

## Fuselage Construction

The fuselage is provided already cut to profile, and has been cut in half to ease radio installation. More than any other type of model aircraft, the work in this section depends greatly on the type and size of components you intend to use.

Radio gear specified for this kit is of the "micro" variety; if anything larger than this is used, the builder will need to accommodate by following the intent of the remaining instructions in regards to balance, protection, and available room. Larger components will also incur a weight and performance penalty.

After many experiences and experiments, we've come up with our own preferred way of mounting the recommended micro-size components in the Push-E Cat. We won't say that this is the only way to do it, but it does provide an easy method of installing the components and relatively easy service access.

We refer to the method described below as the "plug and patch" approach. You will basically cut plugs out of the fuselage halves where the components will go. Then you will patch unwanted holes with slices of the plugs you previously cut out. The servos will be set up to route the push rods down the outside of the fuselage in simple slits cut with an X-acto knife or soldering iron.

### **Gather:**

- Fuselage sides
- Coroplast tail pieces
- Radio Equipment
- Wiring and connectors
- Battery pack
- X-Acto Knife with No. 11 Blade and No. 26 long straight knife.
- Goop Glue
- 3M 77 or DAP Weldwood Contact Cement
- Ball point pen
- Soldering gun (optional)
- Dremel tool with  $\frac{1}{4}$ " router bit and router base attachment (optional)

### **Procedure:**

- Identify a left half and right half of the fuselage. Mark them on the inside surface with a pen so you don't confuse them later.
- You can work with either side to begin with. Lay the fuselage side flat on your workbench with the outside surface down. Now place your radio components on the inside surface of the fuselage side.

## RULES OF THUMB FOR LAYING OUT COMPONENTS:

- Always leave at least  $\frac{1}{2}$  inch of foam between adjacent components.
- Always leave at least  $\frac{1}{2}$  inch of foam between components and the outside world (exception: battery bay).
- Never place components or cut outs in the "cabin" directly under the wing (except as shown on layout or described in the instructions).
- Think in three dimensions.
- Radio wire routing is best done in the center of the fuselage through slits and channels you cut while the fuselage is still split in half. A soldering gun makes a great channel when used in conjunction with a straightedge.
- An over-cut is when your knife cut continues beyond your intended stopping point. Always fix over-cuts with Goop, DAP Weldwood or Pro-Bond. Never leave over-cuts unglued.
- Before cutting out a plug, make an alignment mark so you will be able to orient the plug later.
- If you have a router attachment and bit for your Dremel tool, consider using this to make pockets in foam. This makes the bottoms and edges uniform and square. Patch pieces can then be cut from your scrap foam block.
- A soldering gun works very well for routing wires and control rods. Use with a straightedge where possible. Always have adequate ventilation when burning foam.



- The first cut outs we will make are for the battery and its connections. The first thing you want to do is lay out your guidelines on the inside of one of the fuselage sides for the battery compartment. Use a ball point pen to do the marking. The following steps will guide you in marking a battery compartment similar to that shown in the plans.

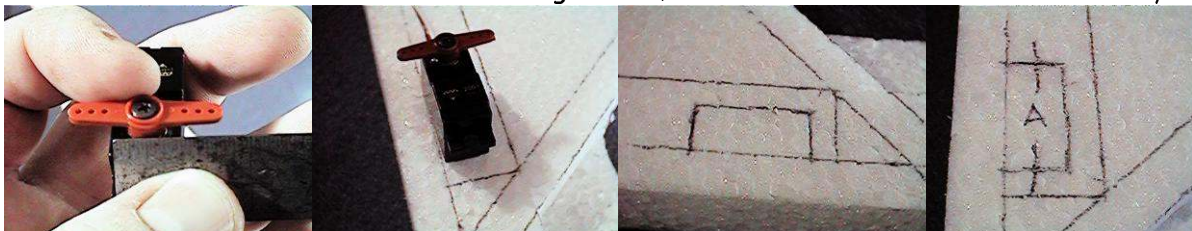
For the first line, line up a straight edge with the front of the "cabin" and mark a line toward the bottom of the fuselage.



- For the second line, measure back from the nose of the airplane  $1^{11/16}$ " and drop a vertical line.
- Line your battery pack up with this forward line and the top of the "duck bill". Mark the depth of the pack in two places and connect them with a straight line.
- Now, on top of the "duckbill", mark a line that is offset from the inside edge a distance equal to half the width of your battery pack. Draw lines that connect this line to the edge where the other lines you just made are. You have now marked out your battery pocket.
- Use your X-acto knife to draw around the edges of the lines on the inner surface to the depth marked on the top surface.
- Use a long blade knife to go from the top surface down to the edges you cut in the previous step. The first half of the battery pocket should come out fairly easily. (A router set to the proper depth can be used here instead.)
- Now, you can either repeat the layout procedure for the other side of the fuselage, or you can hold the two sides together and trace the pocket from the first side to the second.
- Go ahead and cut out the battery pocket half from the other fuselage side. Trim as necessary to get the sides to match up when mated.
- You can now make a connector pocket as shown on the plans. Split the pocket between the two fuselage sides.
- Mark out and carve out another connector pocket on the wing saddle area as shown on the plans.
- Draw a curved line from the battery compartment connector pocket to the wing saddle connector pocket. This is where the power jumper will be routed. You are now ready to move on to the servos and receiver mounting.
- Secure servo mounting in EPP foamie aircraft has historically been a combination of a good, tight fitting hole and Goop. This form of mounting is common in foamie combat gliders, and is the standard approach for mounting servos in the Push-E Cat.



