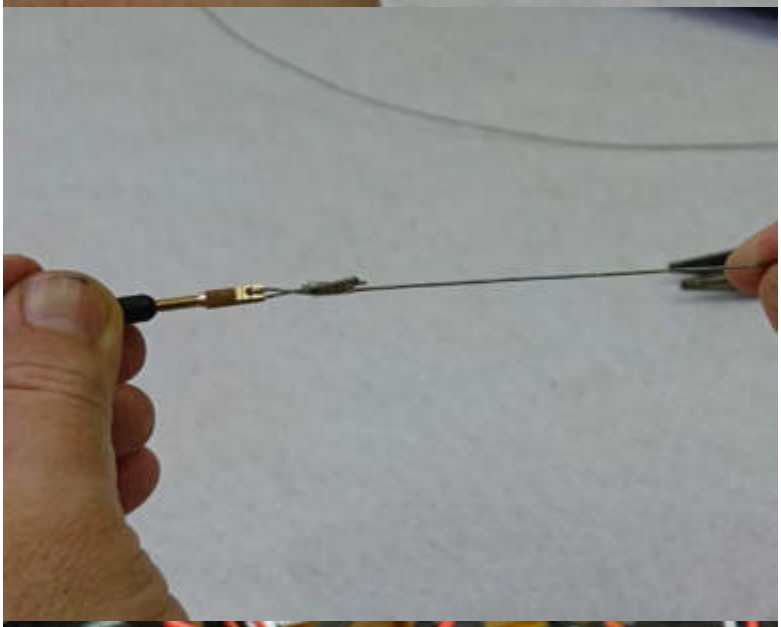
the crimp tube and cable. Repeat this for the other 3 cable ends and install onto the servo arm and control horns using the provided 3mm hardware.

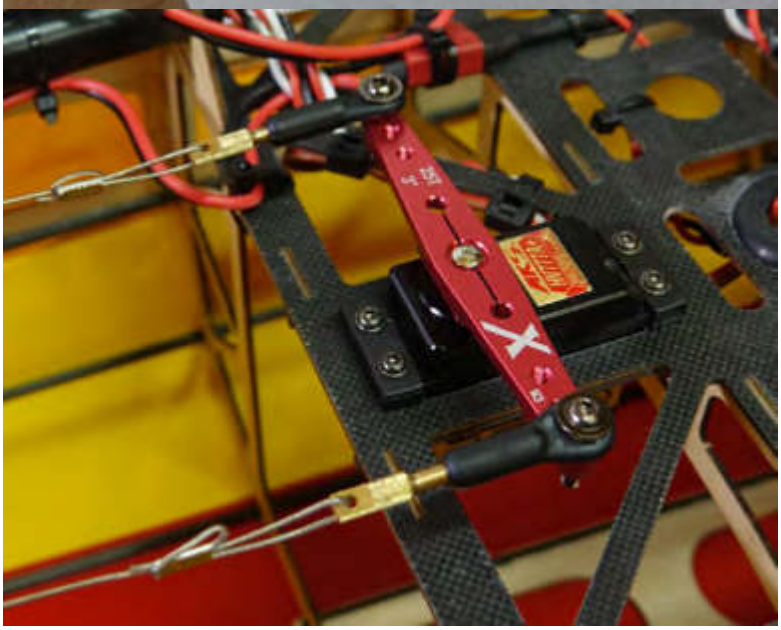




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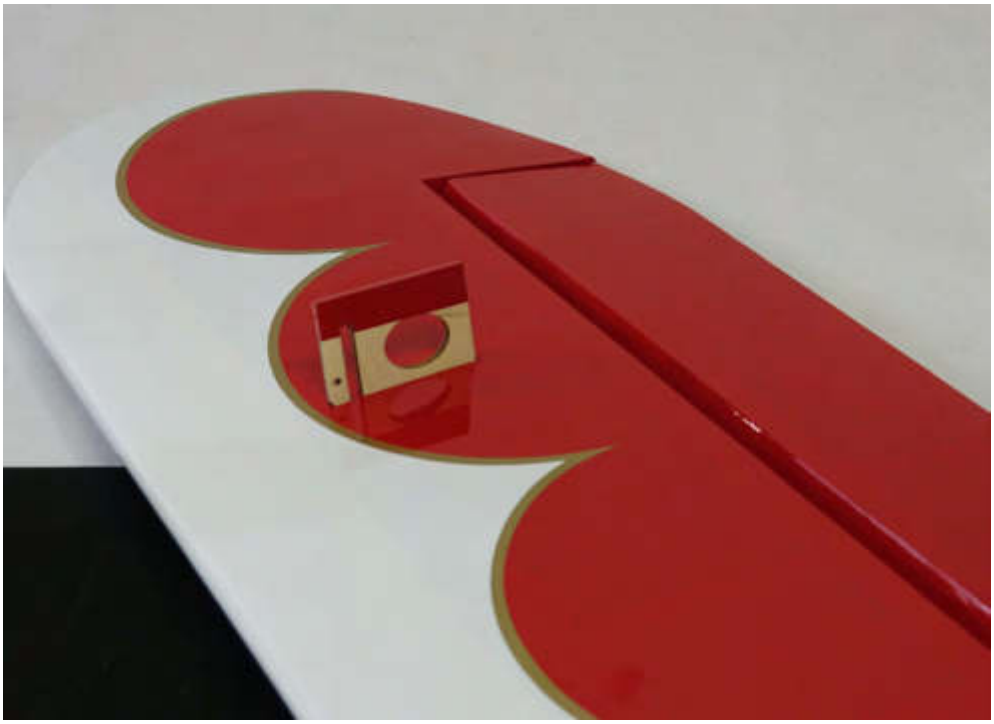




