

EXTREME FLIGHT ✓

RADIO CONTROL™

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

110 inch YAK-54 ARF

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 90 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. Please inspect the model immediately upon receipt.

Extreme Flight RC in no way warrants 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 setup 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. Congratulations on your purchase of the Extreme Flight RC 110 inch YAK-54 ARF! This new Extreme Flight Yak-54 includes all first rate

hardware and components and thorough instructions to ensure a trouble free assembly and setup. Weight saving components are used throughout, such as carbon fiber wing and stab mounting tubes, carbon fiber main 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 100cc class 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 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 topnotch precision aerobatic machine. It is capable of performing the entire FAI catalog of maneuvers and it has the kind of "40% plane" presence in the air that will impress the judges. This makes the 110 inch Yak 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 100cc Yak-54!

A few tips to ensure success and airframe longevity

1. We are very pleased with the level of craftsmanship displayed by the builders in our factory. Through many 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, the intersection of the wing root rib and wing sheeting, anti rotation pins, etc. A few minutes spent here inspecting the joints and applying glue where needed is time well spent
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. The black covering may require a little bit more attention than other colors due to its tendency to absorb heat.

3. 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. 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 high torque METAL GEAR servos. We have had great success with the Hitec HS-5955 and now the 7955 servos in our prototypes. We also recommend the JR 8611A or new 8711 or other 180oz torque or higher for all flight surfaces. Note: unless using the JR8711 or higher torque servo, you may need two ganged servos for the rudder to attain 400oz.

5. 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.

Hardware

Your new Extreme Flight 110 inch Yak includes all necessary hardware with the exception of main wheels, axles and collars. These items were omitted as I have been unable to source satisfactory versions of these items in China. I recommend Dubro 3/16" axles and collars and 4.5 or 5 inch main wheels. If you intend to use the wheel spats I highly recommend that you use a stiff set of wheels versus soft foam wheels. This will help to prevent the spats from touching the ground and possibly damaging them.

On the following page is a photo of the various connectors used for the Yak. You will notice 3 sets of 3mm bolts. The 4 shortest of these (1/2" long) 3mm bolts are the stab retention bolts which mate up with the pre-installed blind nuts in the rear of the fuselage. The 2 medium length (5/8" long) 3mm bolts are for securing the carbon fiber tailwheel assembly (the appropriate blind nuts are already installed in the bottom rear of the fuselage to accept these bolts). The 4 longest 3mm bolts are for securing the canopy.

You will find a complete pull-pull system, as well as high quality Dubro heavy duty ball links, titanium turnbuckle pushrods and composite control horns, and a carbon fiber tailwheel assembly. You will find a white ball link for use on your throttle linkage.

The bonded sealing washers are used when mounting the cowl and canopy/hatch. When the bolts used to retain the canopy/hatch and cowl are tightened against the bonded sealing washer, the rubber on the washer compresses, preventing the bolt from backing out. The rubber on the washer also protects the surface of the cowl. Tighten the bolts until the rubber compresses, but do not allow the metal part of the washer to make contact with the cowl.

There are 6 titanium pushrods included in the hardware package. The titanium turnbuckle style pushrods are used for elevator and aileron actuation.

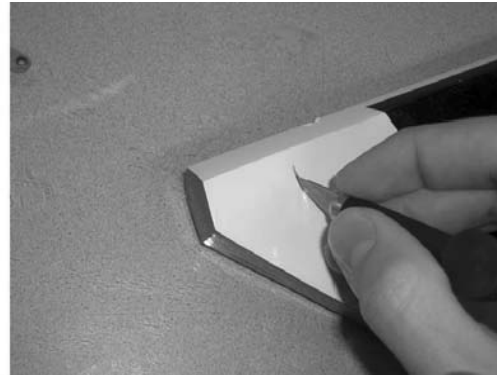


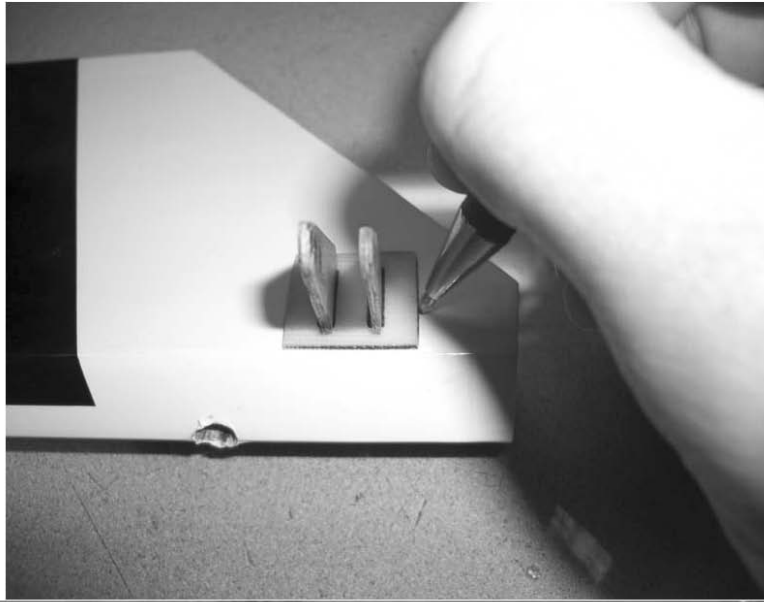
Let's Begin!

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. Carefully insert the control horns into the slots and push down until the base plate is flush with the control surface. You may need to trim the edge of the base plate to prevent it from overhanging the bevel. Use a fine tipped felt marker to trace the outline of the base plate and 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 or into the sheeting, cut the covering only. Make your cut only where there is sheeting below the covering.**





1. 4. 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. Use some fine sandpaper to roughen the portion of the control horns that will be inserted for gluing. Mix up some 30 minute epoxy (add a little milled fiberglass if you have it) and using a toothpick or an old #11 blade to force glue into the slots 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.

.5. 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. Insert one of the 3mm bolts through the 2 control horns as shown to insure proper alignment. 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.

1. 6. Locate 4 hinges per elevator half. There are two hinges that have one end shorter, these go into the inner two holes of the horizontal such that they will not interfere with the socket. Be sure the hinges clear the socket before gluing.

2. 7. 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, toothpick 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 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.



TIP: you may coat the pin section only with petroleum jelly (or something similar) to keep epoxy from drying in the pin section. Be sure not to coat anything but the pin (center) section as that would hinder the epoxy from curing at full strength. Be sure the hinge is not sideways in the hole.

1. 8. 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.

9. 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 Blenderm tape. Be sure to fully deflect the control surface when applying the tape or Ultracote to allow full deflection once the gap is sealed.

2. 10. Use a sharp #11 blade to remove the covering from the slot for the elevator servo control horn. You may have to slightly enlarge this hole to allow for maximum travel.