The first step is to mark the cutout for the **bottom** of a servo (not including the mounting ears). Remember, we are installing the servos so that the push rods can be routed down the outside of the fuselage. Also, the servos will be installed so that they



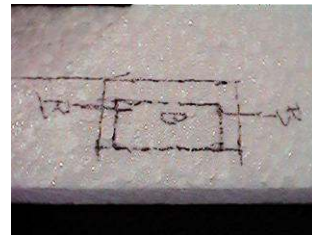
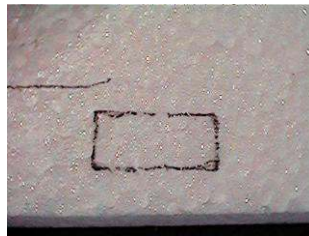


are lying flat relative to the bottom of the fuselage.

Place your servo on the fuselage as shown. Measure the width of the servo, including one side of the extension arm, to define a minimum plug width for the opposite side. Use a ball point pen to trace the outline of the bottom of the servo. Don't worry about the wire lead just yet. You will also want to make some orientation lines to identify the plug later.

The best way we've found to cut out the "plugs" is to use a No. 26 long straight knife blade. A sharp blade will slice EPP like butter. You will never have a problem telling when a blade has gone dull, though.

Go ahead and carefully cut out the plug, which will leave you with a rectangular hole all the way through the side.



- Put the two fuselage halves together. Trace the pocket you just cut on the inside of the opposite fuselage side.
- Now add the extra space you marked out on the opposite side to the outline for the second plug.
- Cut out this new oversized plug. If you put the two halves of the fuselage together, you will now have a larger hole that looks down at a smaller hole. Together they form a sort of "L" shaped cavity.
- Now you need to repeat the previous steps for the second servo on the opposite side of the fuselage. Remember to leave at least  $\frac{1}{2}$  inch of foam between all components and cutouts.
- With the servo holes cut, we now need to make room for the receiver and provide wire routing tunnels. Place your receiver on a fuselage side and trace around it to identify where you want to install it. Remember the  $\frac{1}{2}$  inch rule and remember to leave room for the servo connectors. Depending on what type of receiver you use, your receiver plug may be rectangular or "L" shaped.
- Cut out the receiver plug.



Place the two fuselage sides together and trace the receiver cutout onto the opposite fuselage side.

Cut out the opposite receiver plug.

OK, now you have a fuselage that's starting to look like Swiss cheese. Don't panic. We're almost ready to start gluing plugs back in. All we have left to do is to route the servo, power and speed control wires through the fuselage.

Take one of your fuselage halves and slip a servo into the base hole. Push it down until the mounting lugs are seated against the fuselage side. The bottom of the servo (if it's a micro servo) should not reach the outside of the fuselage side. Mark the bottom of the servo on the side of the pocket with a pen.

Remove the servo. For the standard, glued in installation, all you have to do is slit the foam to that depth at the servo side and slide the knife to the receiver bay. The wire will just be stuffed into that slit when you glue in the servo.

Repeat for the second servo on the opposite fuselage side. Make sure to orient the servo so the servo lead points at the receiver.

It's now time to glue in the servos. Wrap the servos in masking tape from the mounting lugs down. Be sure to wrap the wire lead where it will be encased in foam as well.

Run a good sized bead of Goop or a thin layer of Pro-Bond around the edge of the hole. As you push the servo in, stuff the wire in the routing slit you made earlier.

Repeat for the servo in the opposite side of the fuselage.

Now, in each side of the fuselage, you have the bottom of a servo staring back at you. Find the plugs (you did save them, didn't you?). Measure the distance from the bottom of the servo to the side of the fuselage. Slice off a piece from the corresponding plug that is that thickness or a little more.

Glue your new plugs in over both servo bottoms with Goop or Pro-Bond. Make sure to get the edges well glued since this is where the stress accumulates. After the glue dries, if the plug sticks up a little you can trim it down with the #26 blade.

Now is the time to fabricate the battery to speed control jumper wires. Lay out your power wires (14 gauge, high strand count, silicone insulation, 1 black, 1 red) on the fuselage from the battery bay connector pocket to the wing connection pocket. This gives you the approximate length based on your actual installation. Remember to add a  $\frac{1}{4}$  inch on each end for soldering to the connectors. We recommend using four Anderson Power Pole or Sermos-type high amp connectors. Crimp and/or solder the contact to the wire, and then insert the contacts into the connector bodies. Make sure to maintain proper polarity to color in order to avoid reversing polarity to the speed control.