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20. Trial fit the strut mounting brackets into the wings, making sure they seat properly against the wing surface. It is best to trial fit the wings at this time to insure proper alignment before permanently gluing the brackets into place with epoxy.

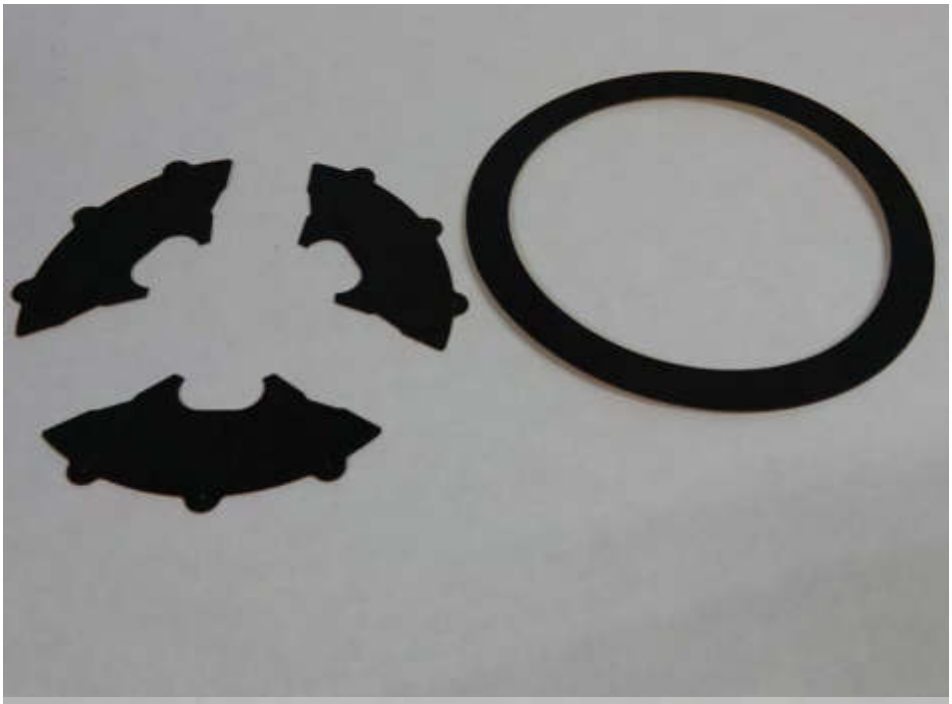


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21. For those of you assembling the radial version of the Muscle Bipe, installing the engine baffle will probably be the most time consuming step in the assembly process. Start by installing the cowl over the mounted engine. The baffle should fit 1/4" to 1/2" behind the front of the cylinders. I find it a huge help to determine the location of the baffle and measure forward from the rear of the cowl, making several marks around the interior circumference of the cowl with a felt tip marker where the baffle ring will be glued. Then take some scrap balsa or spruce 1/4" square sticks and cut into 1/2" lengths and glue these in place in multiple locations where you have marked the cowl. This will allow you to slide the baffle ring into position and butt against the sticks, aiding in proper positioning of the ring. Carefully bend the baffle ring to insert it into the cowl. Use the opening in the bottom of the cowl ring that accepts the mounting block to give you a bit more room to fit the ring into the cowl. Tack glue the ring into place, then use some short wood screws (3 per section) to mount the 3 baffle pieces to the ring. You will notice there are pre-drilled holes in the ring and baffle pieces to accept these screws, insuring proper alignment. Re-install the cowl and check baffle alignment with the cylinders. Reposition until the best fit is achieved and when satisfied run a fillet of epoxy around the entire intersection of baffle ring and cowl.

