

EXTREME FLIGHT ✓

RADIO CONTROL™

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

YAK-54 ARF

1.60 Class

Instruction Manual



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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 buyer with a very high quality model aircraft component kit, from which you, the buyer, 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 to the AMA safety code. It is highly recommended that you join the Academy of Model Aeronautics in order to be properly insured, and to 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. It is your responsibility to ensure the airworthiness of your model.

Thank you for your purchase of the Extreme Flight RC 1.60 class YAK-54 ARF! The Yak-54 represents the state of the art in modern, high performance aerobatic ARF aircraft technology. Highly refined and thoroughly tested, the Extreme Flight Yak-54 is being brought to you as a complete package, including all first rate hardware and components and thorough instructions to ensure a trouble free assembly and set-up. Weight saving components are used throughout, such as carbon fiber reinforced balsa spars, carbon fiber wing and stab mounting tubes, and a carbon fiber tail wheel assembly, all ensuring the lightest, most high performance aircraft possible.

The performance ability of the Extreme Flight RC Yak-54 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 is also a top notch 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 1.60 Yak-54 ARF 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 1.60 Yak-54!

A few tips to ensure success

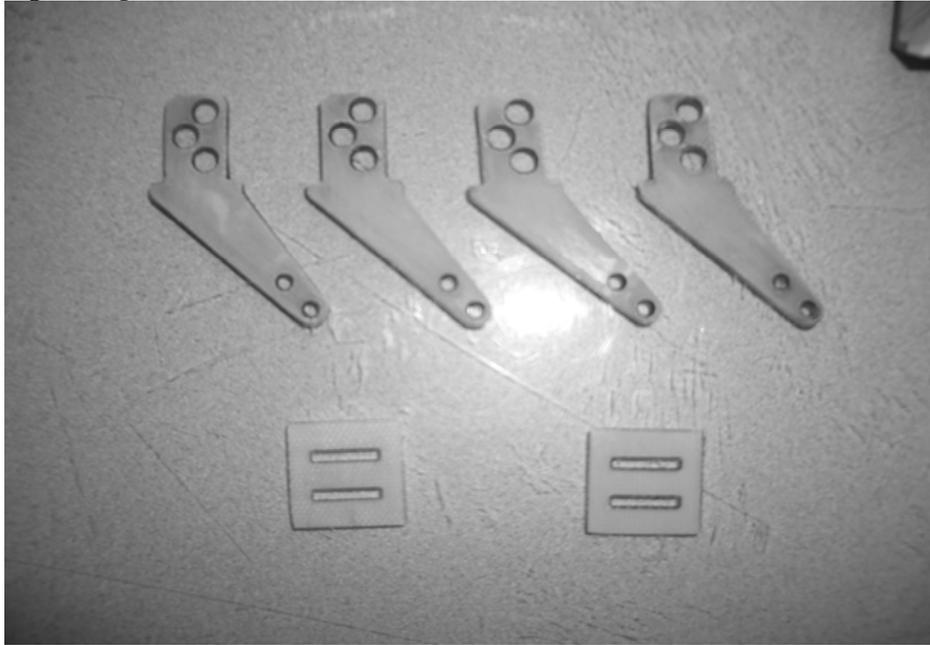
- 1. We are very pleased with the level of craftsmanship displayed by the builders in our factory. Through hundreds of grueling test flights containing maneuvers that no aircraft should be subjected to, our Yak prototypes have remained rigid and completely airworthy. However, it is impossible for us to inspect every glue joint in the aircraft. Take a few minutes and apply some medium CA to high stress areas such as servo mounting trays , landing gear blocks, anti rotation pins, etc. We like to use the Bob Smith Industries IC-2000 on the servo trays. This is some amazing glue!**
- 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 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. By the time the Yak 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. A neat trick 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! The Yak-54 is equipped with very large control surfaces that deflect over 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 GEAR servos with a minimum of 100 oz. in of torque. We have had great success with the Hitec HS-5645 servos in our prototypes. We are using the new HS-5985 for the rudder, and recommend this servo or the JR 8611 for this position.**

- 5. Use a high quality epoxy for installing the composite control horns and hinges. We highly recommend the use of Pacer Z-Poxy 30 minute formula. We have used this glue for many years with zero failures.**
- 6. You may want to add a bead of silicone glue (Pacer Zap-A-DAP-A-GOO, etc.) to the intersection of the plastic canopy/hatch and its wood frame for additional strength and resistance to vibration. DO NOT USE CA here as it will fog the canopy.**
- 7. Add a fillet of epoxy over the hatch pin mechanism where it mounts to the turtledeck and plywood former on the front of the turtledeck. Be careful not to get any epoxy on the actual hatch pin.**

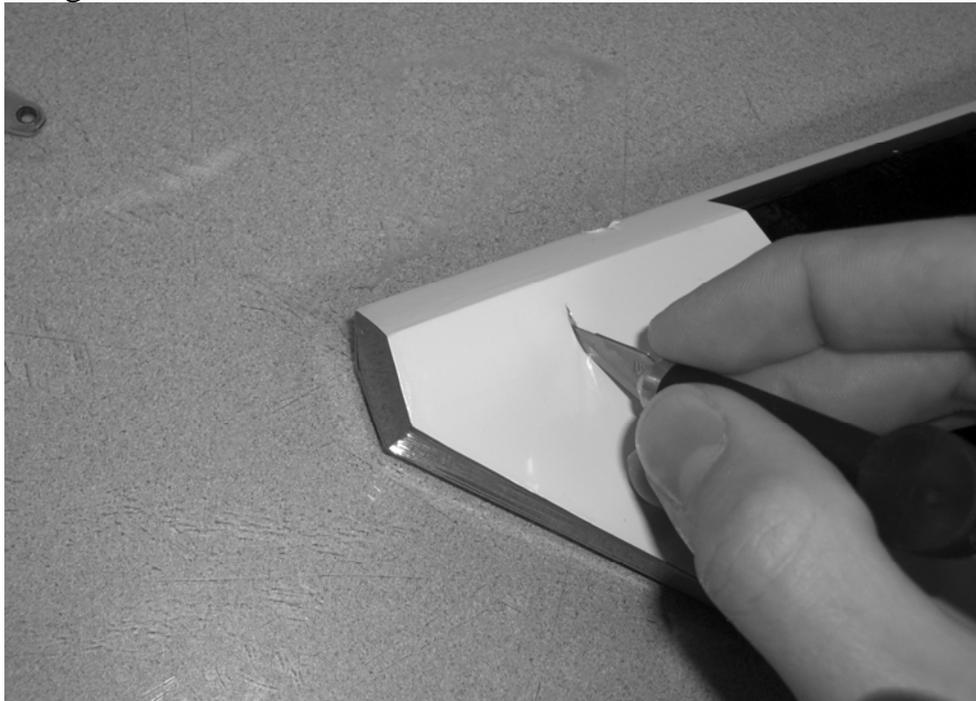
Let's Begin!

Elevator Assembly

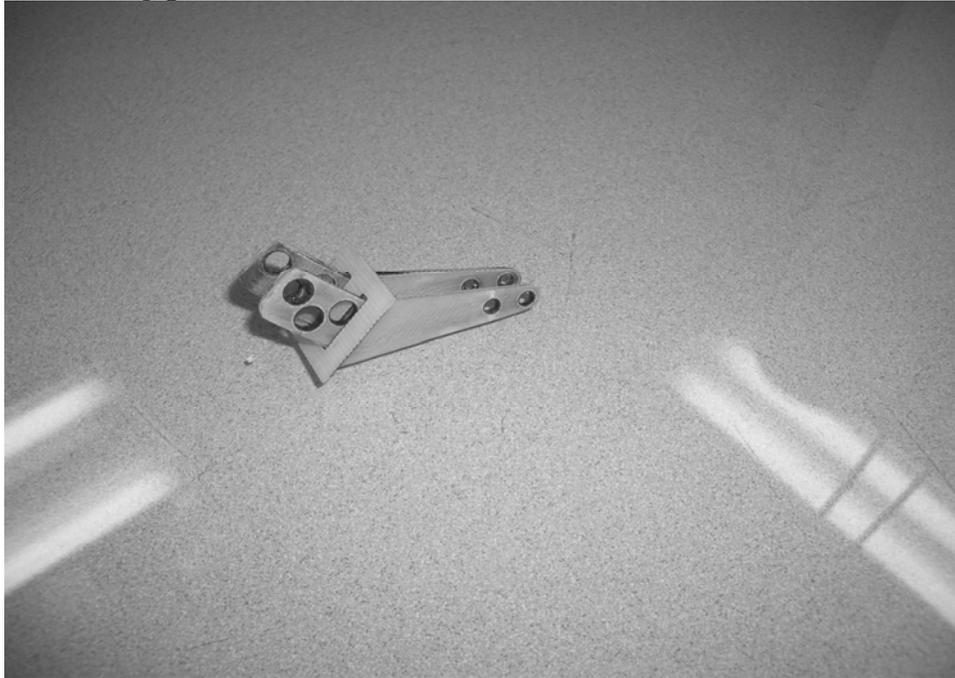
1. Locate the horizontal stabilizer/elevator assemblies as well as the composite control horns and base pieces from the elevator hardware package.