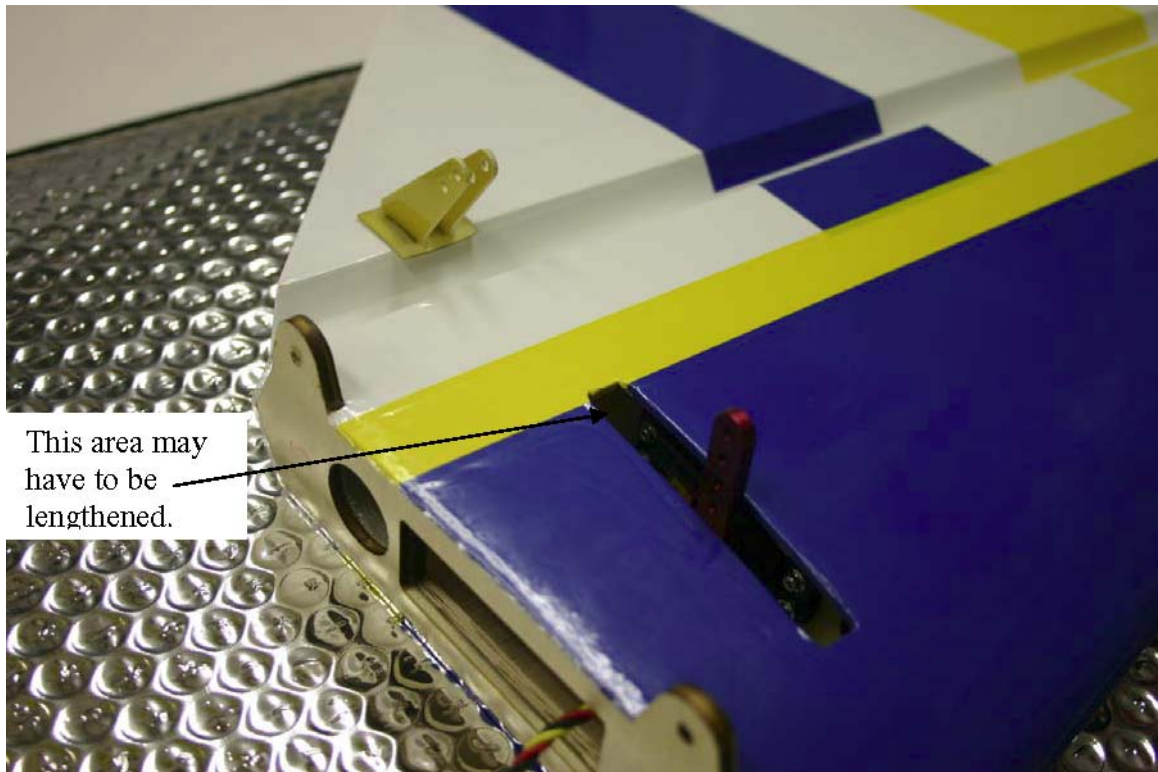
3. 11. Before installing the elevator servos, I highly recommend that you temporarily install the servo arms and electronically center the servos. It will be much easier to match up the servos at this point than when they are installed. I also recommend that you thin a small amount of epoxy with a few 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. Over time exhaust residue begins to collect here and by sealing it with epoxy you will prevent degradation of the wood.

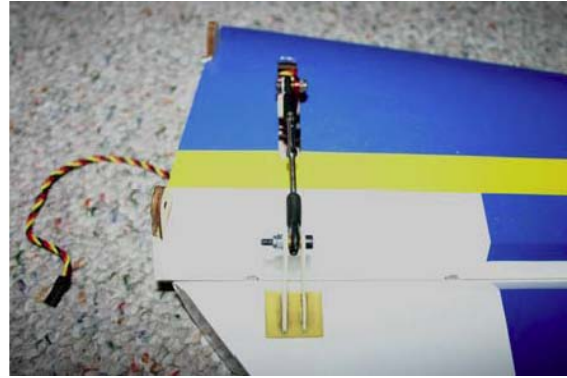
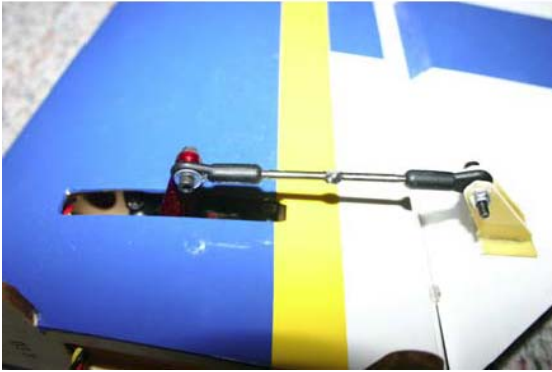
4. 12. Use the manufacturer supplied mounting hardware and install the elevator servo with the output shaft toward the front of the stab.

5. 13. Thread 2 of the heavy duty ball links onto one of the 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. Insert a 3mm socket head cap screw into the ball link and into the servo arm. If using the SWB arms you will need to drill out the hole to accept the 3mm bolt. Secure with a 3mm nylon insert locknut.

6. 14. Place the servo arm onto the servo (which you should have electronically centered in a previous step) and make sure the elevator is in the neutral position. Adjust the ball links until the linkage fits between the composite control horns and lines up with the desired pre-drilled hole. Insert a 3mm socket cap screw, through one side of the composite control horn, through the ball link, and finally through the other composite control horn. Secure with a 3mm nylon insert lock nut. Use blue Loctite on all bolts! Below is the finished set-up.

7. 15. As mentioned previously, you may need to adjust the size of the servo arm exit slot to achieve maximum travel. A 1/4" Drum sander in a moto-tool makes quick work of this. Repeat these steps for the other stab/elevator half. Before you set aside the stabs take a moment with your 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.





NOTE: the methods used to install the control horns, servos, hinges and linkages is virtually the same for the ailerons and to some degree the rudder.

Wing Assembly

1. 16. 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 4 slots for the control horns and remove the covering from the slots. **Follow the same procedure as outlined previously to install the control horns into the control surface and hinging the wing.** You may need to trim 1/16" from the front of the composite base plate to prevent overhanging the bevel. Repeat this procedure for the other wing.

2. 17. Locate the aileron servo holes and remove the covering from these areas. Use a sealing iron to seal the edges of the covering to the insides of the servo opening. Take a few minutes to apply some CA to the joints of the servo rails and the ribs.

