

EXTREME FLIGHT ✓

RADIO CONTROL™
STATE-OF-THE-ART R/C AEROBATIC AIRCRAFT AND ACCESSORIES

91" Yak-54 ARF

Assembly Manual



Please take a few moments to read this instruction manual before beginning assembly. We have outlined a fast, clear and easy method to assemble this aircraft and familiarizing yourself with this process will aid in a quick, easy build.

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.

Congratulations on your purchase of the Extreme Flight RC 91 inch Yak-54 EXP ARF! This all new design is the result of applying what we have learned from 10 years of flying the Yak-54 design. Highly refined and thoroughly tested, this new Extreme Flight Yak-54 EXP features weight saving, performance enhancing components. These include carbon fiber wing and stab mounting tubes, carbon fiber fuselage longerons and wing spars, carbon fiber landing gear, titanium pushrods and a carbon fiber tail wheel assembly, all ensuring the lightest, most high performance aircraft possible. You will notice there is a box built into the bottom of the Yak's fuselage. This is a pipe tunnel and will accommodate the full range of canister mufflers and tuned pipes sold for the current makes of 50-60cc engines. Also included is a set of protective wing and stab bags and a canopy/hatch cover to keep your investment looking great season after season.

The performance ability of the Extreme Flight RC Yak-54 EXP is phenomenal! With its low weight and enormous control surfaces, the Yak-54 is a 3D monster, capable of all current 3D maneuvers as well as possessing the ability to forge new ground in this exciting new style of flying. The Yak-54 is also a topnotch precision aerobatic machine. It is capable of performing the entire FAI catalog of maneuvers and it has the kind of "big plane" presence in the air that will impress the judges. This makes the 88 inch Yak-54 a great candidate for all classes of IMAC competition.

We have spent a great deal of time and effort to provide you, the discriminating aerobatic enthusiast, with the highest quality, most complete package possible. We are very proud of the end result of our labor and wish you great success with the assembly and flying of your Extreme Flight RC Yak-54 EXP!

Items needed for completion:

- ✓ **Masking tape.**
- ✓ **Hobby knife with #11 blades.**
- ✓ **Thin and medium CA. We highly recommend Mercury M5T thin and M100XF medium formulas as well as the Mercury glue tips.**
- ✓ **30 minute epoxy. Mercury Adhesives Epoxies have worked very well for us.**
- ✓ **Blue and Red Loctite.**
- ✓ **Electric drill with an assortment of small drill bits.**
- ✓ **Small flat head and Phillips head screw drivers.**
- ✓ **Standard and needle nose pliers.**
- ✓ **Side cutter.**
- ✓ **Metric ball driver or allen key set.**
- ✓ **Sanding block and sandpaper.**
- ✓ **5 x Ultra high torque metal gear servos (HS-7950TH or comparable).**
- ✓ **1 x standard size servo for the throttle.**
- ✓ **2 x 1.5" single aluminum Servo Arms for the ailerons**
- ✓ **2 x 2" single aluminum arms for the elevators**
- ✓ **1 x 4" double aluminum offset arm for the rudder.**
- ✓ **2 x 6" Servos Extensions.**
- ✓ **2 x 12" Servo Extensions.**
- ✓ **2 x 36" Servo Extensions.**
- ✓ **4" Spinner.**
- ✓ **50cc-70cc gas engine.**
- ✓ **Engine Manufacturer recommended prop.**

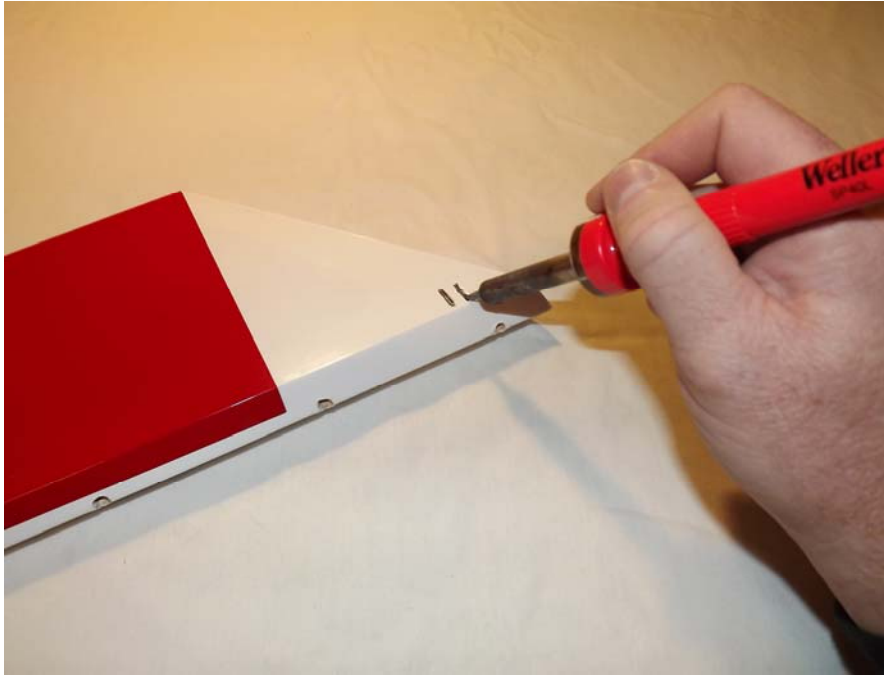
Tips for Success:

- 1. Before starting assembly, take a few minutes to read the entire instruction manual to familiarize yourself with the assembly process.**
- 2. Go over all the seams on the aircraft with a covering iron on a medium heat setting. Also, due to climate changes, wrinkles may develop in the covering however; these are easily removed with a little bit of heat. Use a 100% cotton tee-shirt and your heat gun and heat the covering while gently rubbing the covering onto the wood with the t-shirt. Be careful not to use too much heat as the covering may shrink too much and begin to lift at the edges. Take your time, and a beautiful, paint-like finish is attainable.**
- 3. Apply CA to high stress areas such as servo mounting trays, landing gear mounts, anti-rotation pins, wing and stab root ribs, and motor box joints etc.**
- 4. 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 and 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.**
- 5. Use a high quality epoxy for installing the composite control horns and hinges. We highly recommend Pacer Z-Poxy 30 minute Epoxy. We very pleased with the results and ease of application and cleanup of this product.**
- 6. When applying decals, first clean the area where the decal will be applied with alcohol. Mist the area lightly with Windex or Rapid Tack before applying the decal which will allow you to properly position it, and then use a rubber squeegee to push all of the liquid from under the decal. This will result in very few air pockets trapped under the decal.**
- 7. Take the time to properly balance and trim your aircraft and set up rates and exponential values. Your flying experience will be greatly enhanced once your plane is properly dialed in.**

Let's begin!

Elevator Assembly

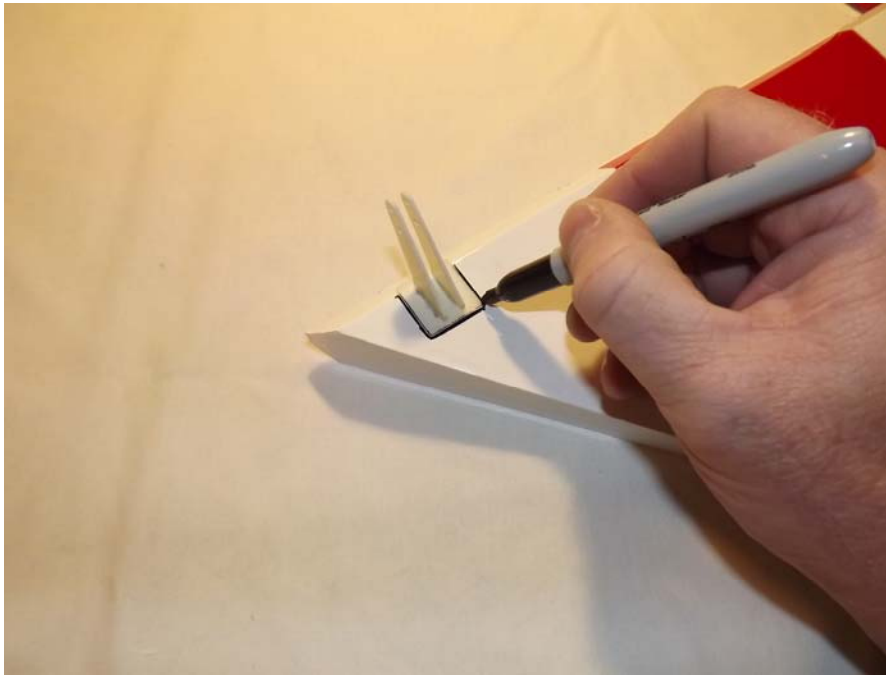
- 1. Locate the horizontal stabilizer/elevator assemblies as well as the composite control horns and base plates from the elevator hardware package. Use a sharp #11 blade or soldering iron to remove the covering over the 2 slots for the elevator control horns on the bottom of the elevator surface.**