2. Use a sharp #11 blade to open the 2 slots near the bottom leading edge of the elevator.



3. Insert the 2 control horns into the base plate as shown in the following picture.



4. Carefully insert the control horns into the slots and push down until the base plate is flush with the control surface. Use a fine tipped felt marker to trace the outline of the base plate onto the covering. Remove the control horn assembly. Use a sharp #11 hobby blade to remove the covering 1/16" inside the lines you drew. **Do not cut into an open bay area. Make your cut only where there is sheeting below the covering.**

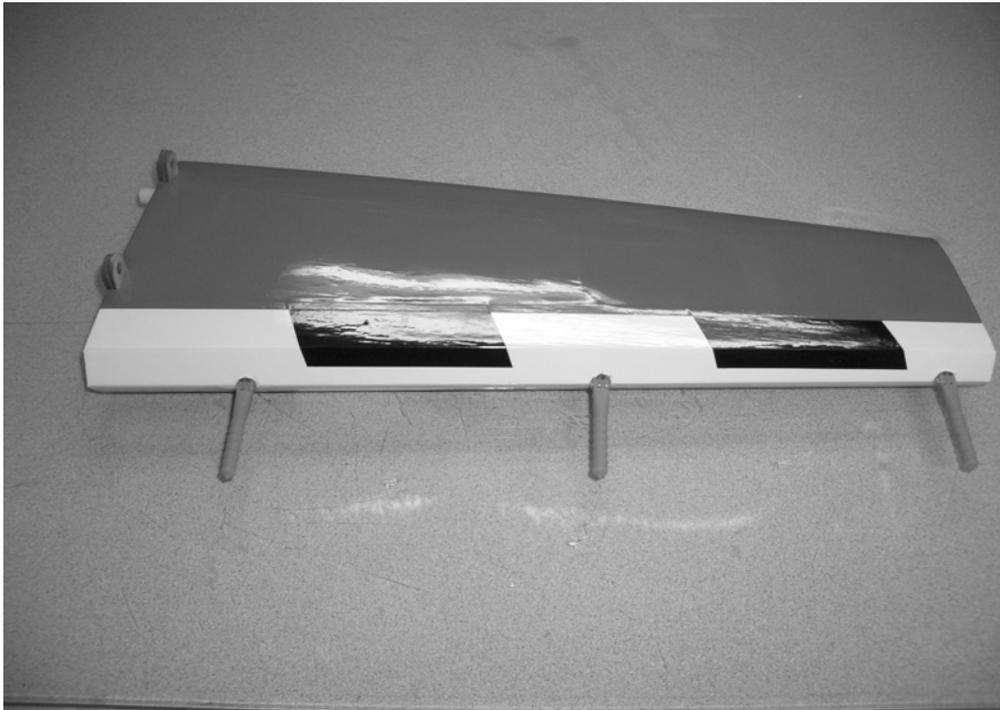




5. Use some denatured alcohol to remove any residue or oils from the composite control horns and base plate. If you wish to paint the control horns for a more finished appearance now is the time to do so. Mix up some 30 minute epoxy (add a little milled fiberglass if you have it) and fill the 2 slots in the elevator with epoxy. Use an old #11 blade to force glue into the slot and make sure they are thoroughly coated with epoxy. Use an epoxy brush to thoroughly coat both sides of each control horn as well as the bottom of the base plate. Use an abundance of glue here, as any excess will be forced out of the slot when you insert the horns.
6. Insert the horns and push them into the slots until they are seated flush with the base plate and the base plate is flush with the control surface. Use some denatured alcohol and paper towels to remove the excess glue and inspect the assembly. When satisfied set this assembly aside to dry. Repeat this process for the other elevator half.



7. Remove the covering from the holes for the hinges. We use an old soldering iron for this and it works well. Locate 3 hinges per elevator half.



8. In this step I will outline the procedure we use to install the hinges. There are several ways to do this and several adhesives you can use. We will describe the way we do it, as this method has proven itself over many years of model building. If you are new to this type of hinging process then I recommend that you install a single hinge first just to acquaint yourself with this method. Before starting the process get a few items together that will aid you as you proceed. You will need the following items: 30 minute epoxy (again, we recommend Pacer Z-Poxy), a scrap piece of pushrod or 1/8" dowel, paper towels and denatured alcohol. Mix a generous batch of 30 minute epoxy. Use the pushrod or dowel to thoroughly coat and fill the hinge hole with epoxy, then coat the hinge with epoxy. Push the hinge into its hole until the joint is about a 1/4" from its final position and use a paper towel to remove the excess epoxy that has been forced from the hole. Push the hinge the rest of the way in and make sure the hinge pin is centered in the hinge line. Use some denatured alcohol and a paper towel to remove all excess epoxy, especially on the hinge pin. When you are satisfied with the result set the surface aside to dry. Position the drying piece so that any excess epoxy will pool around the rear of the hinge.
9. When you are comfortable with this process you should be able to do one side of a surface per batch of epoxy. Glue all hinges into the stabilizer first. After the glue has set trial fit the elevator to the stab and adjust if necessary. There should be as little gap as possible between the stab and elevator. When satisfied with the fit remove the elevator and repeat the gluing process outlined above. Be sure to wipe away all excess epoxy! Set aside to dry. Repeat this process for the other stab/elevator half.
10. After the hinges have dried thoroughly, pull on them to make sure they are properly installed. The hinges will probably feel a little stiff as it is almost impossible to get all of the glue out of the joint. Use a fine tipped hypodermic needle and place one (only one!) drop of acetone on each side of the hinge pin. Move the elevator back and forth a few times and you will feel it loosen up. **Be careful to only use one drop as you don't want to weaken the glue joint!** Add a drop of penetrating oil to each hinge pin and you will ensure a smooth operating surface with no binding. Seal the bottom of the hinge gap with a strip of Ultracote or clear packing tape. Be sure to fully deflect the control surface when applying the tape or Ultracote to allow full deflection once the gap is sealed.