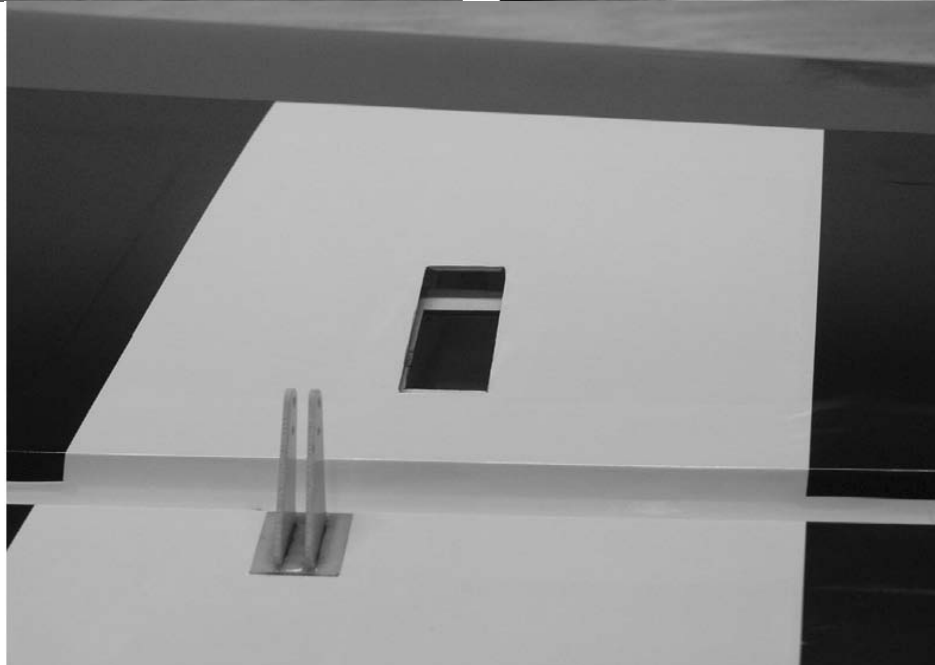
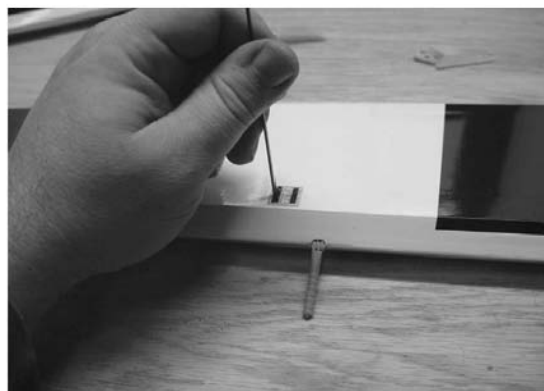
18. The 110" Yak requires 2 servos per aileron. Use the manufacturer supplied mounting hardware and install the servos with the output shaft toward the leading edge of the wing and the servo arm pointing to the wing root rib.

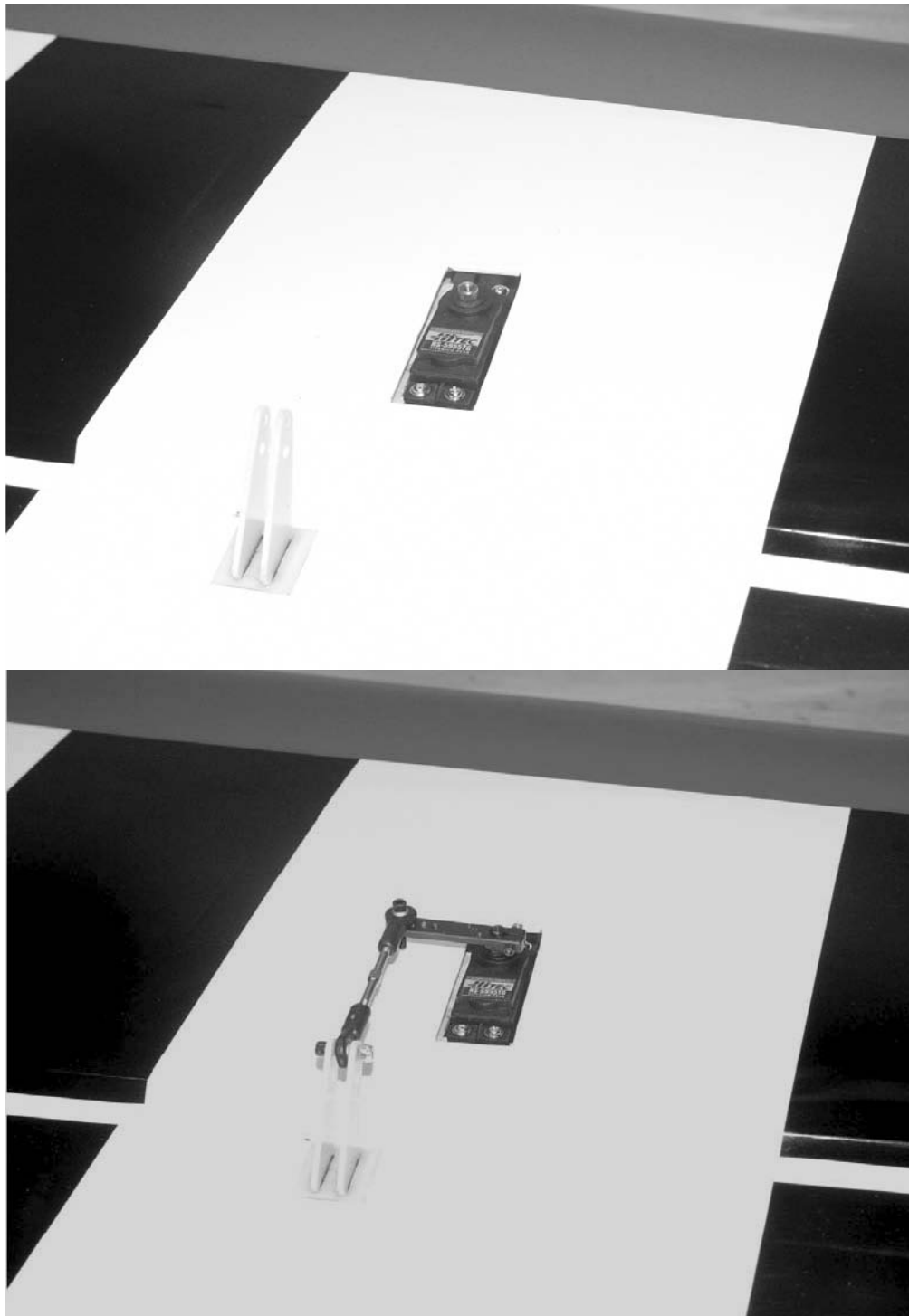
We used Hitec 5955TG digital servos and used the Hitec digital servo programmer to ensure that the 2 servos were properly matched and working together. Then the 2 servos were attached to a Y-Harness and plugged into a single port in the receiver. The 2 servos in the other wing were set up the same way and plugged into an auxiliary port in the receiver and the 2 ailerons were connected electronically within the transmitter's programming menu.

3. 19. We will fabricate the linkage much in the same way as the elevator linkage. Aileron control horn length should be 1.50". As always,

use blue Loctite on ALL bolts!