- 2. Insert the 2 control horns into the base plate and trial fit the horns into the slot, making sure they seat properly against the base and elevator surface.**



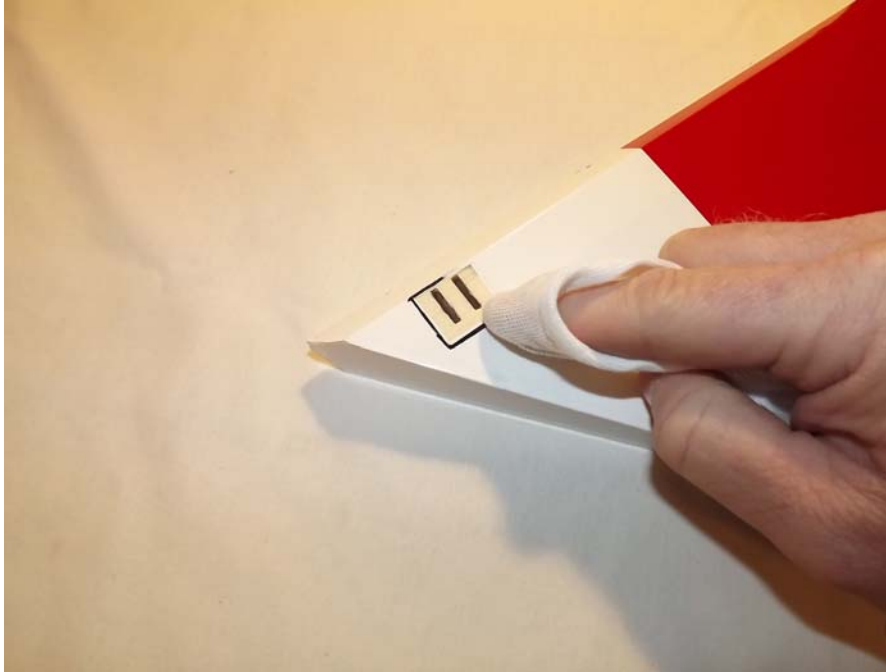
3. Trace around the base plate with a felt tipped marker.



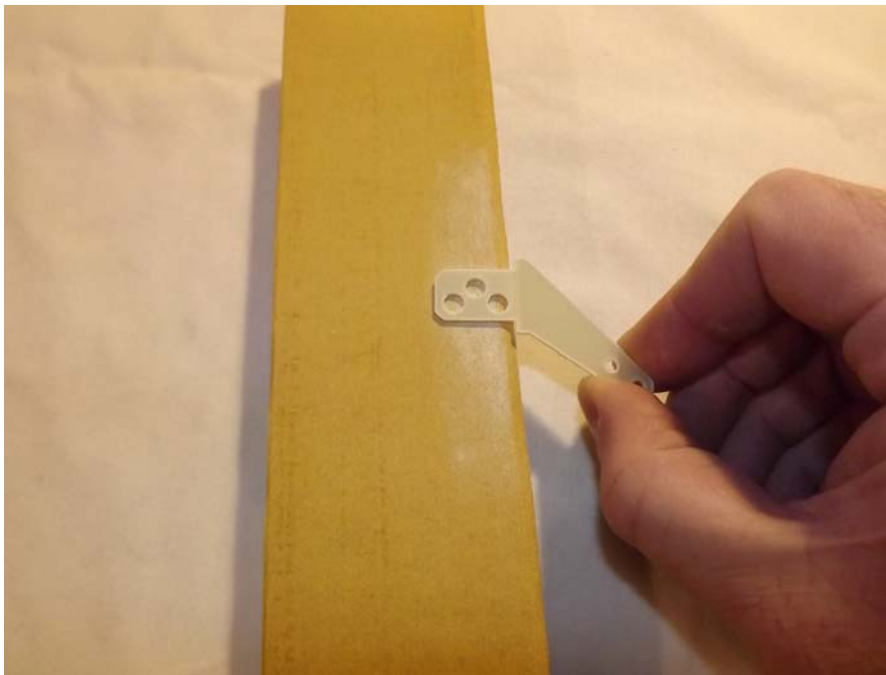
4. Remove the horn assembly and use a #11 blade to remove the covering from inside the ink line you traced around the control horn base.



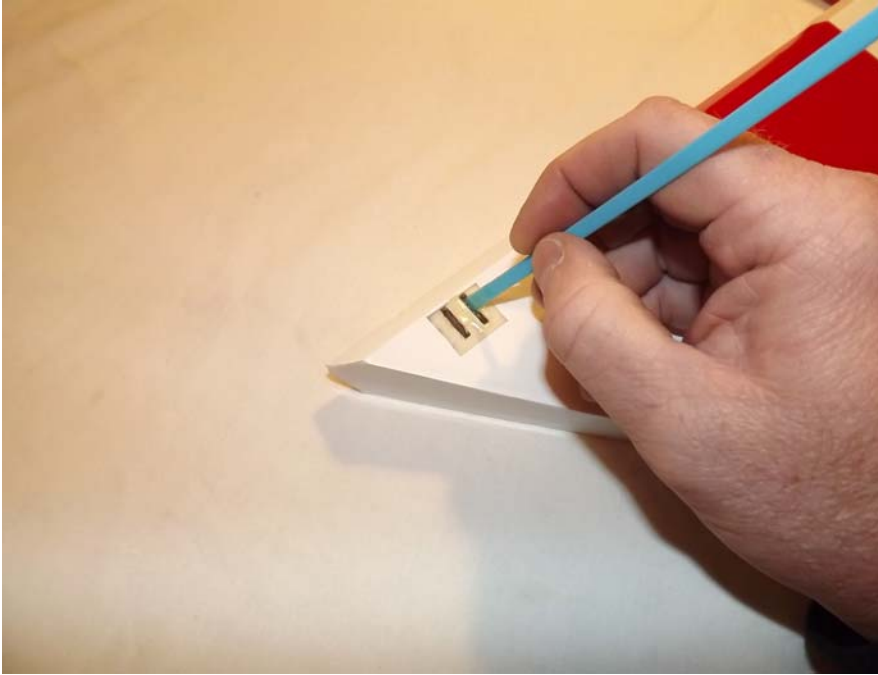
5. Wipe away the ink line with a cotton cloth or paper towel soaked in denatured alcohol.



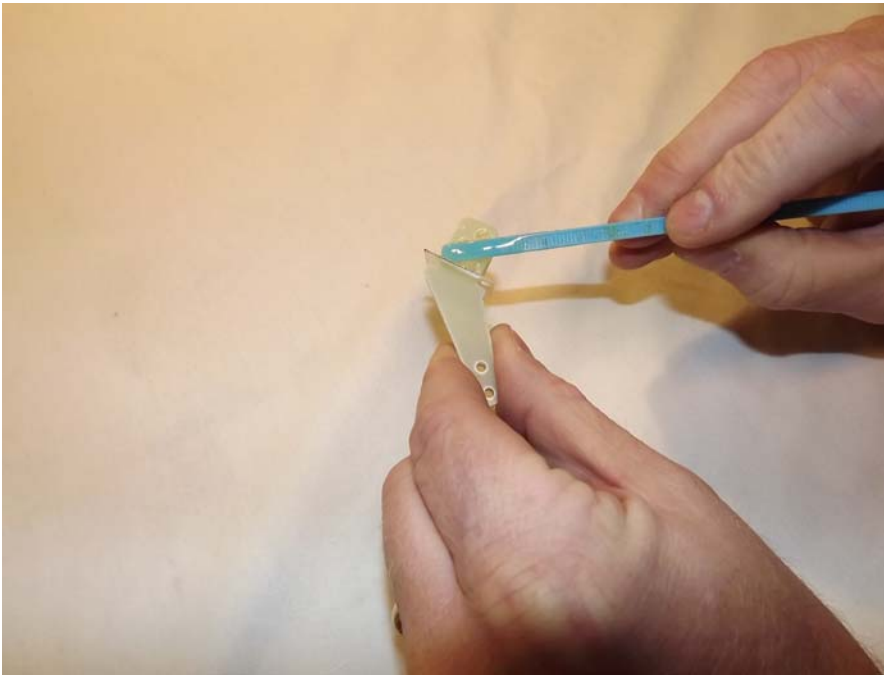
6. Use sandpaper to scuff the portion of the horns and base plate that will be inserted into the elevator.