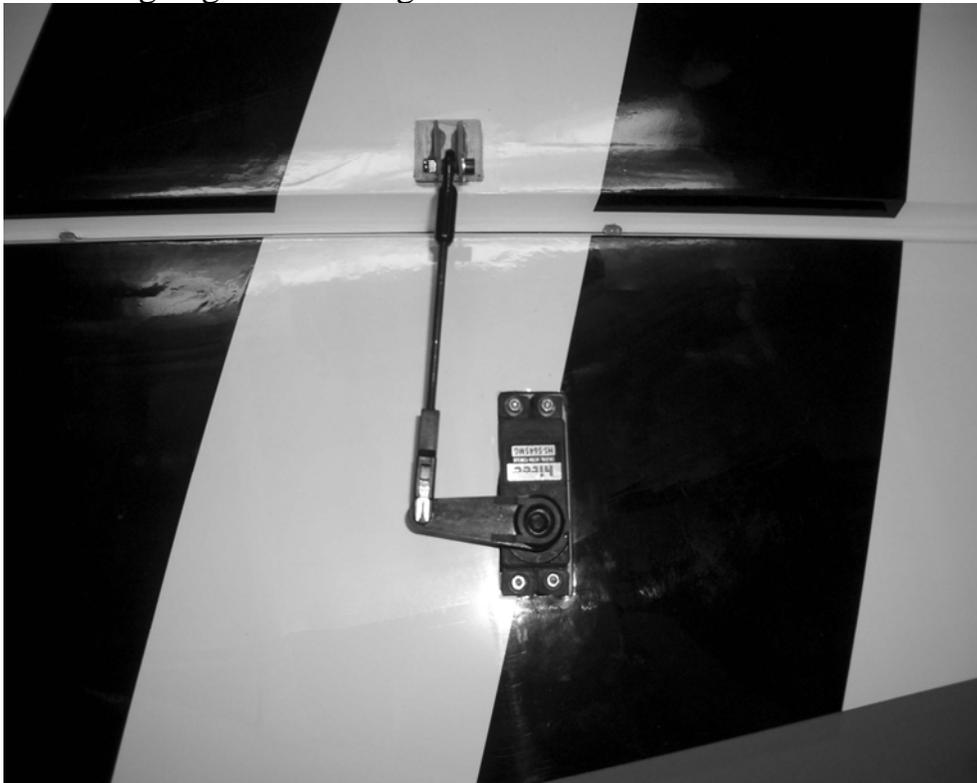
Wing Assembly

11. The assembly process for the wing is almost identical to that of the stab/elevator. For this reason we will not go into quite as much detail as in the previous procedure. Remove the aileron from the wing panel. Locate the 2 slots for the control horns and remove the covering from the slots with a sharp #11 blade. **Follow the same procedure as outlined previously to install the control horns into the control surface and hinge the wing.** You may need to trim 1/16" from the front of the composite base plate to prevent overhanging the bevel. Use the same procedure to hinge the aileron as outlined for the elevators. Repeat this procedure for the other wing.
12. 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 (we use and recommend the Bob Smith Industries IC-2000 in this application) to the joints of the servo rails and the plywood rib doublers.

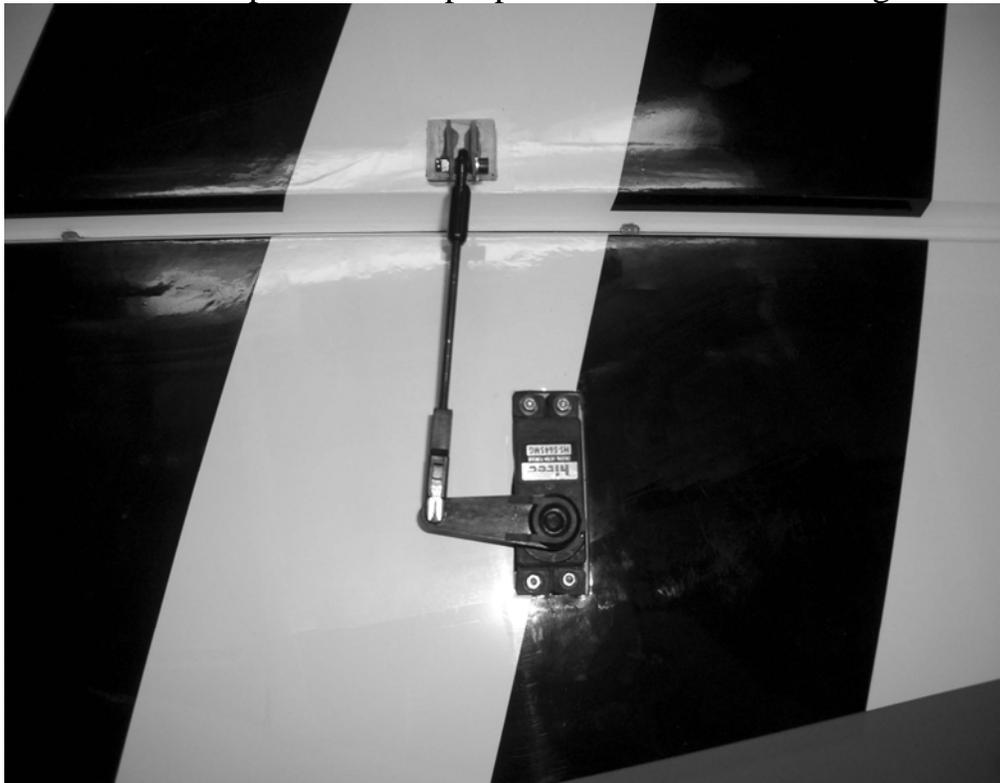




13. Attach a 12" servo extension to your servo and secure with thread or heat shrink tubing. Use the manufacturer supplied mounting hardware and install the servo with the output shaft toward the leading edge of the wing.



14. Electronically center your servo. Aileron servo arm length should be 1.25". Although the picture below shows a clevis on the servo end of the linkage, we have upgraded the hardware to include 2 ball links. We highly recommend the use of a high quality aluminum servo arm such as those manufactured by SWB or JR. When attaching the ball link to the servo arm, be sure to use one of the brass standoffs between the ball link and servo arm to prevent binding. As always use blue Loctite on ALL bolts! You may find it necessary to snip off a couple of threads from the ends of the included pushrods for proper fit in the aileron linkage.



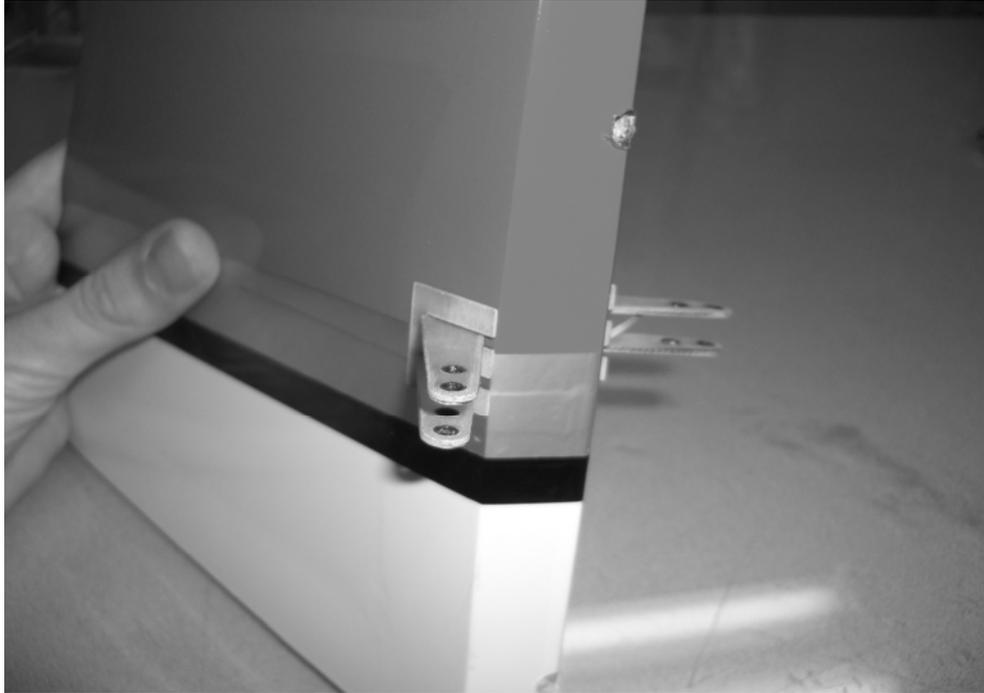
15. Before beginning the next assembly process, take a few minutes with your sealing iron on a medium heat setting and go over all seams, paying special attention to thin trim stripes and the seam at the leading edge of the wing. If there are wrinkles in the covering on the leading edge sheeting use a heat gun with a 100% cotton t-shirt to remove them and prevent digging into the wood with an iron. Use caution and avoid excessive heat as you may cause the Ultracote to shrink too much and lift at the seams. Also take the time to seal the hinge gaps with Ultracote or clear packing tape.