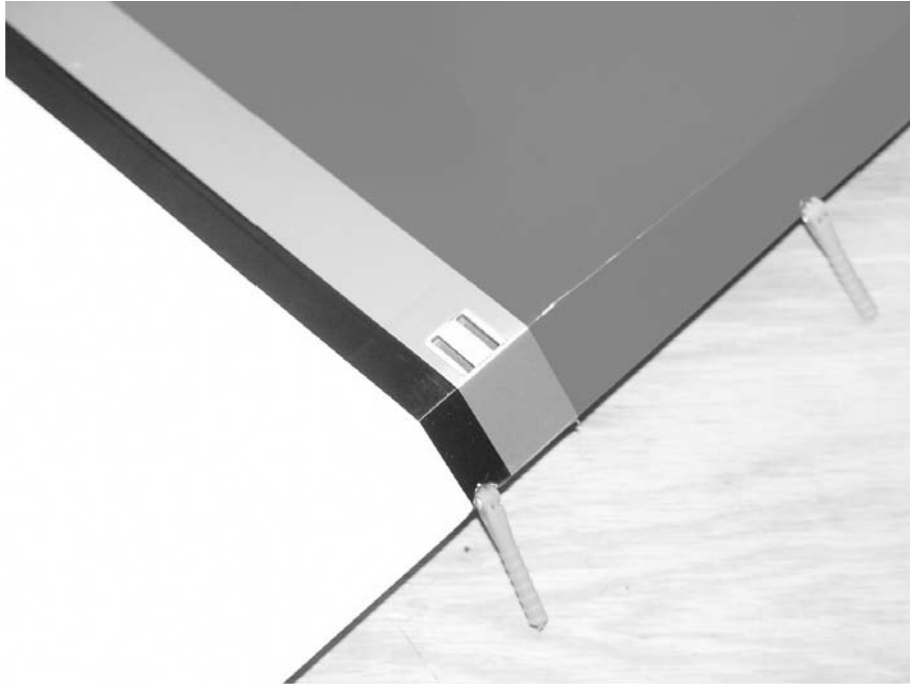
4. 20. Before beginning the next assembly process, take a few minutes with your sealing iron on a medium heat setting and go over all seams, paying special attention to thin trim stripes and the seam at the leading edge of the wing. If there are wrinkles in the covering on the leading edge sheeting use 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 Blendederm tape. Clean the wings with Windex and put them away in their protective bag.





Rudder Assembly

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



1. 22. Trial fit the 2 servo horns through the base plate and into their proper position flush against the rudder surface. You may need to trim the front of the base plate so that it does not overhang the hinge line as shown in the photo.

2. 23. 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 and base plate that will glue into the rudder. Slide the rudder horns back into their

proper position and immediately wipe the excess epoxy from the horns. 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. Repeat for the other side of the rudder.

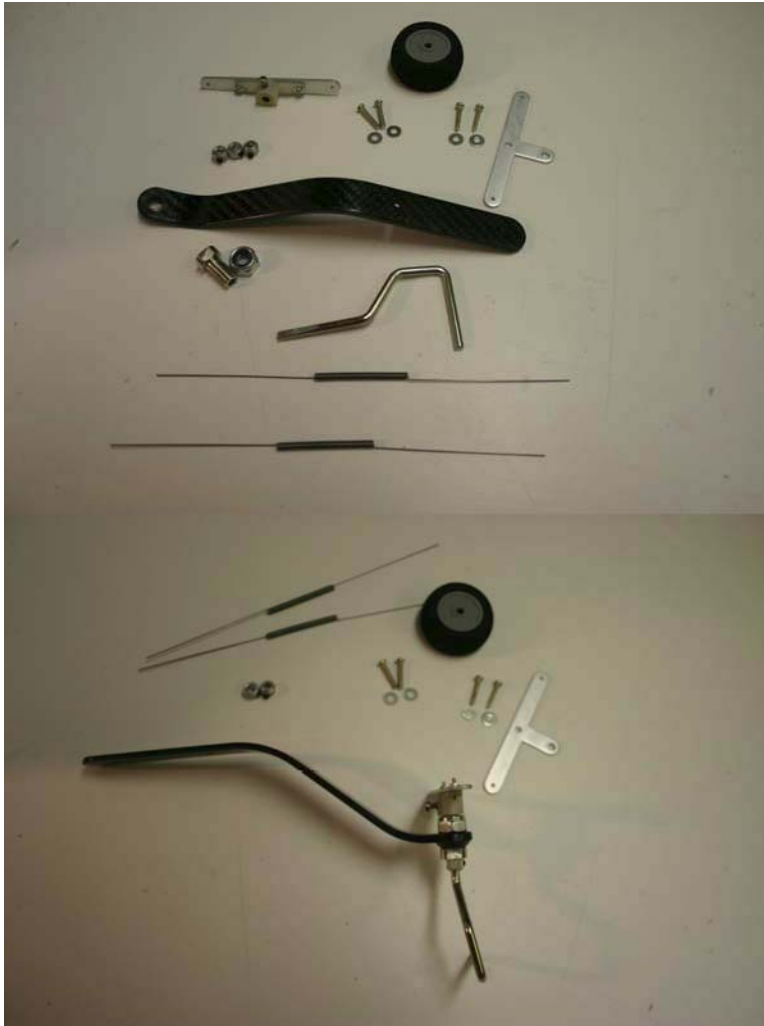


Tail Wheel assembly

1. 24. Locate the bag with all the tail wheel parts. Take the main carbon fiber gear leg and mount the support bushing with the nylon insert nut on top and tighten. The metal portion that the wheel fits onto, locate that, the top tiller and 1 wheel collar. You will need to grind some flat spots onto the metal wire portion of the tail wheel assembly, to allow all set screws to mate against a flat spot to prevent slippage.

2. 25. Slide a wheel collar onto the top of the metal gear. Now slide the gear up thru the metal support bushing and past the nylon nut. Now position the main tiller onto the top until it bottoms out and tighten the bolt. Position the main tiller against the nylon nut and then slide the bottom wheel collar up against the

metal support bushing and tighten. Now position the rudder tiller in the very center of the rudder's bottom and about $\frac{1}{4}$ " from the leading edge of the rudder. Mark the hole locations and drill for the supplied wood mounting screws and mount the rudder tiller. See pictures for detail.





26. Feel along the bottom of the aft bottom fuselage area and you will notice two holes under the covering. Open these holes and position the carbon gear leg over them and mount with the supplied machine bolts. Now locate the springs and mount them within each outer hole of the tillers.