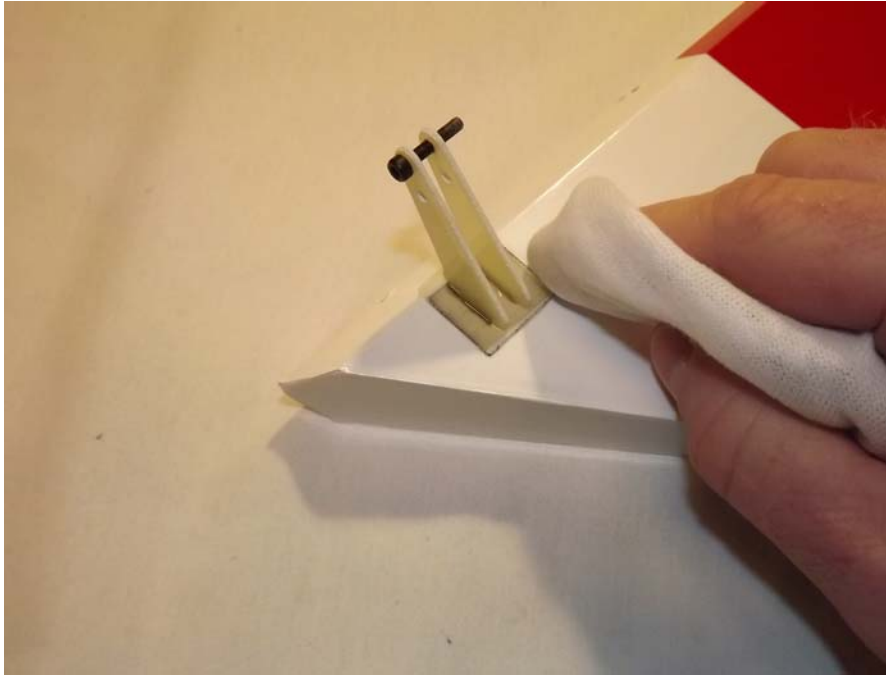
7. Apply 30 minute epoxy to the elevator slots using a zip tie to ensure the slots are filled with epoxy.



8. Also, apply a generous amount of epoxy to the bottom of the G-10 control horns and base plate.



9. Reinsert the assembly into the elevator and wipe away any excess epoxy with a cloth and denatured alcohol. Place a 3mm bolt through the horns to help insure proper alignment and set aside to dry. Repeat for the other elevator half.



10. Next, remove the pin hinges from the horizontal stabs. Take note there are two pins that are shorter than the others - this is to allow for clearance of the stab tube.

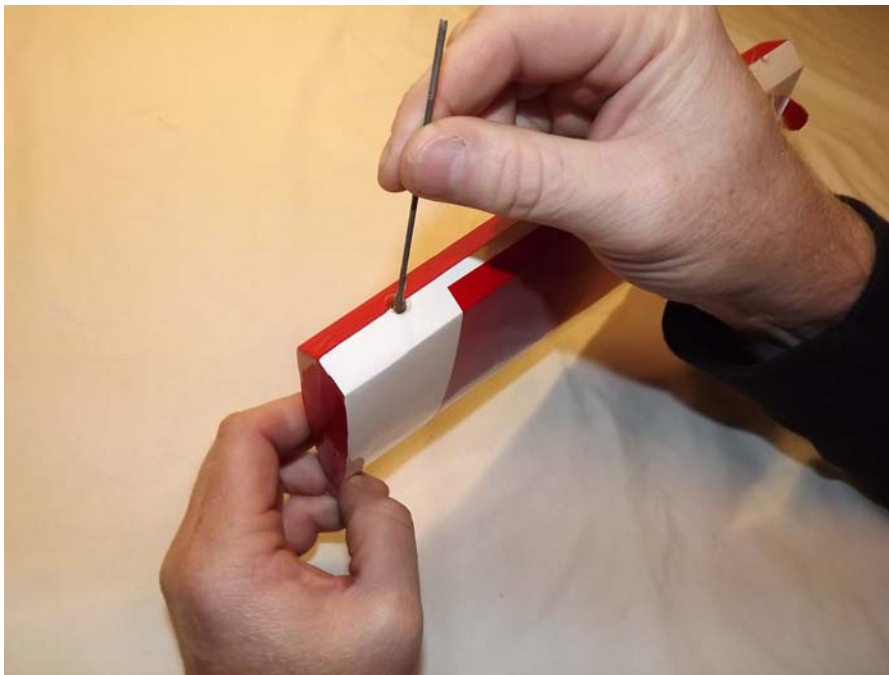


Note: There are several methods and adhesives that can be used for installing the hinges. We will describe the way we do it as this method has proven itself over many years of model building.

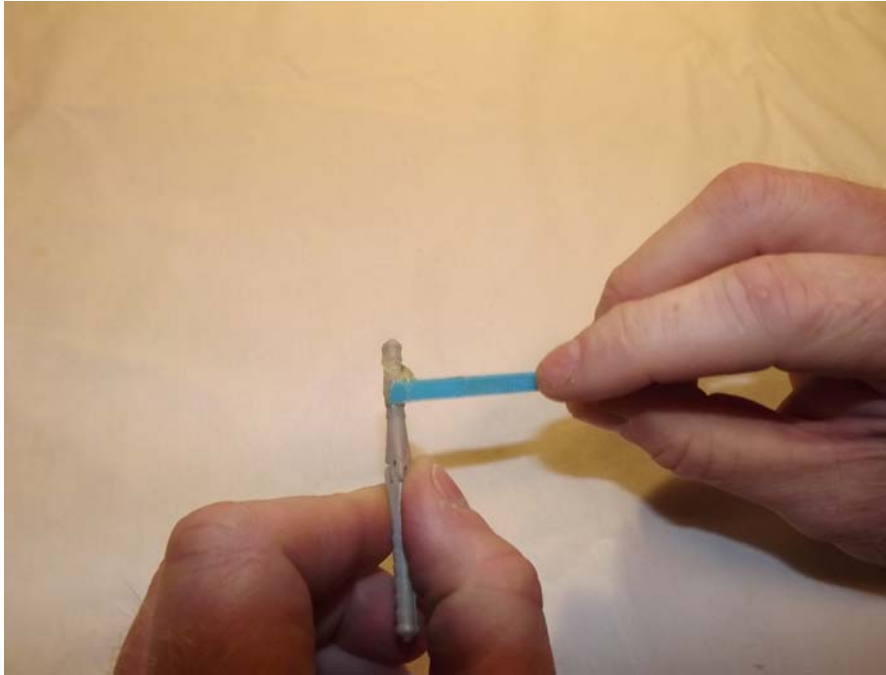
- 11. Use a cotton swab to apply petroleum jelly ONLY to the knuckle of the hinge. This will keep the epoxy from getting into the hinge which can cause it to bind.**



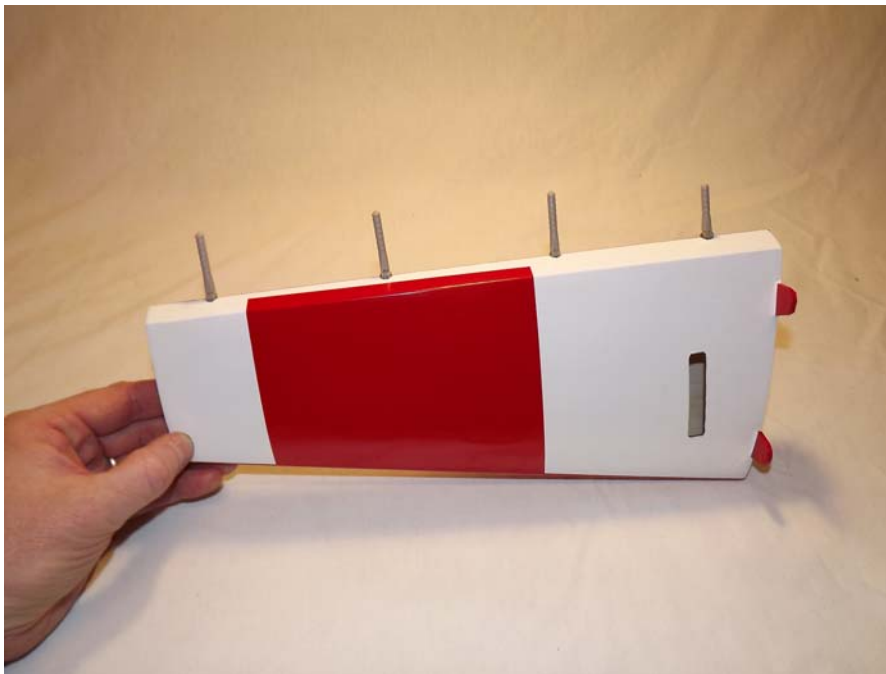
- 12. Mix a generous batch of 30 minute epoxy. Use a zip tie or an old pushrod to thoroughly coat and fill the hinge holes on the stab with epoxy.**



