

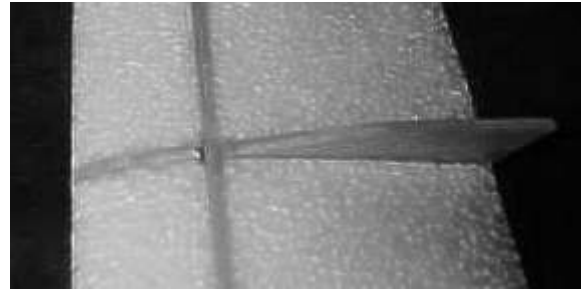
Wings

It is important to remember to work on the wings with the cores weighted down in the provided wing saddles when possible to help prevent warping the wing. Warps are not that difficult to remove, but if they can be avoided, that's all the better. The outer panels have wing washout (basically twist) in them for added stability and following this procedure ensures that the twist is consistent and equal between the two sides.

Wing Center Sections

Gather:

- Wing center panels and lower "core beds"
- Two 36" spruce spars
- Motor mount pylon



Procedure:

- Break out the wing center sections. Using a sanding block with 100 grit sandpaper, carefully dress the leading edge of the wing core so that it is round.
- Examine the wing core for any stray bits of EPP left from the cutting process and remove them. Lightly sand the cores with the 100 grit sandpaper. Vacuum the cores to remove all dust.
- At the time of this writing, we are in transition between machine cut and laser cut motor pylons. If your motor mount pylon does not have notches in it, you will have to cut them out first before you can assemble the wing. The next few steps illustrate this process.
- Grab the left center wing core and bottom core bed. Lay the wing on the shuck and line up the leading and trailing edges. Scoot the square end of the wing core sideways about $\frac{1}{4}$ inch so there is room to align the motor pylon with the end of core in the bed.
- Line up the motor pylon to the square end of the wing core using the core bed to keep it flush with the bottom of the core, and even with the leading and trailing edges.
- Trace the top and bottom spar slot outlines on to the motor pylon with a pencil.
- Using a razor saw or coping saw, remove the traced spar slot outline material from the motor pylon.
- Lay a piece of wax paper on one of the core beds.
- Place the left center wing panel in the core bed.
- Apply DAP Weldwood contact cement to the straight end of one wing core and the mating face of the motor pylon per the instructions on the container. Two coats of cement on the porous EPP surface are required for a good joint. Allow the adhesive to dry as directed.
- Using the core bed to keep the bottom surface of the motor pylon flush to the wing core, carefully press the motor pylon against the end of the wing core. Once attached, the joint will be forever, so be careful with this step.

On a smooth flat surface, lay the two lower core **beds** end-to-end, align them, and use a strip of tape to keep them together and aligned.

Apply DAP Weldwood contact cement to the motor pylon and the opposite core as was done previously for the other panel.

Place the wing center panels in their lower core beds, lining the cores and beds up as carefully as possible, and make sure the motor standoff is in the middle! Be aware that wings are in "flying" position at this point. Be careful to build straight.



Slide the cores together to make the second joint between the motor pylon and the last core.

TRIAL FIT both spars. Do not cut the spars in half! They are 3/16" x 1/4" x 36", and the 3/16" dimension is the depth. A tight fit that forces the foam apart is to be avoided as it could induce warpage. You may lightly sand the 1/4" dimension so it fits well, but not tight.

Because of variations in the foam cutting process, the spars may try to lie above or below the surface of the wing. Don't worry about any of the spar sticking up out of the spar channel; this will be sanded prior to covering. If the spar sets slightly below the surface of the wing, it will not hurt the performance of the wing.

A quick word before you start gluing the wing together:

A good glue joint with the spar is essential for wing strength. A piece of model building trivia: most of the strength of a spar in a foam wing comes from the glue joint with the *edges* of the slot, not the bottom. You can sand the spar lightly to attain a good fit, **but don't try to sand or re-cut the foam**. The only exception to this is if you can see some left over foam flash from the cutting process. Feel free to remove any of that.

Lay down wax paper or some other protective sheet over the bottom wing core beds.

Urethane adhesive (such as Elmer's Pro-Bond) is recommended for installing the spars. (An optional adhesive is GOOP glue.) Pro-Bond is moisture activated, and expands as it cures. The expansion allows the adhesive to fill gaps between the spar and the foam, and the adhesive remains flexible when cured.