Rudder Assembly

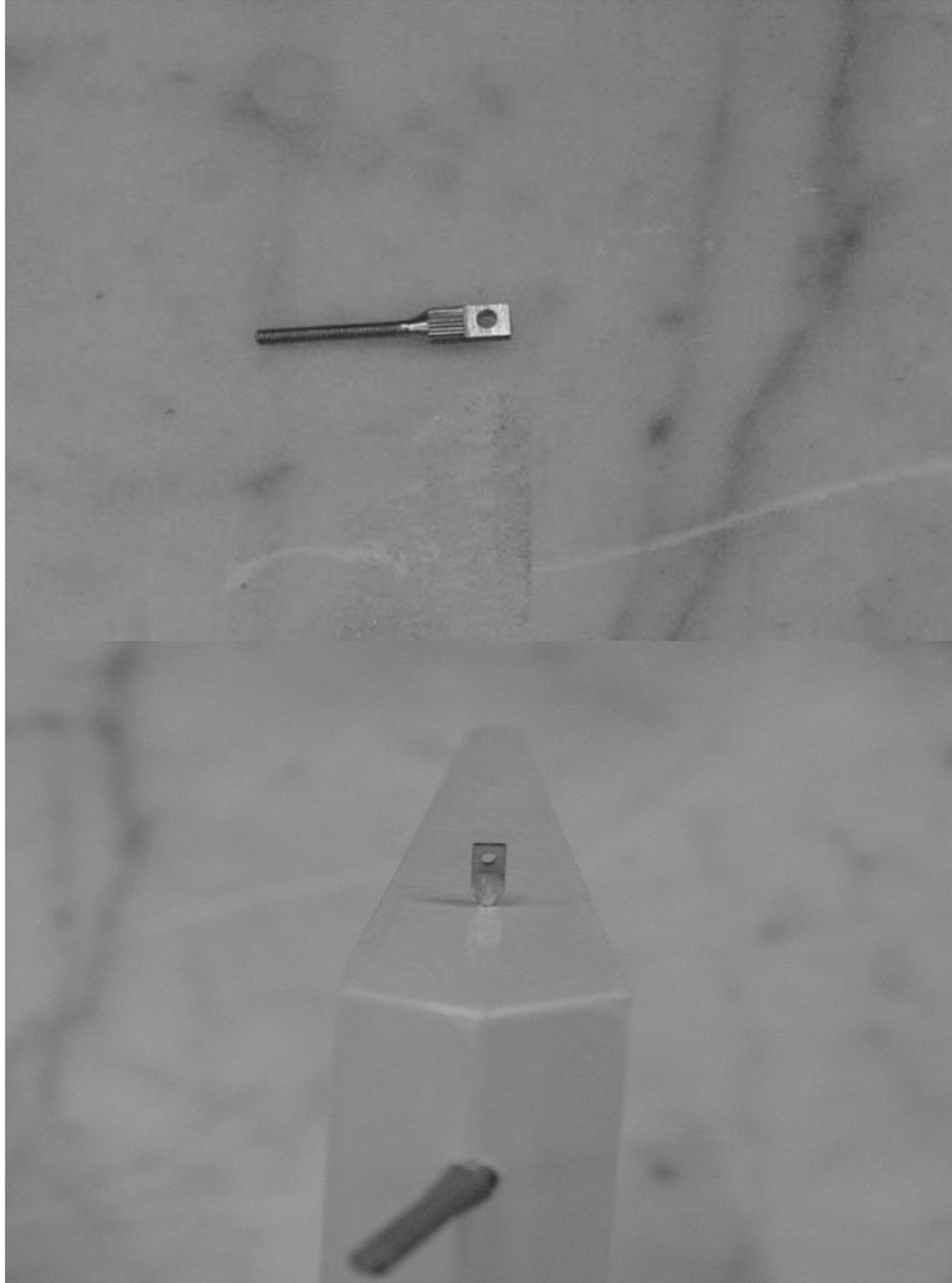
14. Locate the rudder, the rudder control horns and the 2 open slotted base plates. Use a sharp #11 blade to remove the covering from the 2 pre-cut slots in the rudder.



15. Trial fit the 2 servo horns through the rudder and into their proper position. You will want to measure so that the holes in the ends of the rudder horn are equidistant from the hinge line and in-line with the hinge line. Slide the open ended base plates over the rudder horn and trace around them with a fine tipped felt marker. Before removing the horns for gluing you may want to make a few reference marks so it will be easy to re-align the control horns once glue is applied.



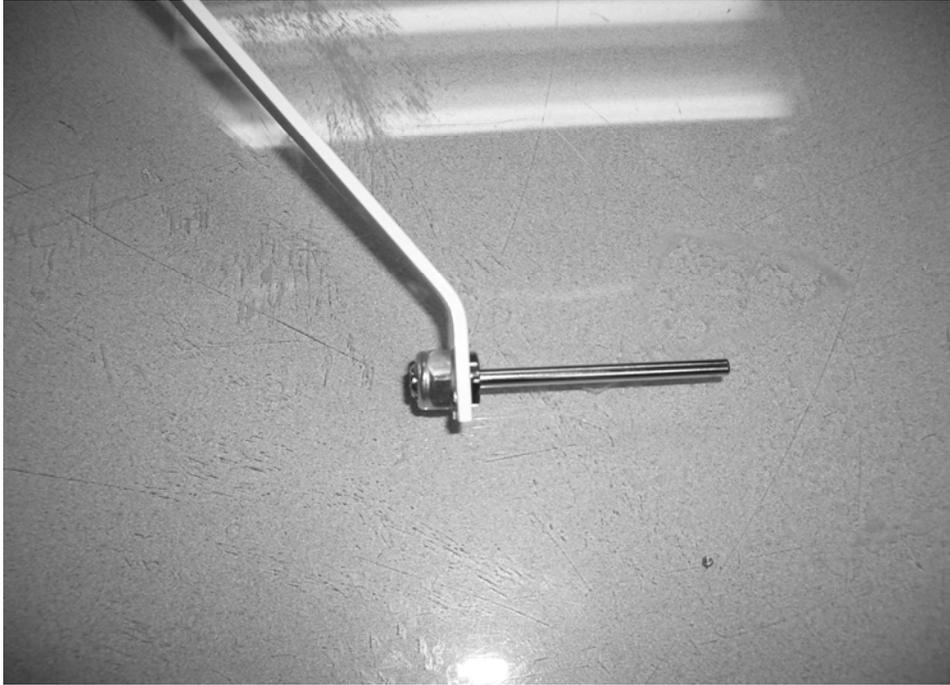
16. Remove the control horns and use a sharp #11 hobby blade to remove the covering 1/16" inside the lines you drew in the previous step. Mix up some 30 minute epoxy and milled fiberglass and use a small blade to fill the 2 slots with epoxy. Use plenty of epoxy and be sure to completely fill the two slots. Use an epoxy brush to completely cover the areas on the rudder horns that will glue into the rudder. Slide the rudder horns back into their proper position and immediately wipe the excess epoxy from the horns. Paint the 2 flat base plates with epoxy and slide into position. Carefully check and re-check alignment to insure proper positioning. Use some denatured alcohol and a paper towel to remove any excess epoxy. Re-check the alignment one more time and set the assembly aside to dry.
17. Locate the small brass connector in the hardware package. Measure back 2 inches from the leading edge of the rudder and drill a small hole in the bottom of the rudder. Apply some epoxy in the hole and onto the threads of the connector and screw it into the bottom of the rudder. Use some epoxy to make a small fillet around the base of the connector.



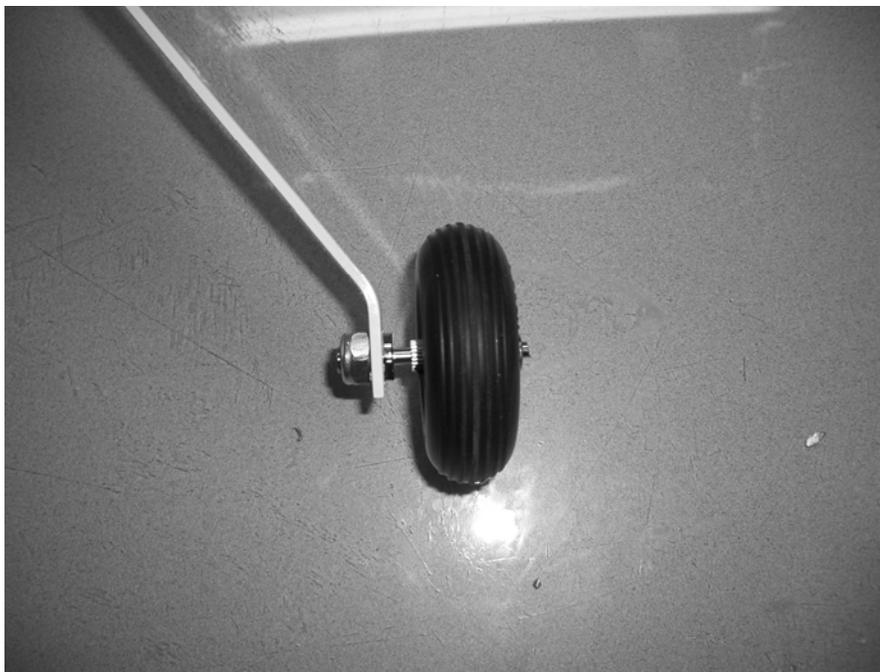
18. Using the same procedure as before, attach the rudder to the rear of the fuselage with the three hinge points.