Fuselage Assembly

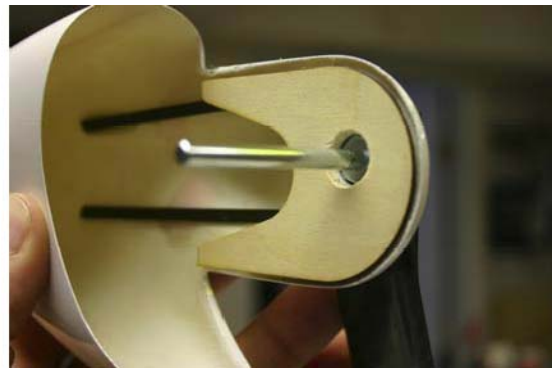
1. 27. We'll begin by installing the landing gear. Locate the carbon fiber main landing gear. Insert the gear into the slot on the bottom of the fuselage and center it in the slot. Use the pre-drilled holes as guides and drill through the plywood landing gear plate and aluminum mounting bracket.
2. 28. The pipe tunnel has a piece of plywood still attached at the front just below the motor box. It has been laser cut but has some points not cut to hold it in place. Cut these areas and remove the plywood such that you can see down the pipe tunnel. Place a washer on one of the longer 4mm mounting bolts and insert them through the holes you just drilled from the landing gear side. The preceding pictures show how the bolts will be placed.
3. 29. Secure the landing gear with 4 washers and nylon insert lock nuts from inside the tunnel.
4. 30. Attach the landing gear fairings with silicon glue. You may want to scuff the inside of the fairings with sandpaper for better adhesion.



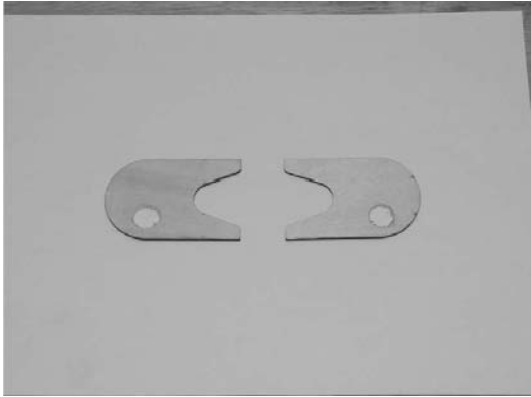
TIP: you may fit these flush with the fuselage, but I left a small 1/16" gap to allow the landing gear to flex without damaging the fuselage.



31. Locate the 2 wheel spats and 2 plywood mounting plates. Use sandpaper to scuff the inside of the spat for better glue adhesion. Drill a hole as shown in each ply plate about $\frac{1}{4}$ " below center. This will allow the spat to be positioned slightly higher than center to prevent it from making contact with the ground. Be sure to position the hole fore and aft properly for tire clearance.



TIP: since the spat is so big and rough fields can wreak havoc on spats, here is a suggestion. Glue two small carbon strips inside the spat as shown above before proceeding with step 32.



1. 32. Glue the ply mounting plate to the spats as shown with 30 minute epoxy. Once dry drill through the fiberglass spat at the location of the hole in the plywood plate. We chose to use a 1/2" drill bit for this so that the spat will fit over the hexagon portion of the axle.

2. 33. Install your choice of axles. You may need to drill the opening in the CF gear to accept the axle of your choice. Now slide the spat over the axle and into position against the landing gear leg. Position as desired and mark the location for the blind nut using the pre-drilled hole in the aluminum gear as a guide. Center and install the 4-40 blind nuts and secure the spat with 2 4-40 bolts. Use blue Loctite on ALL bolts. Slide a wheel collar onto the axles followed by the wheel and finally another collar to retain the wheel. You may need to trim the spat to clear the wheel.

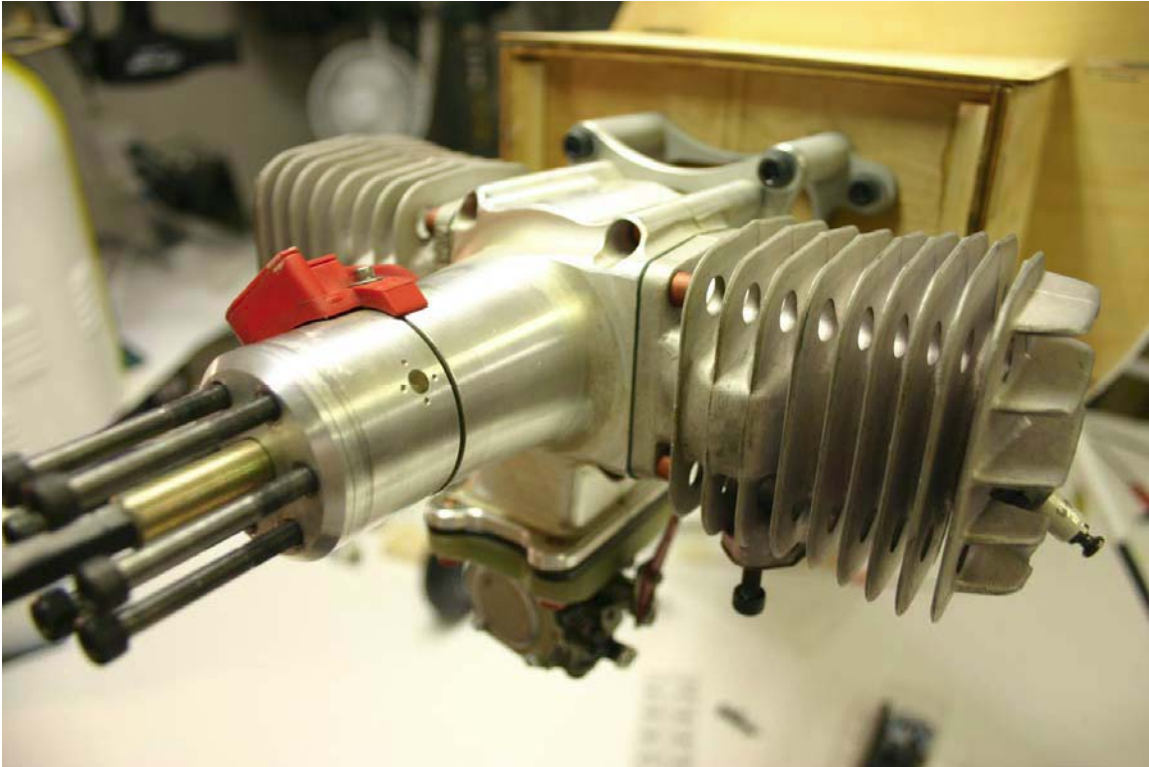




34. Next let's install the engine. We have made this process very easy. The center and offset marks have been scribed into the front of the firewall with a laser.



1. 35. Most manufacturers will provide a mounting template for their engines. If you do not have a template, you can measure the distance between your engine's mounting holes and determine the center and align with the lines on the firewall. The line to the right of the center line is the proper reference point to use as it provides the proper offset to accommodate for right engine thrust.
2. 36. Use the recommended mounting bolts to mount the engine to the firewall, we used 1/4" 20 thread per inch bolts. You will need to use 1" standoffs if using the DA-100. These will provide the recommended distance for the engine/cowling. The actual distance from the face of the firewall to the front of the engine drive hub should be 7 5/8". Drill the necessary holes and mount the engine, in our pictures we used an aftermarket engine mount, you could also use 1" diameter wooden dowels or aluminum standoffs.