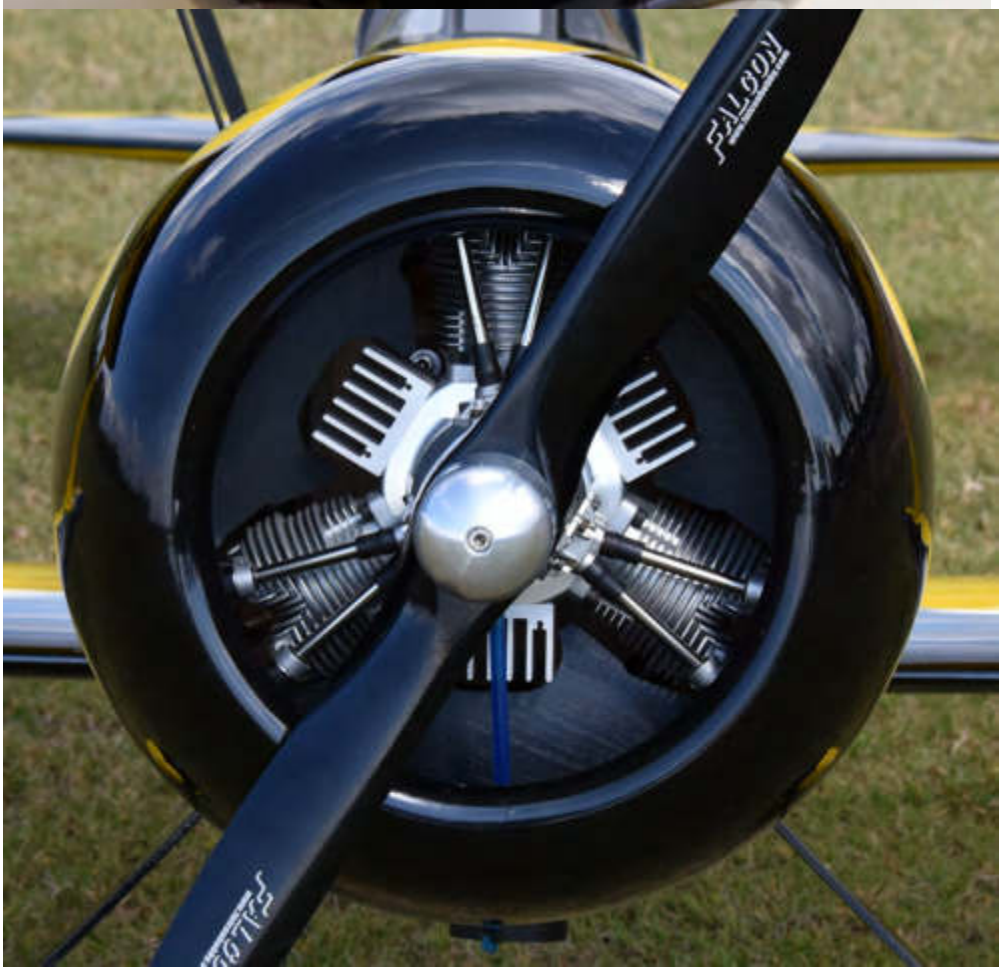
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22. Make an opening in the bottom of the cowl to allow incoming air to exit. Below is a picture of the cutouts I made on the bottom for the gas twin engine version for the exhaust stacks and air exit. I made a similar opening on the radial version.



23. Install your cowl, prop and spinner along with your receiver and batteries and assemble your aircraft. For the radial version, install you receiver on the rear tray and your battery as far back on this tray as possible. Since I am powering the servos and ignition (via an IBEC) I used a 5000 mah 2S Lipo at the very rear of the tray and the CG was perfect. For those using a 70cc twin or electric setup it is imperative to mount all batteries and components as far forward as possible. I mounted my receiver just in front of the rudder servo and my 5000 mah 2S pack in front of the gas tank. Assemble the entire aircraft to confirm CG. We have found the ideal CG to be measured at 5.25 inches back from the leading edge of the top wing at the root.

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24. The quick mount/release components make assembling and disassembling your Muscle Bipe very fast at the flying field. Start by sliding the stab tube and anti-rotation rod into the fuselage and make sure the silver knob is in the rear position. Now slide both stabs onto the tube and connect the servo lead to the extension in the fuselage. Push the stabs into position. Pull out on the spring loaded knob and slide it forward until it sinks into the recess. Do the same for the other side. You may find it necessary to apply a bit of pressure to the opposite side when fastening the second half. You can adjust the bolt in the root of the stab if necessary for best fit, but typically it is setup in the ideal position from the factory.