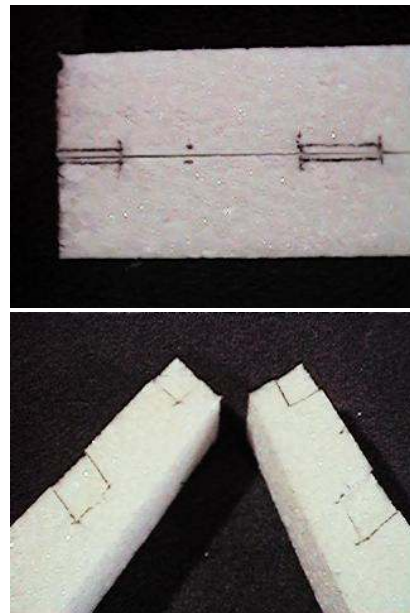
The next step is to install the power jumper harness and the throttle channel wire. Refer to the plans to see how the connectors are oriented. Use your X-acto knife or soldering gun to make wire slots for the wires to run in. One slot will have to be channeled out so that the power wires have room to run. The other slot for the throttle extension will break away from the power wire slot and run to the receiver bay. Push the wires into your slots.

- Dry assemble the tail. Line up the back tang on the fin with the rearmost edge of the



fuselage. Draw the outline of the tangs on the inside surface of the fuselage.

- Put the two halves of the fuselage together at the tail. Draw a centerline on top of the tail boom at least 3 inches long.
- Use the centerline to mark out the slot depth for the fin tangs. The slots should be 1/8 inch wide, centered on the line, regardless of the thickness of the fuselage sides (which can vary).
- Open up the fuselage sides and clear out the slots for the fin tangs. When you are done, put the fuselage halves together and check to make sure that the fin sits all the way down until the stabilizer seats on top of the fuselage. Set the tail off to the side.
- This is a good time to hook up your radio and verify that everything works before you glue the fuselage halves together. Make sure your servos are centered at this time.



- To glue the fuselage halves together, you can use 3M 77, DAP Weldwood, or Pro-Bond. For 3M 77 and DAP Weldwood, put the fuse halves on some newspaper, and give them a coat of adhesive. You might want to mask off the servos.
- For 3M 77 and DAP Weldwood, carefully line up the fuselage halves and press them together. For Pro-Bond, wipe the surfaces with a damp cloth, apply glue, line up the fuselage halves, and then weight them down and find something else to do until the next day.
- Now you can bore a hole from the bottom of the fuselage to the back of the receiver compartment for the antenna to pass through. Use either a drill bit or a piece of heated 1/16 inch wire.
- Cut a slice in the bottom of the fuselage from the antenna exit to the end of the tail. This is where the antenna will go.



- Go ahead and slip your receiver into its cutout. Center it in the fuselage. Route the antenna through the hole in the bay floor and stuff it in the slit you made above.
- Find the corresponding plugs for the receiver cavity. Double check to make sure the radio is working and your control throws are centered. Measure the distances from the receiver to the outside of the fuselage on either side. Slice off pieces of the appropriate plug of the necessary thickness to seal up the receiver cavity.
- Glue in the receiver cavity plugs. After the glue dries, you can trim the plugs flush with the fuselage surface if necessary.
- Now is the time to install the wing dowel shear plates and wing dowels. The first step is to cut notches in the front and rear of the "cabin" so the shear plates are flush to the surface of the EPP. The #26 knife blade and a good sanding block are handy for this step, or a router is even better.
- Cut four pieces of dowel 2 inches long from the included stock. Bevel sand the ends.
- Glue the plates in place with Goop, DAP Weldwood, or Pro-Bond.
- Measure a  $\frac{1}{2}$ " down from the top of the plate and a  $\frac{1}{2}$ " inch in from either side. Mark these points for the dowels.
- Press the dowels into the balsa wood at these points to make an impression in the wood. Use your X-acto knife to clean out these areas down to the foam. Try to keep the fit of the plate to the dowels tight.
- Now use a heated 1/16 inch wire (the preferred method) or a 3/32 drill bit to make the dowel holes in the foam.
- You can use GOOP or Pro-Bond to secure the dowels.

For GOOP, inject as much glue as you can into the dowel holes. Seat the dowels to the  $\frac{1}{2}$  inch mark. Scrape off any excess glue that spooges out. After GOOP has dried, go back and use thin CyA or epoxy to make sure that the dowels are firmly attached to the shear plate.

For Pro-Bond, drip a few drops of water into the dowel holes and then shake out any excess. Fill the dowel holes with Pro-Bond and insert the dowels by twisting them in until only  $\frac{1}{2}$  inch sticks out. Clean up any glue that spooges out of the holes. Use masking tape to hold dowels in position so the foaming glue won't try and push them out.

After allowing the glue to cure overnight, there should be some adhesive that foamed out around the dowels. Use an X-acto knife and some sandpaper to clean this up. Pro-Bond really adheres well to wood, and should be more than adequate to join the dowel to the shear plate.

You are now ready to move on to installing your push rods.