Fuselage Assembly

19. We'll begin by assembling the landing gear and attaching it to the fuselage. Open the two holes in the landing gear with a drill to accept the axles. Insert the threaded shaft into the gear and retain with the nylon insert lock nut. Repeat for the other axle.



20. Place a wheel collar on the axle 1/4" from the inside edge of the axle. I recommend that you file a small flat area in the axle for the setscrew in the wheel collar to seat against. Place the wheel on the axle followed by another collar to retain the wheel. Be sure to use blue Loctite on the setscrews.



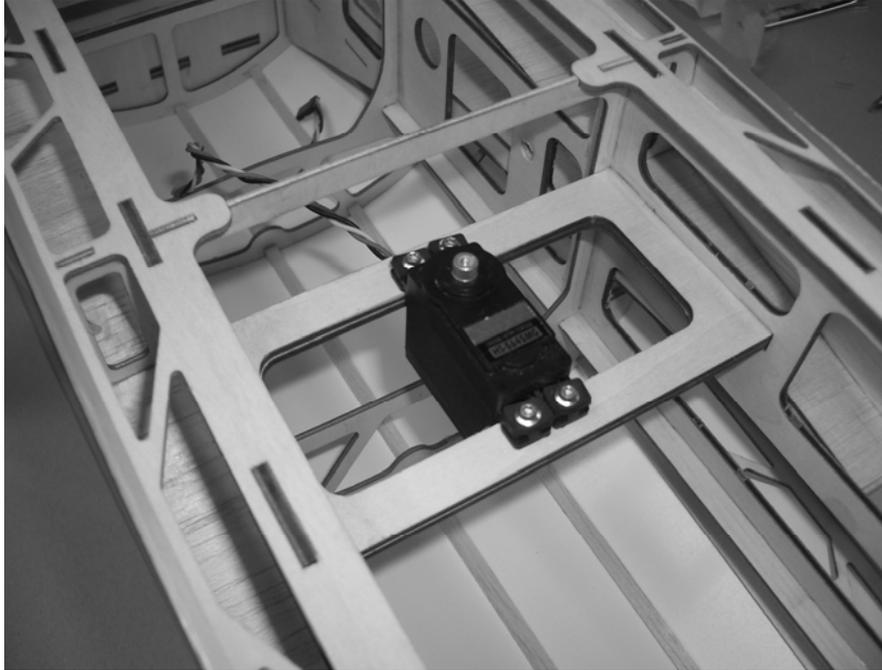
21. Use a ball driver to insert the bolts through the holes in the aluminum landing gear mounts from inside the fuselage. This is made much easier by slipping a piece of large fuel tubing over the end of the ball driver and over the end of the 8-32 socket head cap bolt. Push the bolt through the landing gear and retain with a #8 flat washer and a 8-32 nylon insert lock nut. Repeat for the other 3 bolts.



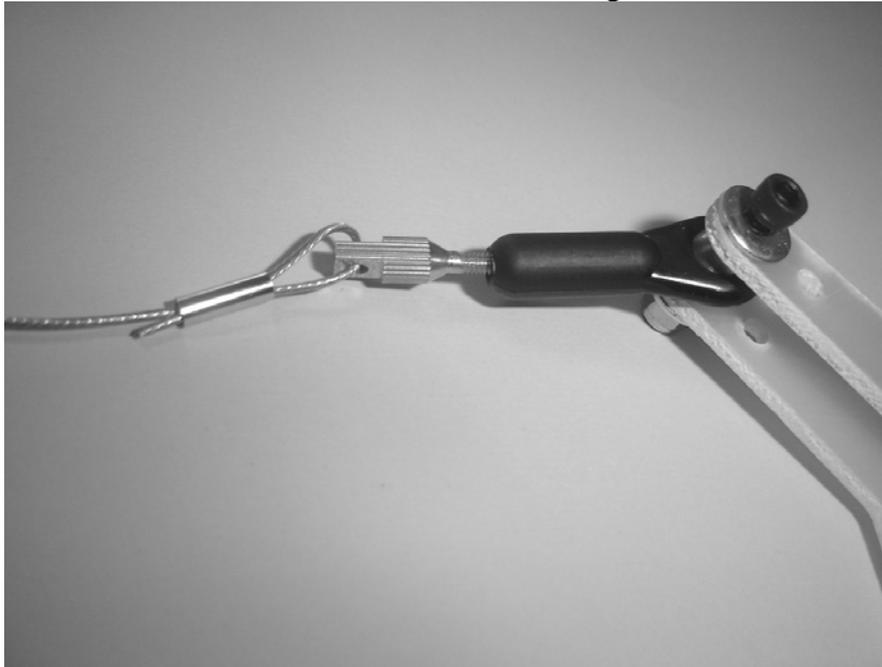
21. Locate the carbon fiber tail wheel assembly. Slide the steering rod through the hole in the connector on the bottom of the rudder. Center the assembly on the rear bottom of the fuselage and drill 2 1/16" inch pilot holes, using the predrilled holes in the carbon fiber gear as guides. Mount the gear using the supplied wood screws. The Yak is now ready to be flipped over onto its "feet".



22. Mount the rudder servo as shown in the servo tray under the canopy.



23. You will need to use a 3" servo arm for the rudder pull-pull system. We highly recommend one of the high quality aluminum servo arms from SWB or JR. Assemble the pull-pull components as shown in the picture below at both the rudder horn end and servo end (although the rudder servo arm you provide will probably be a single truss design). The pull-pull cables will exit the fuselage through the tubes installed on each side of the fuselage as shown.





Engine Installation

24. From the front of the airplane, looking at the front of the firewall, measure to determine the center of the firewall. Once you have determined center, measure over $7/32$ " to the right of center and draw a vertical line at this point. This represents the engine offset to compensate for the right thrust already built into the firewall to overcome spiral slipstream effect.

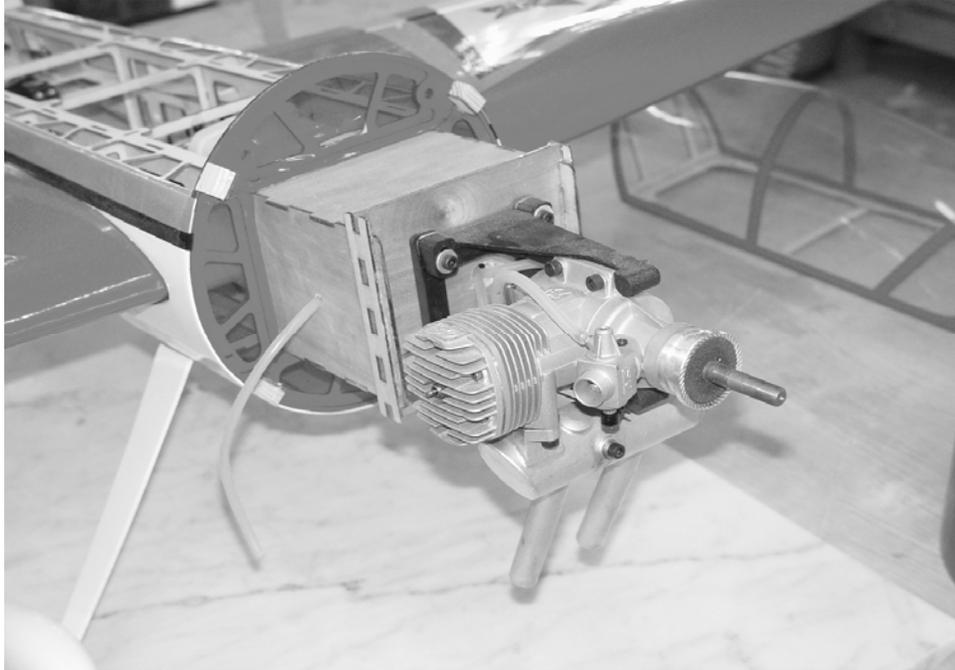


25. Measure down $2 \frac{1}{16}$ " from the top of the motor box side. Transfer this mark to the front of the firewall. This represents the vertical thrustline. Use the two marks to draw a cross on the front of the firewall.