Remove the engine and brush a coat of alcohol thinned epoxy onto the exterior and interior of the motor box. When dry, mount the motor. Be sure to use some large washers behind the firewall to better distribute the load. Again, use blue Loctite on all bolts.

37. Now let's set up the throttle linkage. If you are using a DA-100 this is

very easy. Mount the servo in the hole on the bottom of the engine box and use the 2mm pushrod, and white ball link to fabricate the throttle linkage. Cut the pushrod to length, then solder a clevis or threaded rod end (not included) to the servo end. Use the threaded end to connect the ball link to the carburetor. If you plan to use a tuned pipe be sure there is clearance between the pipes/headers and the throttle linkage. If necessary add a couple of hardwood rails to elevate the throttle servo and provide additional clearance between the throttle servo and exhaust manifold.

Here are a couple of pictures showing servo mount and servo linkage. TIP: scuffing the end of the pushrod will permit better soldering for the clevis.





.38. Assemble the included Dubro 32 oz tank. Make sure to use the gas conversion stopper and Tygon tubing for all plumbing. Use nylon cable ties or velcro to secure the tank to the tank tray. The tank should butt up against the wing tube and. Use some foam rubber under the tank to isolate from vibration.

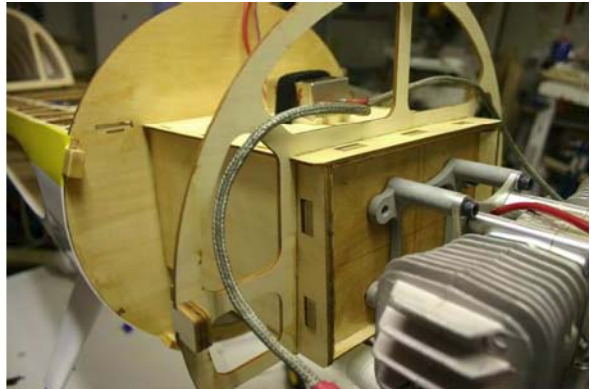
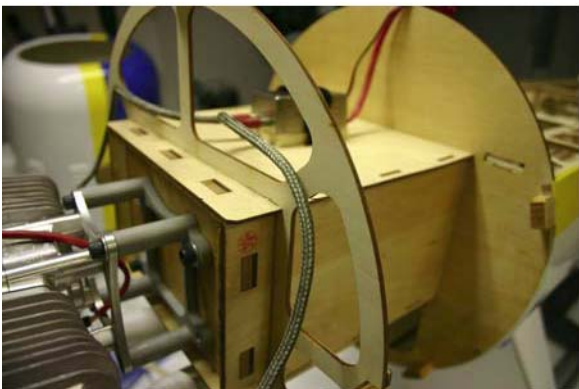
.39. Here is where we installed our fuel dot.

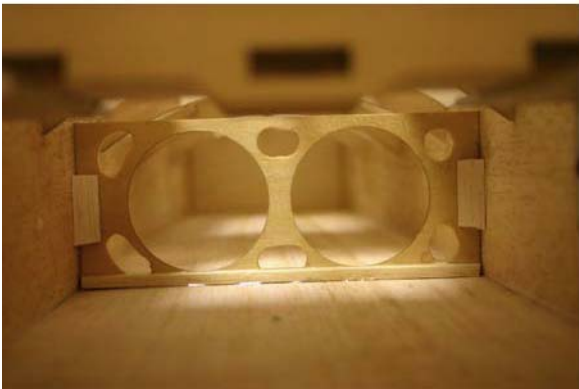
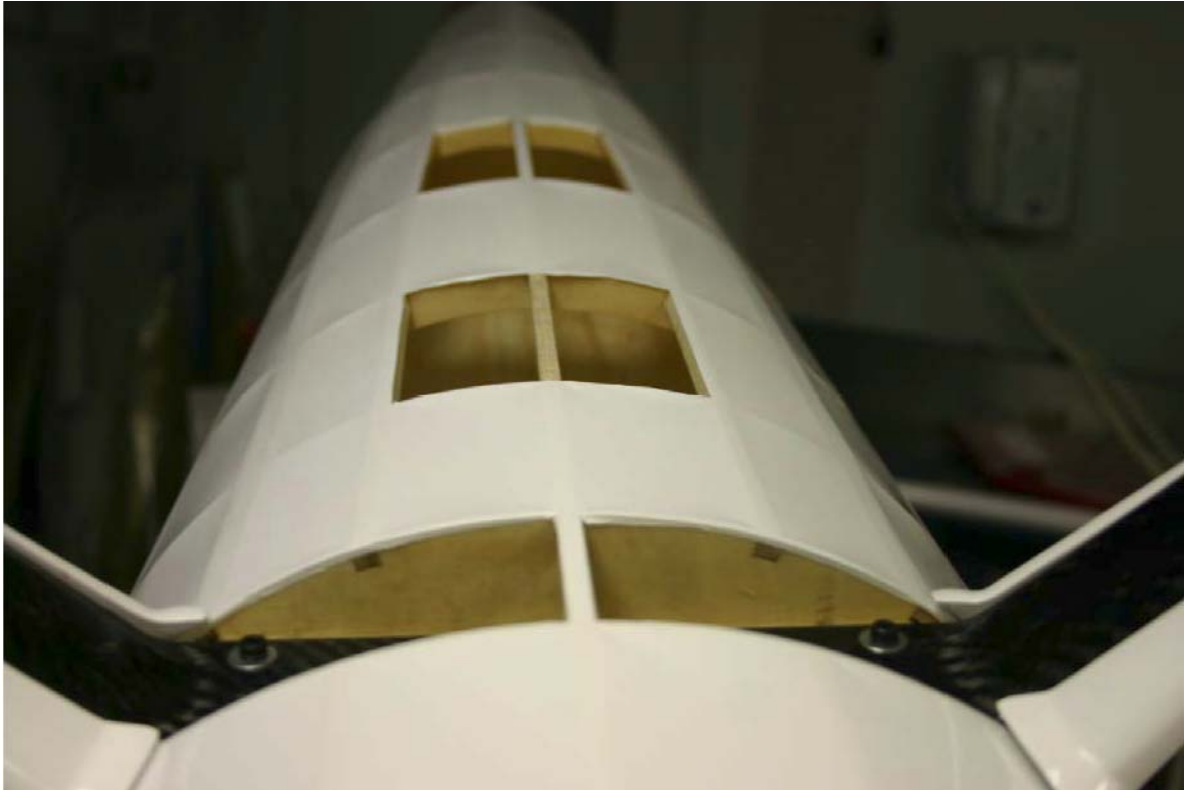
2. 40. Once all plumbing is completed and throttle servo and linkage is installed glue the top of the motor box in place with 30 minute epoxy. Alternately you may wish to cut the forward part of the motor box cover away (the part with the laser cut holes to accept the cowl mounting ring) and glue it in place, while attaching the remaining portion of the box top with bolts and blind nuts to allow access to the interior of the motor box. Glue the cowl ring in place at this time, such that the mounting tabs face forward.