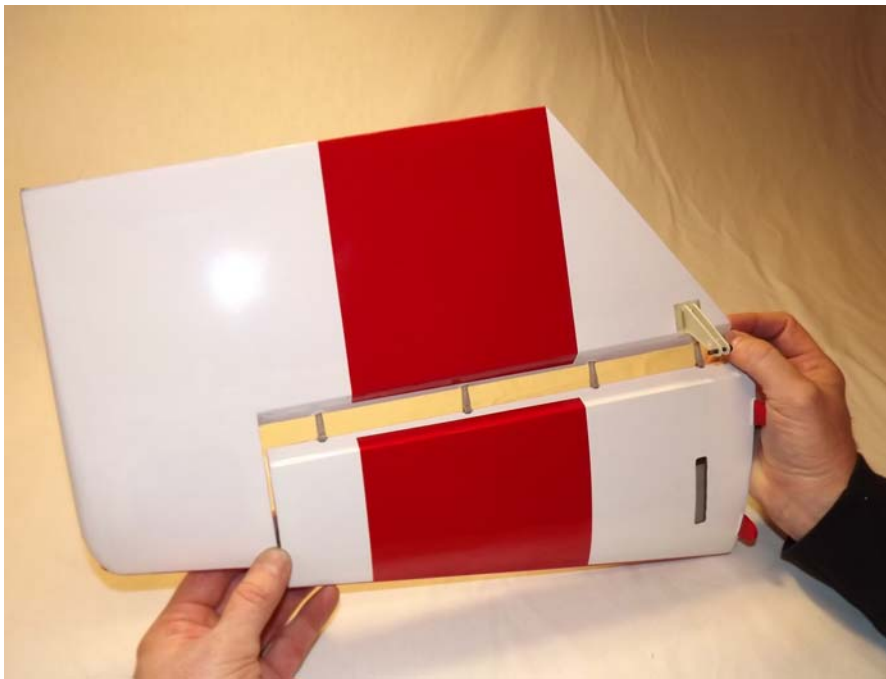
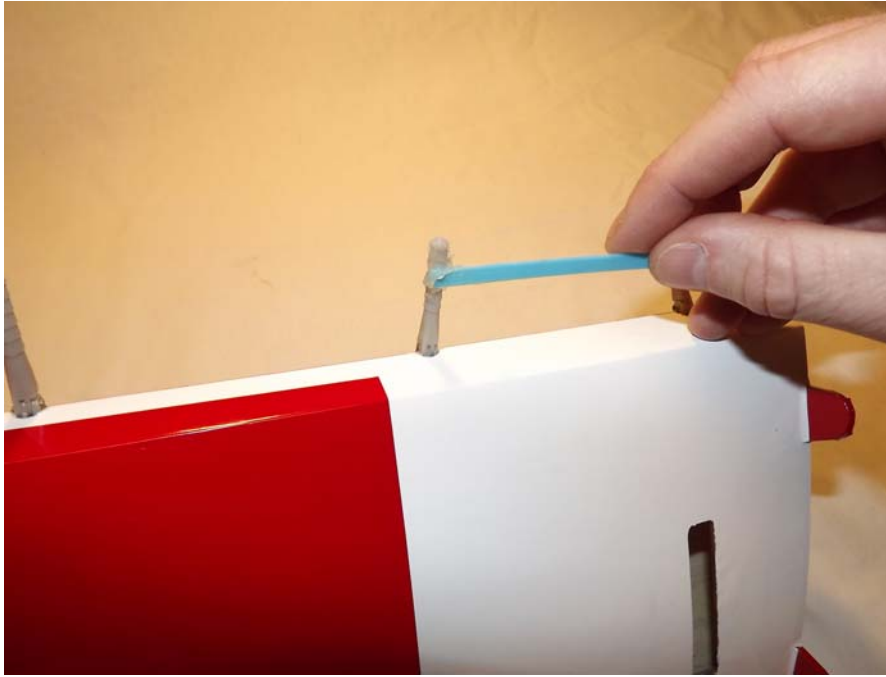
- 13. Next, coat one side of all 4 hinges with epoxy and push the hinges into the holes of the horizontal stab. Remember the short hinges go in the two holes closest to the fuse.**



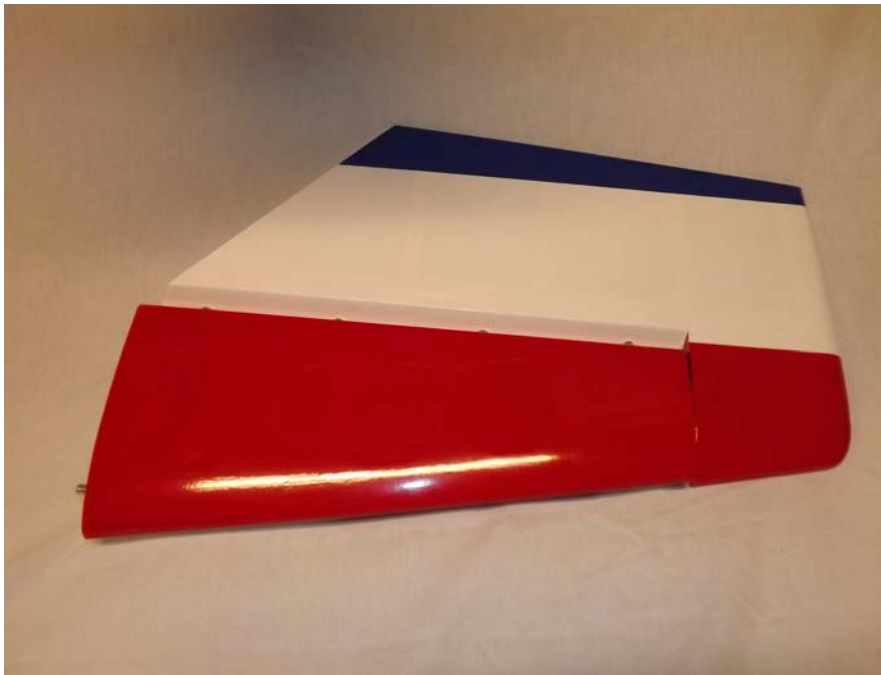
- 14. Make sure the hinge pins are centered in the hinge gap and that they pivot 90 degrees to the stab.**



- 15. Now coat the other side of the hinges as well as the hinge holes in the elevator with epoxy and install the elevator into the stab. Don't forget to apply epoxy in the hinge holes on the stab before installing the stab to the elevator.**



- 16. Use denatured alcohol and a cloth to remove all excess epoxy, especially on the hinge pin. Make sure you have full deflection in both directions – once satisfied with the results, set the surface aside to dry. After the hinges have dried thoroughly, pull on them to make sure they are properly installed.**

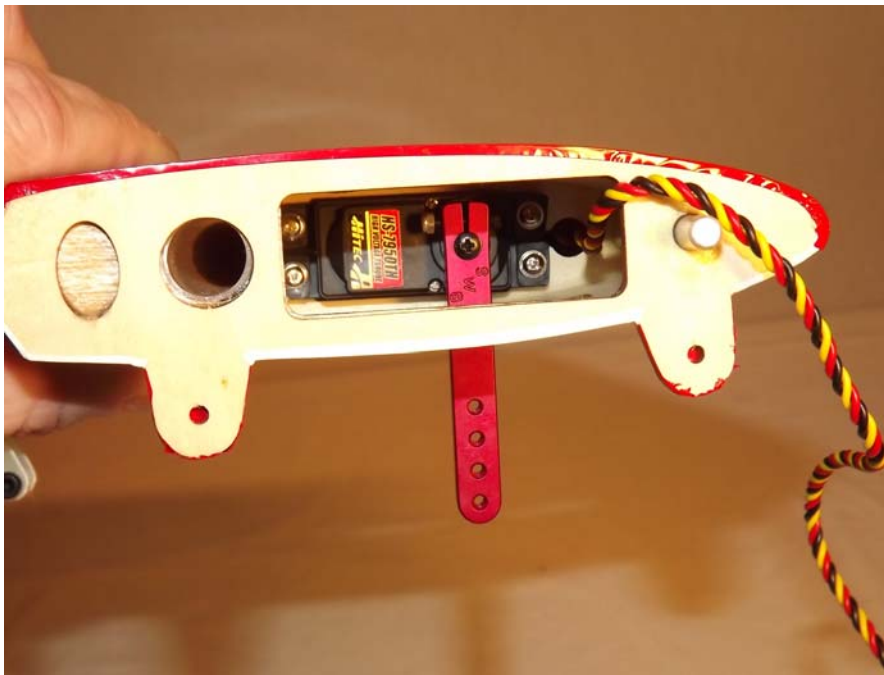


Note: Before installing the servos, it's a good time to seal the hinge gap with a strip of Ultracote or Blendederm tape. Also, I recommend that you thin a small amount of epoxy with a few drops of alcohol and apply a light coat to the inside of the stab and to the servo mounting rib as well as to the root rib and mounting tabs to protect against exhaust residue that can collect in these areas.