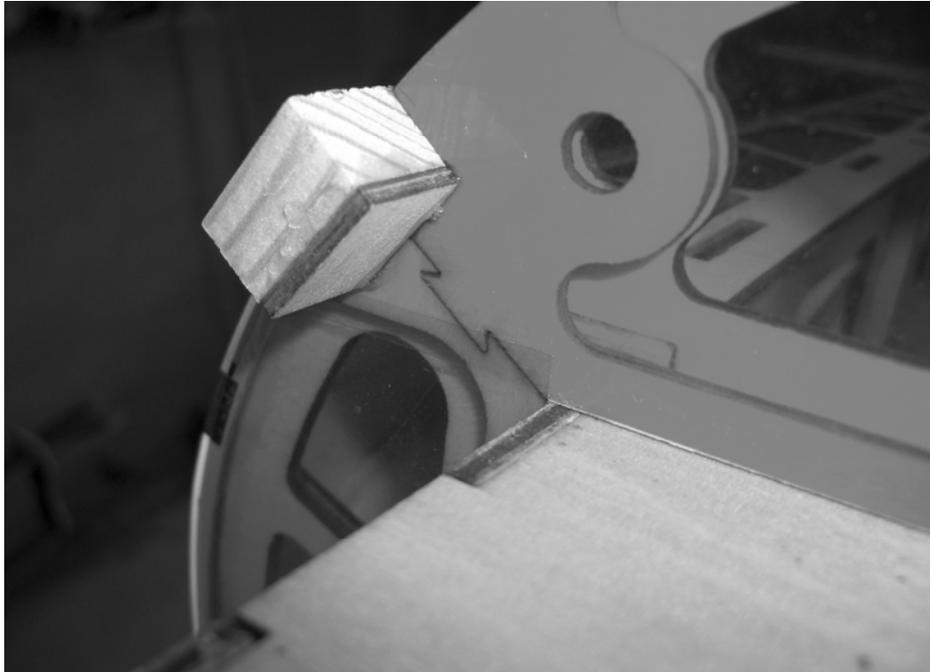
26. Mount your chosen engine on the supplied motor mount. The drive washer of your engine should be 6 ½" from the firewall. Use this figure to mount the engine in the proper position on the mounts. Center the mount on the lines you have drawn on the firewall.
27. Glue the pre-chamfered triangle stock into the interior corners of the engine box as shown in the picture. Before permanently mounting your engine, mix up some 30 minute epoxy and thin with a few drops of denatured alcohol. Use an epoxy brush to thoroughly coat the front and back of the firewall and the inside of the engine box and any other exposed wood surfaces in this area.





28. Use a sharp #11 blade to remove the covering from the 4 cowl mounting block receptacles. Use 30 minute epoxy to attach the hardwood mounting blocks to their respective receptacles.





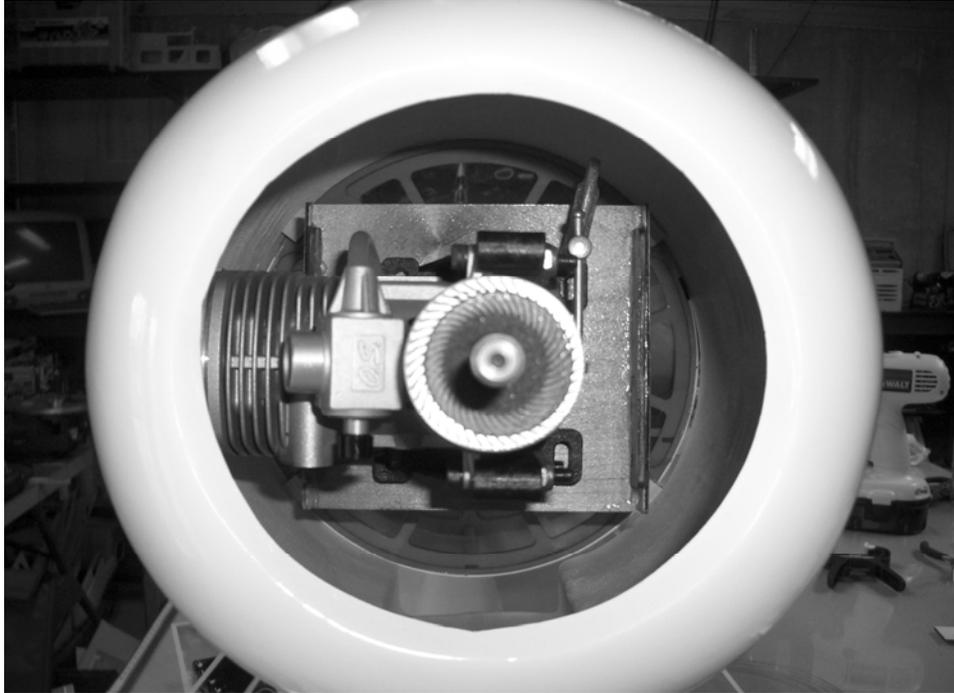
29. Assemble the supplied tank and mount to the tank tray using nylon cable ties or Velcro straps. If using a gasoline engine for the Yak you will need to replace the supplied fuel line with Tygon tubing.
30. Because of the wide variety of engines that can be used to power the Yak, there is not a specific place to mount the throttle servo. We have included a laser cut servo mount for the throttle servo. Assemble this mount and attach it to the fuselage to best suit the location of the throttle arm of your chosen engine.



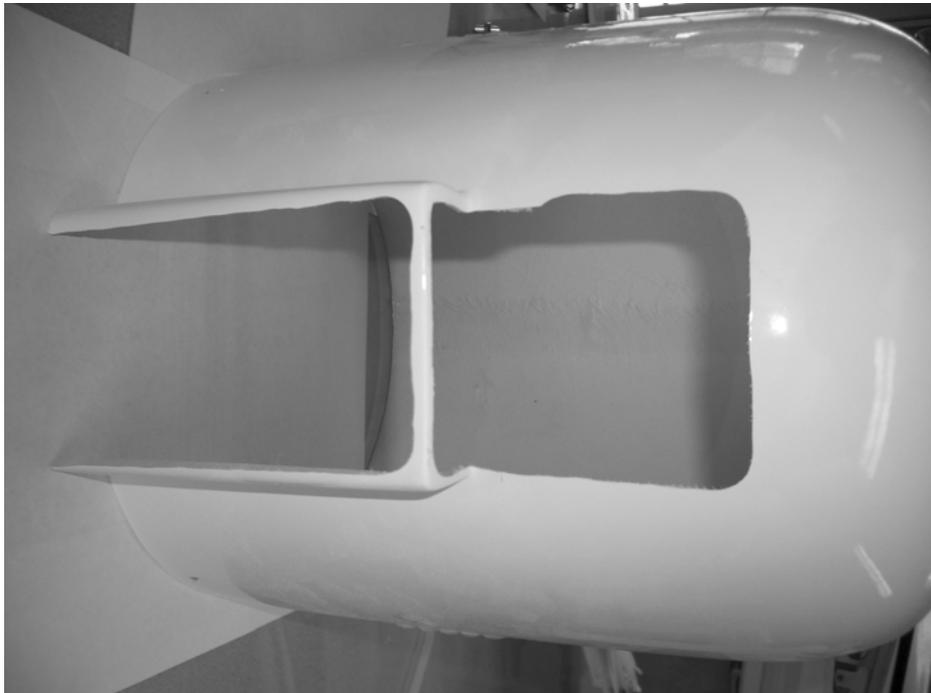
31. Once you have permanently mounted your motor, plumbed your fuel system and secured your throttle servo assembly, glue the motor box top in place with epoxy.