.41. If you are planning to use tuned pipes or canisters now is the time to install them. We will show how to mount the ES Composite's tuned pipes. You will

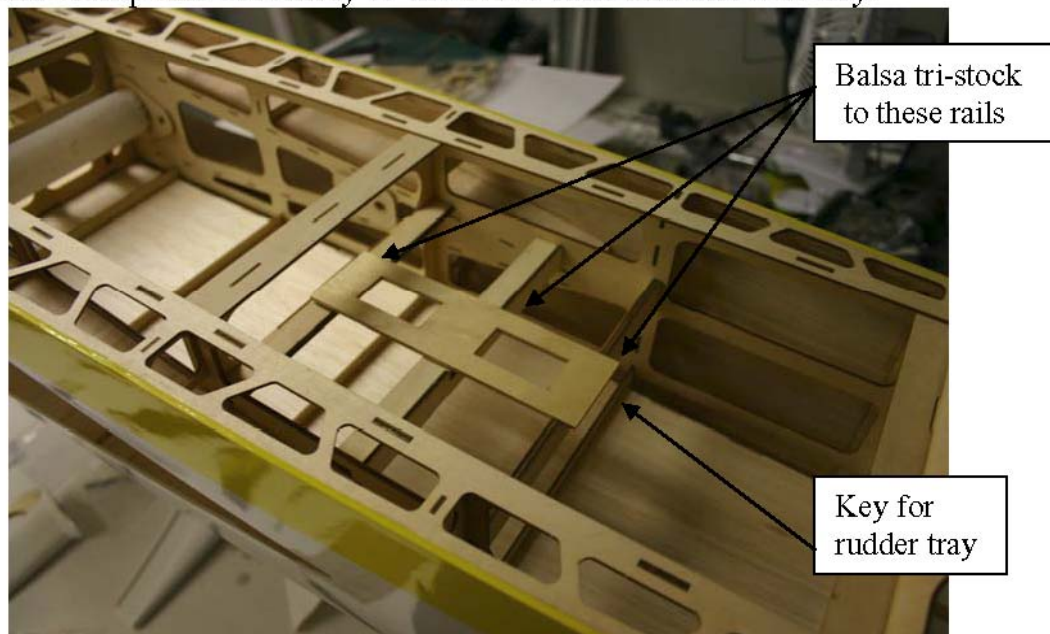
.need to remove covering, measure your pipe and cut the covering where the exhaust tube will exit. The picture below shows two holes, the aft one is where the exhaust will exit, the hole between the gear and the aft hole is to access the pipe's mounting bracket. This middle hole will be recovered after the installation is complete.

3. 42. Locate the lite ply mount, there are two of them but we will use one in this installation. We decided to put the pipe mount just aft of the center of the pipe. I glued the mount in and used some scrap tri stock for additional bracing. I also drilled some holes to wrap my fuel tubing around for a soft mount of the pipes. I weaved thru the holes and around the pipe creating a sort of sewn effect. There certainly are other ways to secure the pipes, but this method has worked well for us. Use whatever method works best for you.
4. 43. Locate the rudder servo tray in the hardware package. Trial fit the tray to the mounting rails, there is a small key in the aft rail. Locate the two pieces of balsa tri-stock, cut 4 pieces the width of the tray and glue these to the rails. This will provide extra gluing surface for the tray. Apply 30 minute epoxy to the
5. 44. Once this assembly has dried install your rudder servo using the supplied hardware with the output shaft toward the front of the plane. We recommend the use of the new “mega-torque” standard size servos such as the Hitec HS- 5955 or the JR 8611A or 8711 for this position. We have found a single JR8711 is plenty for the rudder, however the JR 8611 or Hitec 5955 will require 2/each.
6. 45. Next let's install the pull-pull rudder cables. First remove the covering from the exit slots at the rear of the fuselage as shown.
7. 46. Assemble one end of the linkage by inserting the pull-pull cable into a crimp, through the hole in the brass pull-pull fitting and back through the crimp. Loop the cable back through the crimp a second time and crimp with side cutters.
8. 47. Insert the bare end of the cable into the slot in the rear of the fuselage and feed it forward through the hole in the former that is positioned just in front of the slot. Pull the cable forward into the canopy area and make up the same type of linkage as you did previously. Secure the linkage at both ends with a 3mm bolt and nylon insert lock nut. Repeat for the other side.
You will want to use a





tray and clamp this assembly to the servo rails and allow to dry.





1. 4.5 inch arm for the pull-pull system. I highly recommend the 4.5 inch offset arm from SWB Manufacturing. If using “ganged” servos, we recommend a 3” Straight arm from SWB on the second servo.
2. 48. Here is where we installed our switches on each side of the fuselage. After opening the hole with a new hobby blade we soaked the surrounding wood with thin CA before installing the switch.