17. Before installing the elevator servos, temporarily install the servo arms and electronically center the servos.



18. Using the manufacturer supplied mounting hardware, install the elevator servo with the output shaft toward the front of the stab and re-attach the servo arm.



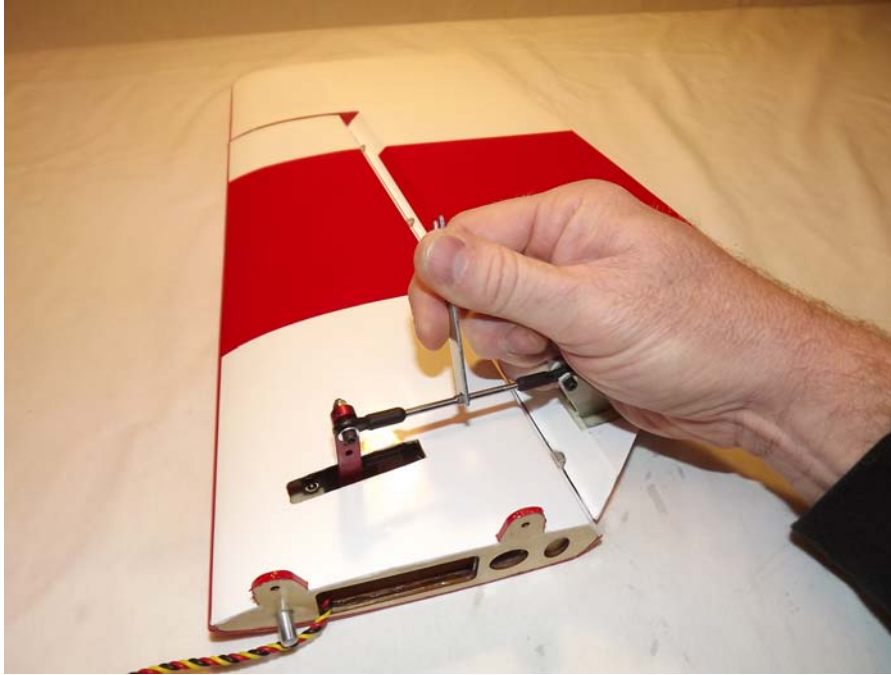
- 19. Thread 2 of the heavy duty ball links onto one of the 2 longer titanium pushrods. Remember that the ends of the pushrods are reverse-threaded so that they can be adjusted like a turnbuckle without removing the linkage.**



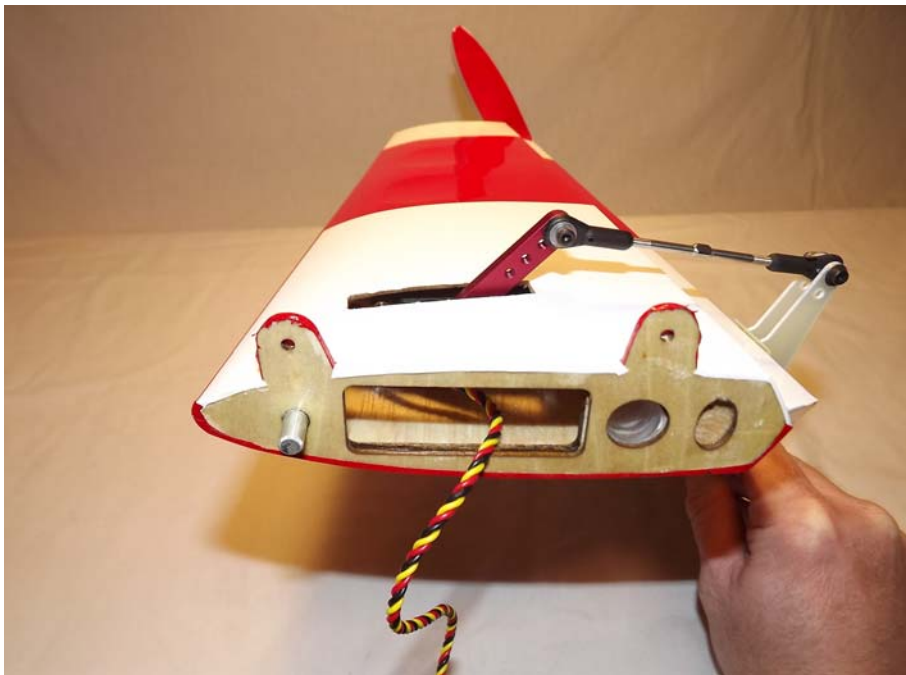
- 20. As shown in the picture below, secure one end of the ball link to the servo arm using a 3mm socket head cap screw, washer and nylon insert locknut. If using the SWB arms, you will need to drill out the hole to accept the 3mm bolt. Secure the other end of the ball link to the control arm with a 3mm bolt, 2 washers, and nylon insert locknut being careful not to over-tighten and damage the control arms.**



21. With the servo arm centered (as described in Step 17), adjust the turn buckle on the control rod until the elevator is in the neutral position.



22. Set the servo endpoints to achieve maximum travel. You may need to enlarge the size of the servo arm exit slot. Repeat these steps for the other stab assembly.

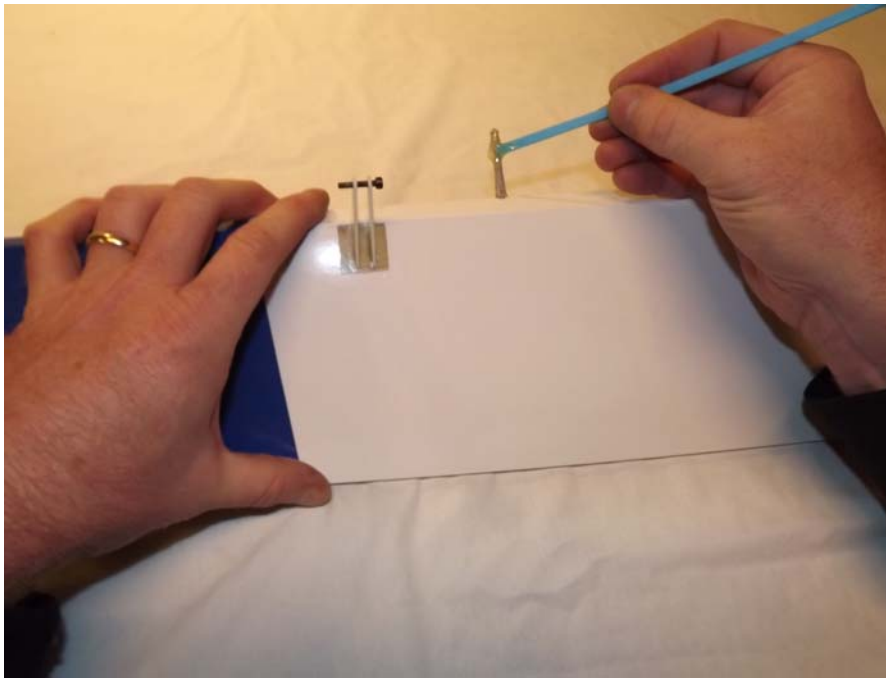


Note: Now is a good time to take a covering iron and go over all of the seams with a medium heat setting, paying special attention to the ends of thin trim stripes. At this point, clean the 2 elevator/stab assemblies with Windex and a soft cloth and put them away in their protective bag.

Wing Assembly

23. Locate the wing/aileron assemblies as well as the composite control horns and base plates from the elevator hardware package. Following the same procedure as outlined with the elevator / stabs, install the control horns and hinges for both wings. Each wing has 6 hinges so it's best to install the hinges in the aileron first then mix a second batch of epoxy to install the aileron hinges to the wing.