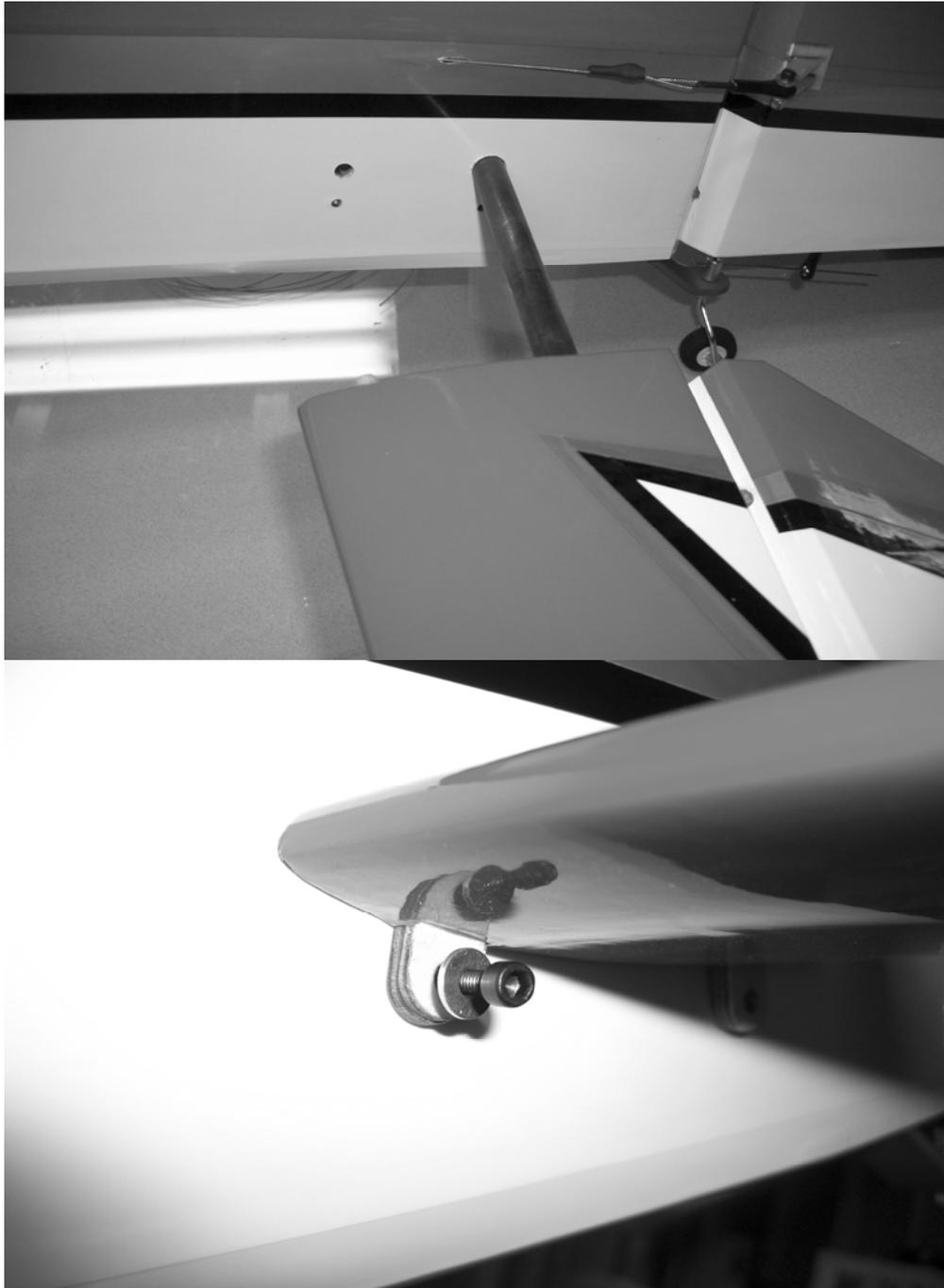
32. Place the canopy/hatch on the fuselage. Slide the cowl over the F1 former and allow it to extend over this former by $\frac{1}{4}$ ". View the cowl from several angles including the side and top and make sure it is properly aligned and that the engine prop shaft is centered in the cowl. Use a few pieces of tape to hold it in place. When satisfied with the position, drill through the cowl and into the mounting blocks with a $\frac{1}{16}$ " bit. Use the 4 short wood screws with the large heads to secure the cowl. You may want to purchase some rubber washers to put under the screw heads to prevent them from eating into the cowl. Another good tip is to glue a CA hinge to the inside of the cowl at the location of each mounting hole.



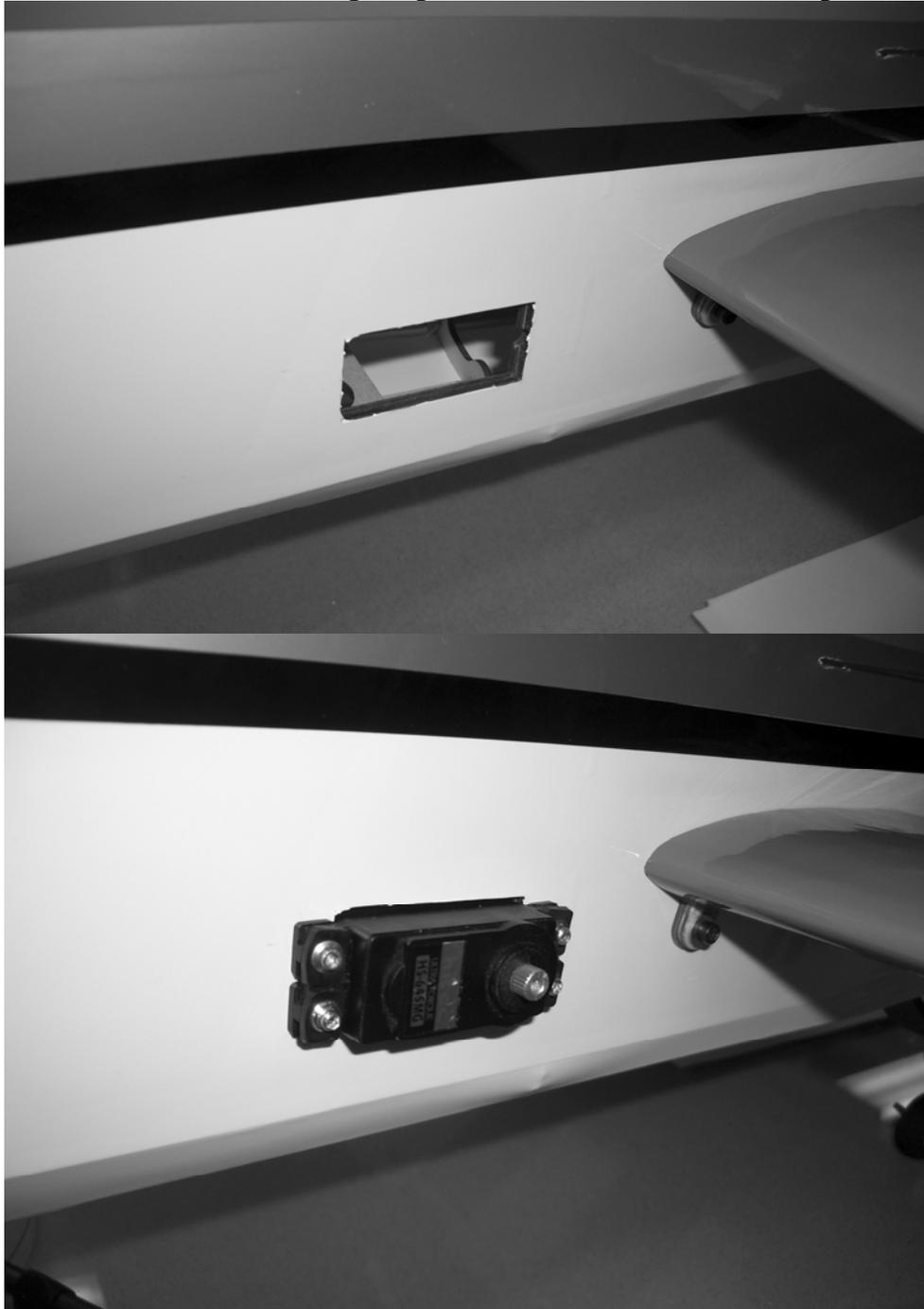
33. You will need to cut some holes in the bottom of the cowl to clear the muffler. The photo below shows how we cut our cowl to clear the OS 1.60FX and Slimline Pitts muffler.