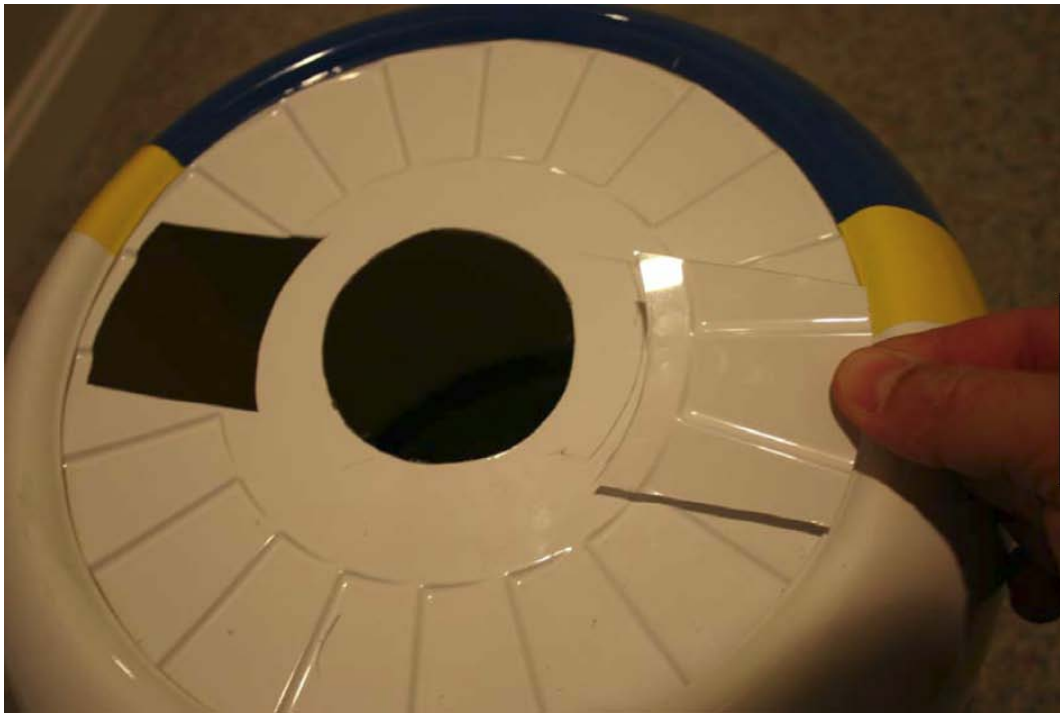


49. If you plan to use the supplied louver plate in the front of the cowl now is the time to install it. Remove the lip from the circumference of the louver plate with a pair of scissors. You will also want to open the louvers in front of the engine cylinders for adequate cooling. Glue the louver plate in place from the rear with 30 minute epoxy. Make sure to scuff the inside of the cowl and edges of the louver plate for better adhesion. Refer to the following

pictures for single and twin cylinder installations. TIP: For a twin cylinder, I cut one side then use the cut out piece as a sort of template for cutting the other cylinder. This assures uniform holes.



Typical
single
cylinder
installation



Typical
twin
cylinder
installation

1. 50. Slide the cowl into position. You should allow at least 1 inch clearance between the cowl and spinner backplate for maximum prop efficiency. This means the rear of the cowl will extend beyond the F1 former by about $\frac{3}{8}$ " to $\frac{1}{2}$ ". TIP: I like to place a strip of Blendederm tape across the top front of the hatch that will fit under the cowl to keep the paint from getting scuffed. I also apply a strip of Blendederm across the bottom of the fuselage in the same location to prevent the cowl from chafing the Ultracote.
2. 51. Use a few pieces of masking tape to secure the cowl in place and view it from several angles to insure that you have it properly aligned. Use a felt tipped marker to make alignment marks to insure you are drilling into the center of the mounting block. Install the 3mm blind nuts in the back of the cowl mounting blocks and secure the cowl with 3mm bolts and bonded sealing washers. Drill 3 additional holes at the location of the cowl mounting ring tabs and secure with bolts, blind nuts and bonded sealing washers.
3. 52. Now let's install the stab/elevators. You will need to attach 36", or longer, servo extensions to the elevator servos. (If you plan to remove the stabs for transport you will need the longer extensions.) Open the holes in the rear side of the fuselage to expose the pre-mounted 3mm blind nuts. You will also need to open a hole for the servo leads to pass through.
4. 53. 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.

5. 54. The canopy is retained by the (4) 3mm bolts and bonded sealing washers. Before flying the Yak 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. This glue dries clear, is water soluble and is easy to clean up. Allow to dry overnight.

6. 55. There are 3 gray Depron pieces that make up the hatch floor and pilot compartment. The following picture shows the layout of those pieces. Install the middle piece first, this will allow you to access the pilot for mounting.

7. 56. Use 30 minute epoxy or other suitable adhesive and glue the middle piece into the canopy. Now install your desired pilot, instrument panel or your desired cockpit setup. In our case, we used the Extreme Flight Pilot X for our pilot.

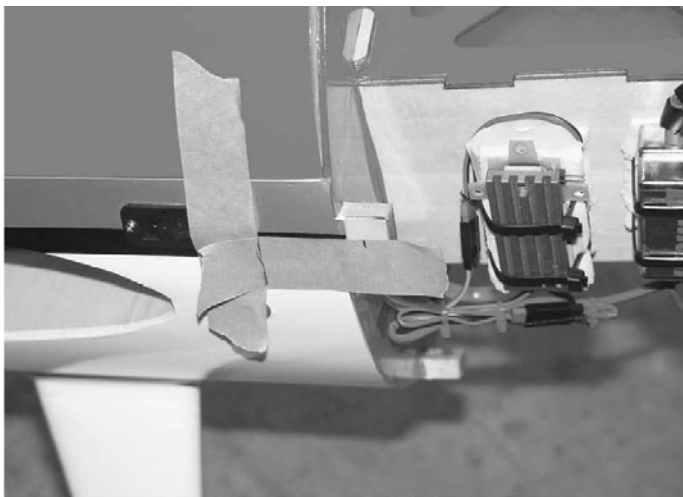
8. 57. To install the Pilot X figure, we use this procedure. Take the tinted face shield piece and using scissors, cut along the molded line. Cut from the inside of the tinted piece and proceed slowly to reduce the chance of cracks during cutting. Now make some starter holes in the face shield and into the helmet, and use the supplied screws to secure the face shield to the pilot head. Now mount the Pilot X figure onto the Depron. TIP: we cut a small hole in the bottom of Pilot X and installed small pieces of lite ply in the base which allows small wood screws for mounting. The hatch has some areas at the sides where screws can go up from the bottom and into the installed plywood. While the Pilot X figure could be glued to the Depron, is not recommended as vibration may cause problems over time.

9. 58. Now mount your instrument panel. If using the Extreme Flight panel cut the clear piece along the molded line. Take the paper instrument panel and remove the backing paper and this exposes the adhesive side. Attach this paper panel to the back side of the clear panel, then use the screws and attach to the lite ply panel. The front side of the panel has simulated instrument dials which are protruded, mount the paper panel to the opposite side.

10. 59. When you have all your desired cockpit items installed, you may glue in the remaining two Depron pieces.

11. 60. The wings are retained by inserting the 2 1/4x20 nylon bolts per side through the holes in the fuselage just behind the wing tube and into the pre-installed 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.









Middle piece,
install it first.



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This completes the assembly of the 110 inch Yak. As a final step I recommend you 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, Targets, 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. The wax helps to protect the covering and paint and makes clean up easy, as oil residue can simply be wiped away.

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. Getting your airplane dialed in is a continuing process that may take several flights to achieve. We cannot overemphasize the importance of taking the time to do this and you will be rewarded with a great flying aircraft. The **center of gravity** (CG) range for the 110" Yak begins at 7 1/2" from the leading edge of the wing measured at the root (center of the wing tube) and extends back 1 1/4" 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. As mentioned earlier, if you are planning to use a tuned exhaust system you may need to vary your battery location to attain desired CG.

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, 15-20% 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, 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.

Please use common sense when flying the 100cc Yak. The Yak's airframe is very robust, but all airplanes have their limits. This is a very large, yet lightweight aircraft and as such cannot be stressed like smaller aircraft. Full power Blenders and Walls are definitely not recommended! 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. We sincerely hope your Yak brings you as much joy and satisfaction as we have experienced with ours! Thanks again for your business! See ya at the flying field!