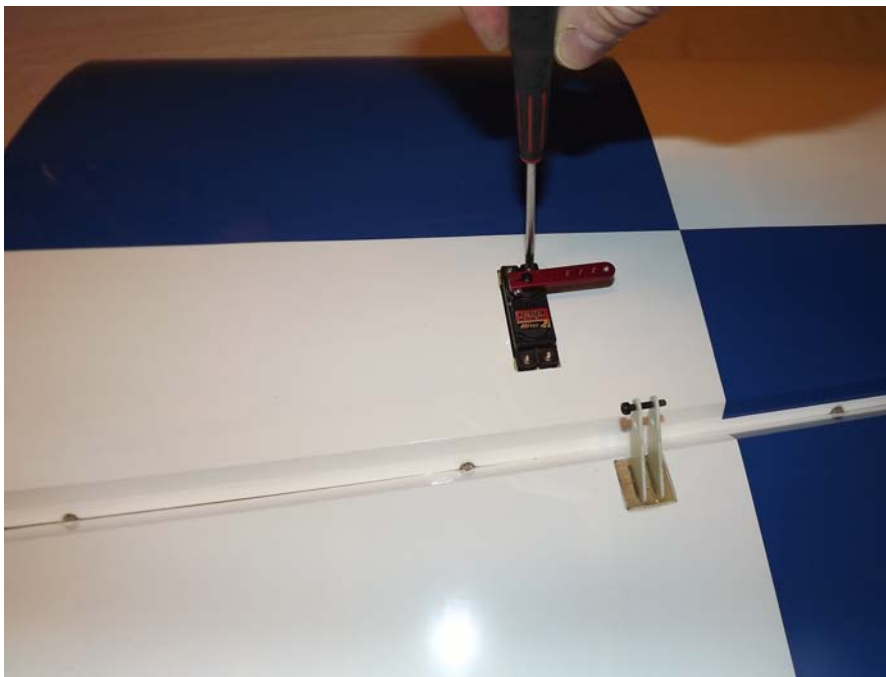
Note: Before moving to the next step – it would be a good time to seal the hinge gap with a strip of Ultracote or Blenderm tape. Be sure to fully deflect the control surface when sealing the gap to allow for full deflection once the gap is sealed.

Also, take a few minutes to go over the wings with a trim iron on a medium heat to seal all the trim seams and remove any wrinkles in the covering. Use caution and avoid excessive heat as this may cause the Ultracote to shrink too much and lift at the seams.

- 24. Locate the aileron servo mount and remove the covering from this area. Use a sealing iron to seal the edges of the covering to the sides of the servo opening. Take a few minutes to apply some CA to the joints of the servo rails and the ribs.**



- 25. Attach a 6" servo extension to your servo and secure with thread or heat shrink tubing. Use the manufacturer supplied mounting hardware to install the servo with the output shaft toward the leading edge of the wing. Electronically center the servo.**



- 26. Use the recommend 1.50" SWB servo arms and attach 2 ball links onto the titanium turnbuckle pushrod. Secure the pushrod to the control horns and servo arm using the supplied 3mm bolts, washers, and nylon insert locknuts as shown in the picture below. As always, use blue Loctite on ALL bolts!**



- 27. Use a soldering iron or a sharp #11 blade to remove the covering from the blind nuts on the wing tip. This is for attaching the SFG's or End Caps.**



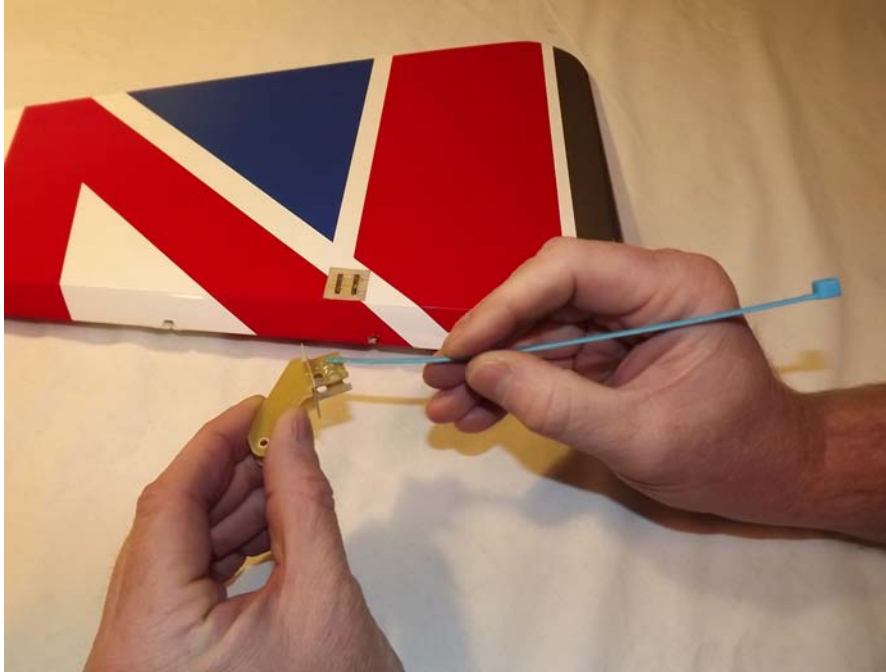
Note: Repeat this process for the other wing. Clean the wings with Windex and put them away in their protective bag.

Rudder and Tailwheel Assembly

28. Locate the rudder, the rudder control horns and the 2 slotted base plates. Use sandpaper to scuff the bottom of the control arms as well as the side of the base plates that will attach to the rudder.
29. As with the elevators, use a sharp #11 blade to remove the covering from the 2 pre-cut slots on both sides of the rudder.



30. Mix a generous batch of epoxy and completely fill the two slots as well as the areas on control horns and base plates that will glue into both sides of the rudder.



31. Install the rudder horns and base plates into the rudder one side at a time. Clean any excess epoxy from the rudder, recheck the alignment and set the assembly aside to dry.



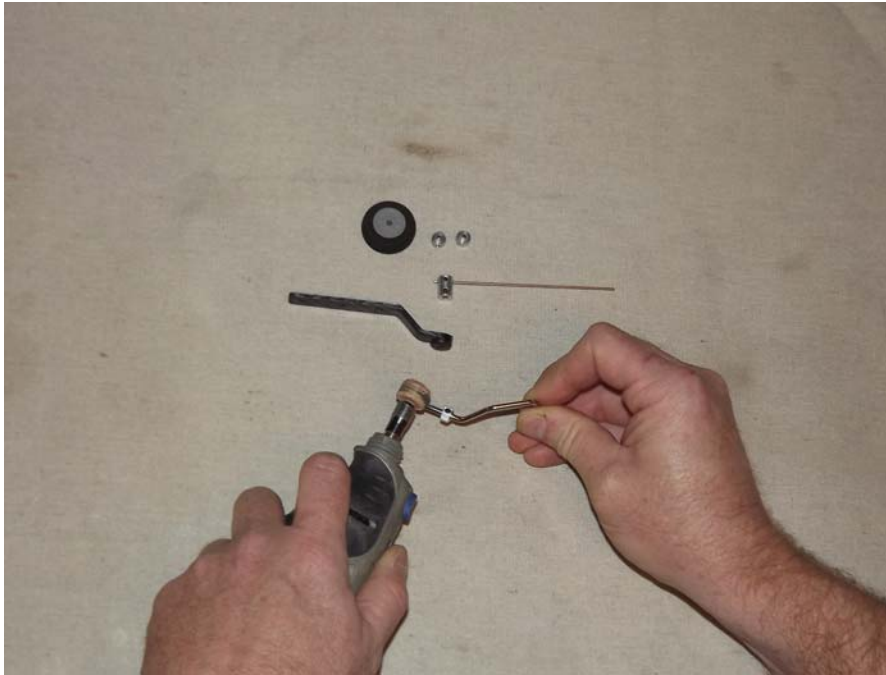
- 32. Locate a 2mm ball link from the hardware bag. Measure 3 inches back from the leading edge of the rudder and drill a 3/16" hole to accept the shank on the ball link. Scuff the shaft of the ball link and glue the ball link into the hole with epoxy as shown below.**



- 33. Next install the rudder hinges using the same procedure as with the Ailerons and Elevators. Use painters tape to hold the rudder in place while the epoxy dries.**



- 34. Disassemble the tailwheel assembly and use a rotary tool or a small file to create a flat spot on the tailwheel wire for the set screws in the aluminum cap to seat against. Reassemble the unit and apply Loctite to the threads on the setscrews. Slide the tailwheel onto the wire and secure with the included wheel collars.**



- 35. Use a sharp hobby knife to open the 3 holes in the bottom rear of the fuselage to expose the 3 pre-installed 3mm blind nuts. Slide the tiller arm of the tailwheel into the hole in the ball link and attach the tailwheel assembly to the bottom of the fuselage with the 3 medium length 3mm bolts and washers. Be sure to apply blue Loctite to ALL bolts!**



36. Next, install the pull-pull rudder cables. First remove the covering from the exit slots at the rear of the fuselage as shown below.