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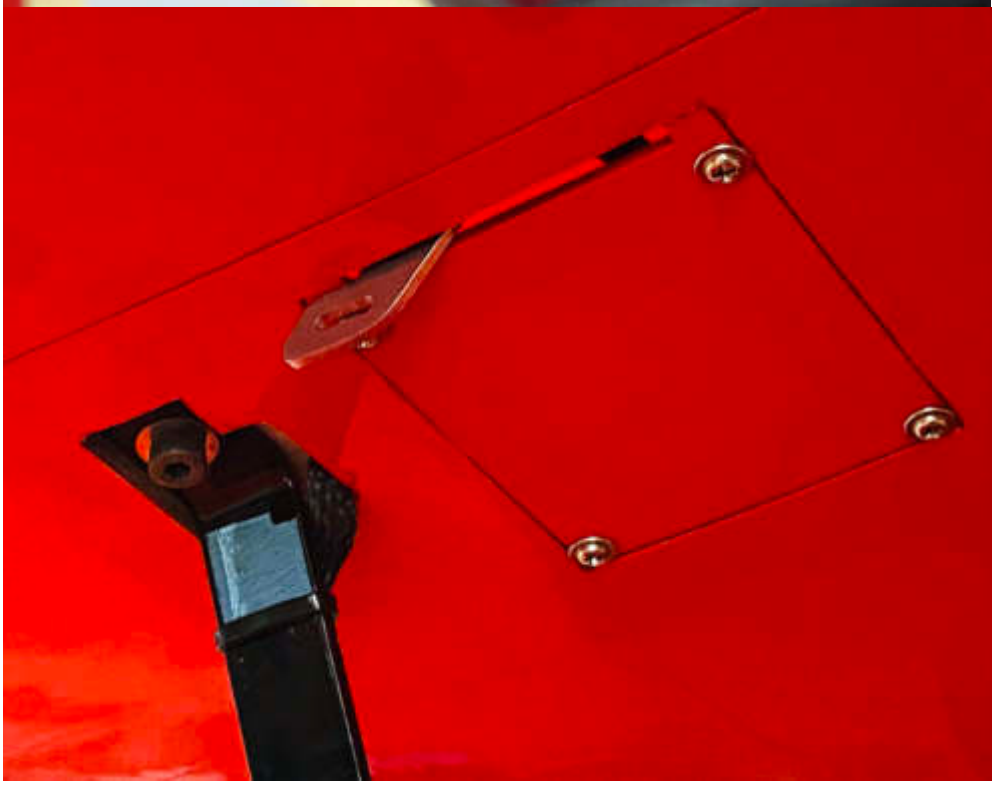


25. Slide the wing tubes into the fuselage and center wing section. Open the latches in the fuselage and bottom of the upper center section. There is a rod spring in the lower wing latch that must be depressed for the latch to open. This can be done with the tip of your finger or a small flat blade screw driver. Slide the wing into position, connect your servo leads and push the latch into the closed position.



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26. Place the outer wing struts into position and secure by sliding a retention pin into place for both the top and bottom of the strut.





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27. The forward hatch is installed by laying it on the forward fuselage top, making sure the bolts on the bottom fit into the keyhole shaped openings, then pushing the hatch forward until it mates with the F1 former. To install the canopy, open the carbon fiber hatch latches on each side of the fuselage, place the canopy into position. You will notice there is a bolt protruding from the top of the turtledeck. As you push the canopy into place, apply some back pressure on the rear of the canopy so that the protruding bolt fits into the slot on the rear top of the hatch. This insures the rear of the canopy sits flush against the fuselage. Close both carbon canopy latches.



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This completes the basic assembly of the Muscle Bipe. Please take time to double check your work, tie up any loose extensions, tighten any covering that has loosened and give your new bird a good polish with some spray-on detailing wax to enhance the luster of the paint and Ultracote covering and protect it from sun exposure and gas/oil mix.

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Setup and Flying

When setup correctly with the proper CG, the Muscle Bipe is a gentle and docile aircraft that is very easy to fly for any experienced modeler. Take offs and landings are easy, just remember there is a lot of drag with the large cowl and 2 wings so be sure to keep some power on when landing to avoid stalling. The Muscle Bipe is also very aerobatic, capable of all standard aerobatic maneuvers and very stable in high alpha 3D manuevers, hovers, rolling harriers, etc. While it is not a plane designed for XA maneuvers, it is very capable of flying gorgeous big sky precision aerobatics and presents very elegantly in the air.

Here are suggested throws, and as mentioned earlier in the manual, the ideal center of gravity is measured at 5.25 inches back from the leading edge of the upper wing, measured at the root.

Aileron Low: 15 deg up, 15 deg down 18-20% exponential
High: 33 deg up, 32 deg down 50-60% exponential

Elevator Low: 10-12 deg 18-20% exponential
High/3D: 45-50 deg 50-60% exponential

Rudder Low: 20 deg 50-60% exponential
High: 45+ deg 60-80% exponential

Thank you so much for your business and I sincerely hope your Muscle Bipe provides you with many seasons of flying fun! See ya at the flying field!
Chris Hinson
President
Extreme Flight

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