34. We recommend a 3" spinner for the Yak.
35. Slide the carbon fiber stab tube through the fuselage and slide both stab halves onto the tube. Secure with the 6/32 bolts and washers which will thread into the pre-installed blind nuts. **MAKE SURE TO PUT A DROP OF BLUE LOCTITE ON EACH SCREW TO PREVENT THEM FROM BACKING OUT!**



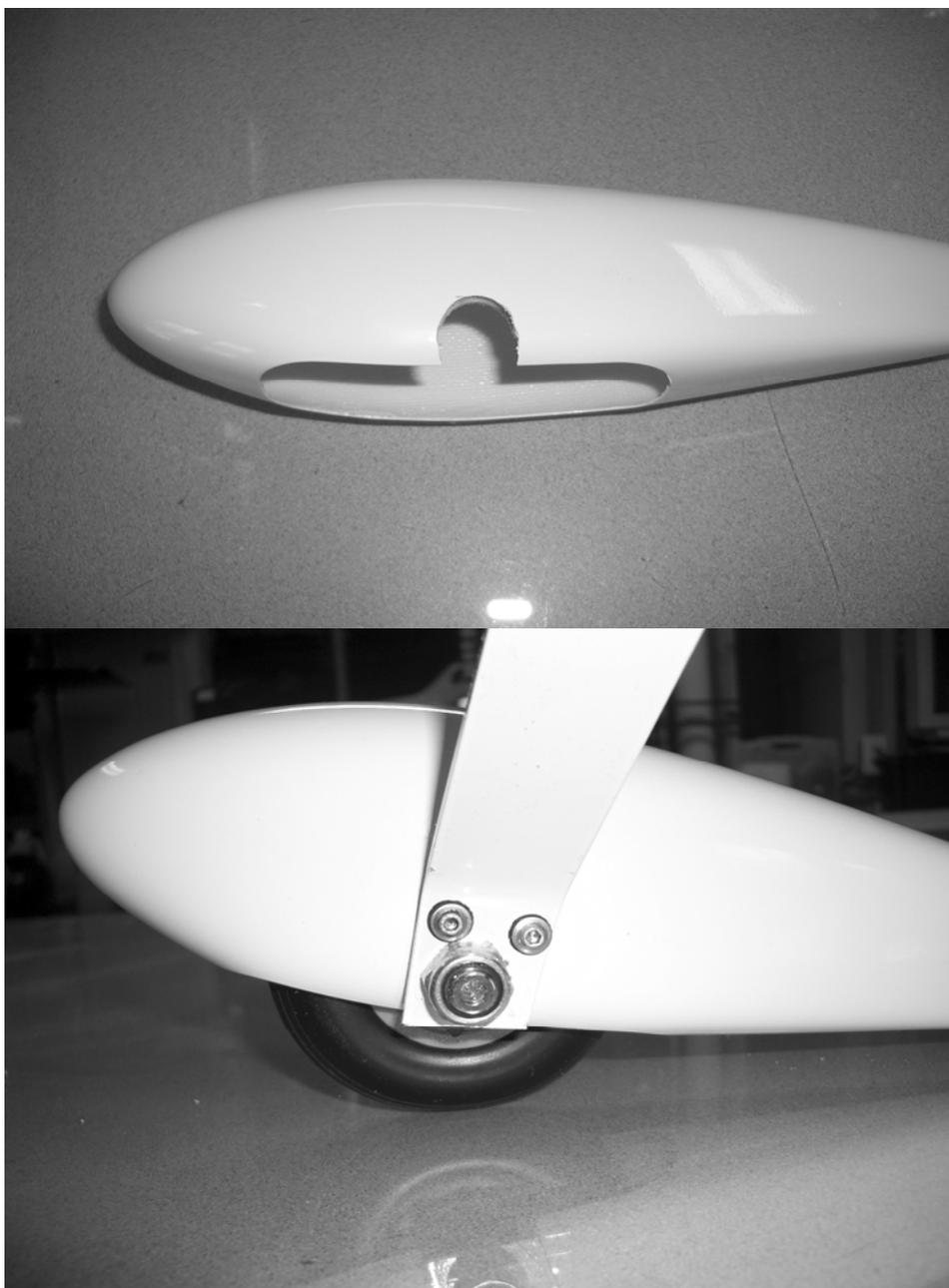
36. Use a sharp #11 blade to remove the covering from the elevator servo bay on each side of the fuselage. Use the manufacturer supplied mounting hardware to mount the servo as shown. Despite the orientation of the servo in the picture, the servo should be mounted with the output spline toward the front of the plane.



37. We recommend the use of a 1.5" aluminum servo arm for the elevator servo. Screw a ball link onto each end of the supplied pushrods and secure one end to the servo arm and one between the outer most hole on the elevator control horn. Be sure to use one of the brass standoffs between the ball link and elevator servo arm to prevent binding.
38. Locate the 2 wheel pants and 2 square pieces of plywood supplied in the hardware package. Glue the 2 plywood plates to the inside of the wheel pants with 30 minute epoxy.



39. Use a moto tool with drum sander attachment to cut a groove in the wheel pants so they will slide down over axle. Drill through the landing gear and pants into the plywood plate and secure with 2 woodscrews each.



40. Install your receiver, switch and battery. Use your battery to help achieve proper center of gravity without adding additional weight.

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.

A common phone call I get goes like this: “I can’t get my plane to fly right. It doesn’t fly anything like your plane in the video. Something must be wrong with mine”. I am always surprised to learn that the customer usually has not varied his CG, control throws, or anything else since first setting up his plane. Getting your airplane dialed in is a continuing process that may take many flights to achieve. Take the time to do this and you will be rewarded with a great flying aircraft.

The **center of gravity** range for the 1.60 Yak begins at 6” from the leading edge of the wing measured at the root and extends back $\frac{3}{4}$ ” from this point. Make your first flights at the front of the CG range. There is no need to have the Yak 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 wingtip to achieve proper lateral balance.

Control surface throws

I highly recommend that you purchase a throw meter that measures 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. These are a good starting point, but are by no means the only way to set up the Yak. Start here and then adjust to fit your own preferences and style of flying.

Elevator: 8-10 degrees low rate, no exponential; bevel to bevel high rate, 60-65% exponential

Aileron: 20 degrees low rate, 30-40% exponential; bevel to bevel high rate, 65-70% exponential

Rudder: 20 degrees low rate, 50% exponential; all you can get for high rate, 80-90% exponential.

Again, this is just a starting point. Adjust to your liking.

The Yak exhibits very little coupling in knife edge flight. There is virtually no coupling when using the small amount of rudder needed for point rolls or slow rolls. When flying slow high alpha knife edge you may experience a

small amount of coupling. Full rudder rate is typically not needed for this maneuver and too much may result in excessive coupling. Experiment with your throws and CG to find the sweet spot. Save full rate rudder for flat spins. And speaking of flat spins, the Yak performs the flattest, slowest descending flat spins I have ever witnessed. The spin is very controllable and is easily exited by neutralizing the controls and adding power. One of my favorite moves is to allow the plane to flat spin down to 10 or fifteen feet from the ground, then add power and begin climbing back up still in a spin. Lots of fun and it gets the heart racing!

The Yak will also perform the most beautiful, round knife edge loops. It has so much rudder authority that recovery on the backside of the loop is typically at idle! This is an impressive sight to behold.

The Yak is a very axial rolling airplane. Its massive ailerons provide tremendous control authority in the roll axis, and high alpha rolling maneuvers are one of its strong points. This incredible control authority allows you to start, stop and change direction of roll instantly. The Yak will obey your every command.

Another of my favorite maneuvers is one I have named "The Aneurysm". This maneuver is basically a medium speed tumble on 3D rates. It is similar to a lomcevak and I have been able to get the Yak to tumble tail over nose 3 times on occasion. This is a very stressful maneuver on the airframe and great care must be taken not to enter it too fast. From medium speed flight pull to a 45 degree upline. Using 3D rates, simultaneously chop the throttle, give full down elevator, full left aileron, and full right rudder. The Yak will tumble tail over nose. Please use caution when performing this maneuver! As I mentioned, it is very stressful to the airframe!

Please use common sense when flying the 1.60 Yak. The Yak's airframe is very robust, but all airplanes have their limits. Take great care to prevent over speeding the airplane which could result in flutter and complete destruction of your Yak. Reserve full power for vertical lines and always have the engine at idle when the nose is pointed down. Inspect your plane thoroughly after each flying session, looking for loose screws, fatigued or worn servo gears, sloppy linkages or loose covering. With proper maintenance, your Yak will provide you with many seasons of aerobatic excitement. Thanks again for your business! See ya at the flying field!