37. Locate the rudder servo tray in the hardware package. Test fit the tray to the mounting rails then apply 30 minute epoxy to the tray, clamp this assembly to the servo rails and allow to dry.



38. Install the rudder servo using the supplied hardware with the output shaft toward the front of the plane. Also, install the recommended SWB 4" offset rudder arm and electronically center the servo.



39. Next, install the pull-pull rudder cables. Assemble one end of the linkage by inserting the pull-pull cable into one of the aluminum crimp tube, through the hole in the brass pull-pull fitting and back through the crimp tube. Loop the cable back through the crimp tube a second time and crimp with side cutters.



40. Insert the bare end of the cable into the slot in the rear of the fuselage and feed it forward into the canopy area. Make the same type of linkage as done previously. Electronically center the servo and secure the linkage at both ends with a 3mm bolt and nylon insert lock nut. Repeat for the other side.



Note: When routing the pull-pull cables through the fuse, they should cross like an “X”. Also, the tension on the wires should be taut but not overly tightened.

Fuselage Assembly

41. Locate the carbon fiber main landing gear, 4 x 4mm bolts, lock nuts and washers. Place the landing gear onto the landing gear plate with the gear angled towards the front of the fuse and align the 4 holes. Use a long T-Handle allen wrench and insert the 4 x 4mm bolts from inside the fuse. Attach the 4 washers and lock nuts to each bolt and tighten.



42. Attach the landing gear fairings with silicon glue.



43. Locate the 2 axles, 2 locking nuts, 2 washers, 2 wheels, 4 wheel collars and 2 wheel spats. Center the wheel on the spat and drill a hole for the axel. If flying on a grass field you may want to drill the about 1/4" below center to allow the spat to be positioned slightly higher than center to prevent it from making contact with the ground.



- 44. Insert the threaded portion of axel through the spat, then mount the axel and spat onto the landing gear. Secure the axel to the landing gear with a washer and nylon lock nut. Position the spat as desired and mark the location for the blind nut using the pre-drilled hole in the aluminum gear as a guide. Install the 3mm blind nut and secure the spat with a 3mm washer and hex nut.**



- 45. Install one wheel collar on the axel first in order to center the wheel on the axle. Next, slide the wheel onto the axle and secure the wheel with the second wheel collar. Repeat this process for the remaining wheel and spat.**



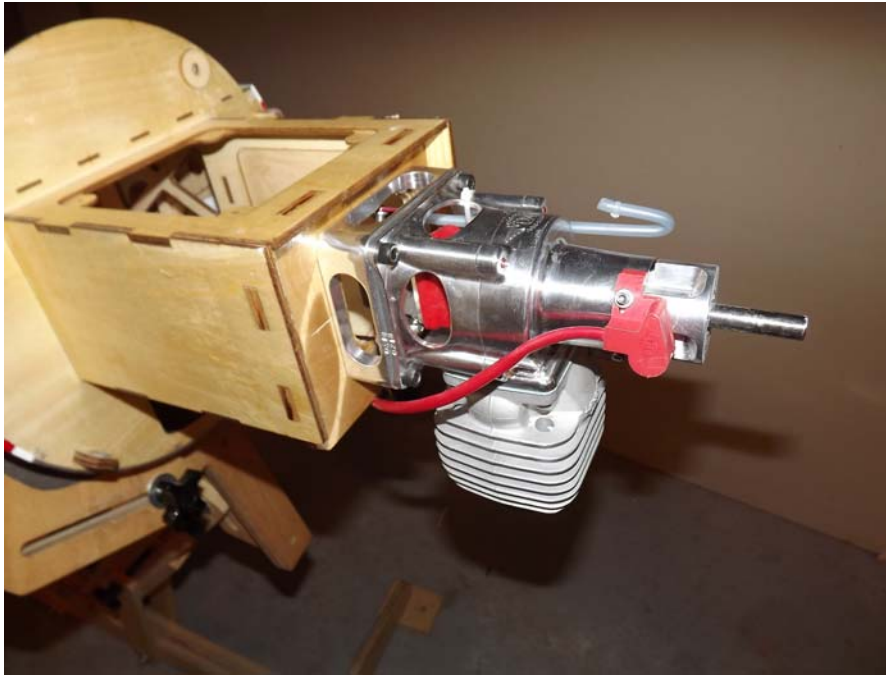
46. Next we'll install the engine. We have made this process very easy. The center and offset marks have been scribed into the front of the firewall with a laser. Print out the engine mounting template for your chosen engine. If using the DA-50 or DA-60, simply drill the firewall at the locations laser scribed on the firewall.



47. If using a different engine, tape the manufacturers mounting template onto the front of the firewall making sure to align the horizontal and vertical lines on the template with the laser scribes lines on the firewall. Be sure to use the offset line to the right of the vertical center line in order to accommodate for the motor offset due to the built in right thrust angle in the motor box.



48. Use the recommended mounting bolts to mount the engine to the firewall making sure to use large washers behind the firewall to distribute the load. Use standoffs to ensure the motor extends 6.32 inches (160mm) from the firewall to the engine thrust washer.

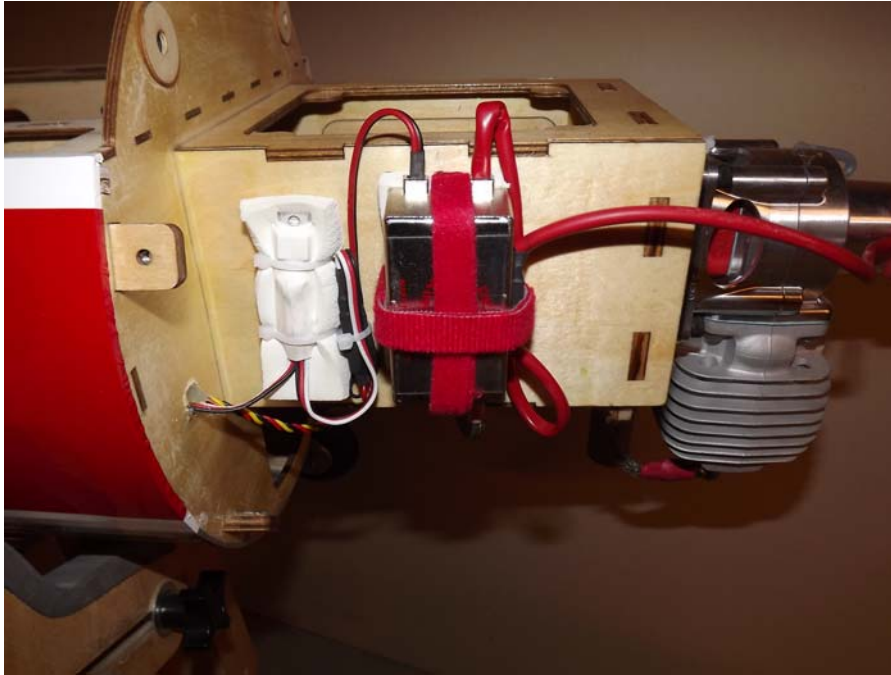


49. Next, install the throttle servo in the pre-cut servo hole located in the bottom of the motor box. Locate the 2mm pushrod and white ball links to fabricate the throttle linkage. If using a pipe you will need to add 3/8" hardwood rails to raise the servo.



Note: If you are using a DA-50 or DA-60 you may need to rotate the carburetor 180 degrees so that the throttle arm is facing the bottom of the motor box. Also, it's a good time to coat the inside of the motor box with thinned epoxy.

- 50. Install the ignition unit and regulator on the side of the engine box using Velcro or nylon cable ties. Make sure to put a piece of foam behind the unit to prevent damage from vibration.**



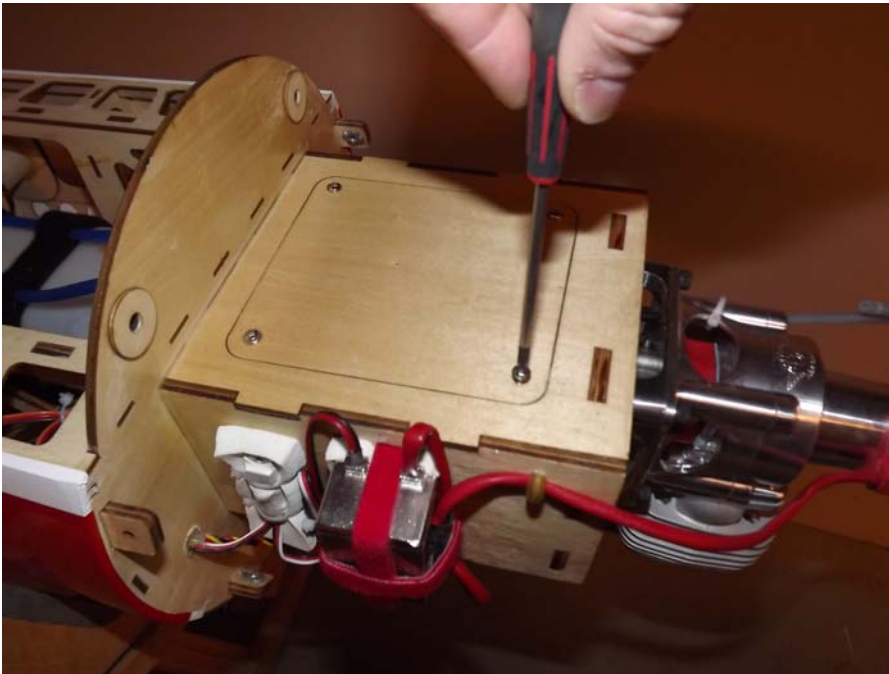
51. Install the tank of your choice-- for our build we used a Dubro 24 oz tank. Make sure to use a gas compatible stopper and tubing for all plumbing. Use Velcro Straps or nylon cable ties to secure the tank to the tank tray. The tank should butt up against the wing tube. Also, install foam between the tank and tray to protect against vibration.



52. Find a location toward the front of the fuse to install a fuel dot. Here is where we installed ours.



53. Once the throttle linkage is installed and all the plumbing is completed, install the engine box cover with 4 wood screws. You may want to take the time to install some blind nuts and use bolts for this.



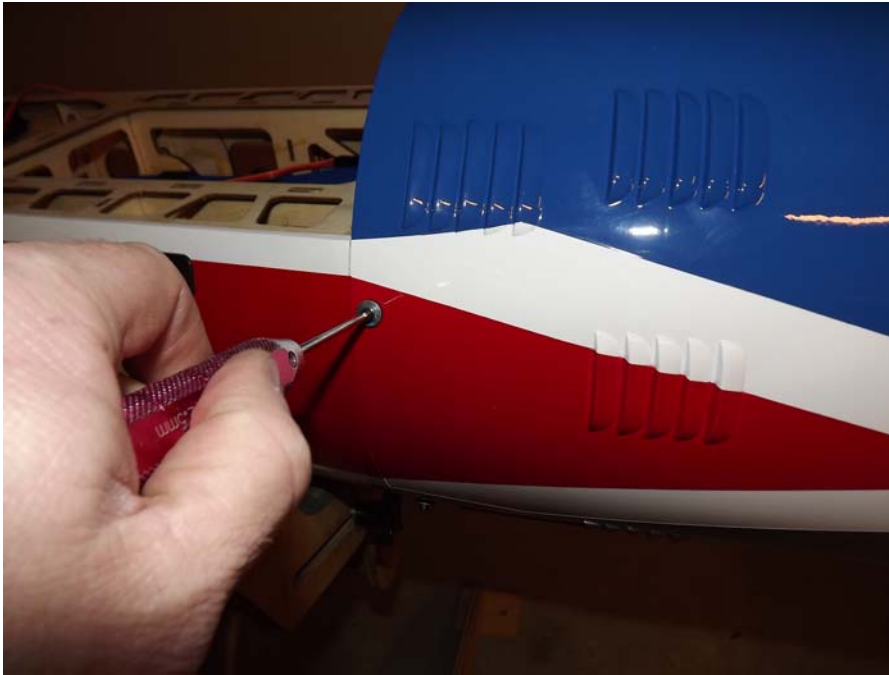
54. Install your switches, batteries and receiver. Please note there are suggested switch mounting locations laser scribed in the fuselage sides visible from the interior of the fuselage. Also, carefully choose the locations to mount your batteries to help achieve correct center of gravity.



55. Slide the cowl into position with and align the 4 slots in the cowl ring with the mounting tabs in the fuse. Cut the cowl to clear the muffler and spark plug wire. Also it's a good idea to cut an opening in the bottom of the cowl for an air exit to allow for proper cooling.



56. Once you're satisfied with the fit of the cowl, add some thick CA or Epoxy to the intersection of the cowl and plywood cowl ring. Slide the cowl into position and secure with 4 x 3mm bolts and bonded washers through the pre-drilled holes in the cowl. (2 per side)



57. Before installing the stab/elevators, remove the covering in rear sides of the fuse to expose the pre-mounted 3mm blind nuts. You will also need to open a hole for the servo leads to pass through.



58. Attach 36 inch servo extensions to each elevator servo. If you plan to remove the stabs for transport, you will need 48 inch extensions. Slide the stab halves onto the carbon fiber stab tube and secure with a 3mm bolt and washer inserted through the mounting tabs and into the pre-mounted blind nuts. Make sure to use a drop of blue Loctite on these bolts.



59. The canopy is retained by 2 x 3mm bolts and bonded sealing washers. Before flying the Yak-54 run a bead of RC-56 canopy glue all along the intersection of the canopy and its wood frame, front and back and both sides.

60. The wings are retained by inserting the 2 nylon bolts through the holes in the fuselage just behind the wing tube and into the preinstalled blind nuts in the root rib of the wing. Be careful not to cross thread the bolts and inspect them periodically to insure thread integrity. Also, included with your Yak-54 is a set of side force generators (SFGs) and fiberglass wing tips. They are secured to each wingtip with 3 x 3mm bolts and a plastic washer inserted into pre-installed blind nuts in each wing tip.

Pipe or canister installation hints

You may wish to install a tuned exhaust or canister muffler system in your aircraft. You will need to remove the covering, center stringer and parts of 2 formers to open the pipe tunnel. Seal the edges of the covering to the edges of the pipe tunnel and paint a thin coat of alcohol thinned epoxy to seal the wood in the tunnel. For the DA-50 and 60 you will need to purchase a header with a 25mm drop. You will also need to purchase a Teflon coupler set and spring clamps along with mounts (these are available from KS, Dave Brown Products and several others). Check with the engine manufacturer for recommendations.

Set-up and trimming

Besides basic assembly, this is the most important part of preparing your airplane for flight. It can also be the most time consuming, but once your plane is properly dialed in you will agree it was time well spent. One of the most practical ways to check the CG on an aircraft this size is to insert the carbon fiber wing tube into its sleeve in the fuselage and tie a length of rope around the tube on each side of the fuselage, forming a loop that you can pick the aircraft up with. Slide the wings into position, install the canopy and pick up the plane with the rope. The Yak-54 should balance in a horizontal position. Move your batteries and radio equipment to achieve this condition. This will give you a safe starting place for the first flights. One of the best ways to fine tune the CG for your aircraft is the 45 degree line test. Fly the aircraft in front of you from left to right (or right to left if you prefer) at full throttle. Pull the aircraft into a 45 degree up line and establish this line. Roll the aircraft inverted, neutralize the elevator and pay close attention to what the plane does. Ideally the plane will continue on this line for several hundred feet before it starts to slowly level off. If the airplane immediately drops the nose and dives toward the ground it is nose heavy. If it begins to climb inverted toward the gear it is tail heavy. There is no need to have the Yak-54 excessively tail heavy to perform 3D maneuvers. At this time you will also want to balance your plane laterally. Add a small amount of weight to the light wingtip to achieve proper lateral balance.

Control surface throws

I highly recommend that you purchase a throw meter that measure in degrees. There are several units available commercially. These units are a great aid in set-up and definitely beat the “that looks about right” method. For any type of precision flying, surfaces that travel equal distances are a must. The following control surface travels are what I use on my own Yak-54. These are a good starting point, but are by no means the only way to set up the Yak-54. Start here and then adjust to fit your own preferences and style of flying.

Elevator: 8-10 degrees low rate, 12-20% exponential; all you can get high rate, 60-65% exponential

Aileron: 20 degrees low rate, 30-40% exponential; all you can get high rate, 65-70% exponential

Rudder: 20 degrees low rate, 50% exponential; all you can get for high rate, 60-70% exponential.

This completes the assembly of the 91 inch Yak-54. As a final step clean the entire aircraft with glass cleaner, then apply a coat of spray-on wax and buff the finish to a high gloss. My favorite product for this is Eagle One Wet Wax AS-U-DRY, available in the automotive section of most Wal-Marts, K-marts, Sears, Target, etc. People often ask me at trade shows how I get the planes to look so shiny, this is my secret. You may wish to apply all of your graphics before applying the coat of wax.

Thanks again for your purchase of the Extreme Flight RC 91 inch Yak-54 ARF. I hope you enjoy assembling and flying yours as much as I have mine.

See you at the flying field!

Chris Hinson

Extreme Flight RC