To prepare the cores and the spars for gluing, get a rag or towel and a bowl of water. Wet a corner of your rag with water and squeeze out the gross excess. Wipe the top spar slot with the wet rag, then drag the spar through the wet rag so that the surface of the wood feels damp.

Run a thin bead of Pro-Bond down the corners of the spar slot. Immediately install the spar, pressing firmly to seat it. Don't worry if you don't see glue spooing out, you will be able to sand off the excess after it cures.

- Lay the cores on their beds. Cover the top of the cores with another piece of wax paper. Weight down the cores directly on top of the top spar. Make sure the wing is aligned with the cores, and then leave the whole thing alone until the next day.
- Inspect wing assembly. Sand off any projecting spar material and smooth any exposed urethane. For this step, it really helps to have fresh, sharp sandpaper.
- If either of the spars projects from the end of the cores, cut them off flush now and sand them even with the wing ends. Be careful not to alter the cut-in dihedral angle.
- Install trailing edge rubber band reinforcements by gluing them to the surface of the wing with DAP Weldwood or GOOP glue so that the reinforcement plate butts against the motor pylon. CyA or epoxy glue the end of the reinforcement end to the motor pylon. If using GOOP to glue plate to wing, hold reinforcement in place with tape until dry.



Wing Tips

Gather:

- Wing tip cores and core beds
- 3/16"x1/4" Balsa tip spars

Procedure:

- Trial fit the spars as was done previously for the main wing spars.
- Prepare the spar slots and spars with the wet rag as was done for the center panels previously.
- Glue in spars using urethane glue as before.
- Place a piece of was paper on the lowed core bed. Place the panel on its lower core bed. Put a piece of wax paper on top of the panel, and weight the panel down right on top of the upper spar. Make sure the panel is correctly aligned on its core bed, and flat on the building surface.
- Repeat for the second wing tip.
- Allow cores to cure overnight.
- Inspect the panels. If the spars jut above the EPP foam, sand them even and smooth any projecting adhesive. Again, sharp sandpaper is helpful.
- Trim the spars flush with the ends of the cores. Sand smooth and even, being careful not to alter the cut in dihedral angle on the inboard edges.

Covering the Wing Panels

Important Note:

A Push-E Cat must be covered in order to survive. The covering material provides a "stressed skin" that bears the tensile loads to which the plane is subjected. Suitable coverings are regular plastic packaging tape and Ultracote or Oracover iron on coverings.

EPP foam will not normally stick well to tape or iron on coverings. The surface must be prepared with a secondary adhesive before the covering will stick well. The two suitable adhesives for this purpose are DAP Weldwood contact cement (the original formula that smells bad) or 3M 77 spray adhesive.

With either adhesive, it is better to let the adhesive dry completely before attempting to cover the wing. With 3M 77, I like to apply two or three coats, allowing them to dry in between. Generally, one coat of DAP Weldwood is sufficient, as long as it is allowed to dry several hours or more before covering.

The covering procedures for packing tape and iron on coverings vary because of the nature of the materials. The following procedures are split into two sections: one for covering with packing tape and one for covering with iron on materials.

Prepping the Wing:

Gather:

- Outer panels
- Inner panel
- DAP Weldwood contact adhesive or 3M 77 spray adhesive.

Procedure:

- Lightly sand and vacuum the cores to rid them of all loose material and EPP goobers.
- Coat surfaces to be covered with adhesive and allow them to dry **completely**.

Taping the Wing:

Gather:

- Outer panels
- Inner panel
- All upper and lower core beds
- 2" wide packaging tape (clear or colored, your choice)
- $\frac{3}{4}$ inch strapping tape

Procedure:

- Start with the center wing section. We used to say that you should work with the wings in their core beds. This is actually unnecessary. All you really need is a clean, flat table. Just be careful not to bend the foam as you apply the tape and you'll be fine.
- The wing will function just fine with only it's covering material to stiffen it. However, if you wish to increase the plane's durability further, reinforce the wing with strapping tape as follows:
 1. Apply a single strip of strapping tape on the bottom spar of the center section.
 2. Run a strip of strapping tape down the leading edge of the center section and rub it down on the upper and lower surfaces.
 3. Run a strip of strapping tape on the top and bottom of the trailing edge.
 4. Do not bother reinforcing the tips. They do not require any additional strength.
- Re-coat the surface of any reinforcing tape you just applied with DAP Weldwood or 3M 77 adhesive. Otherwise, your covering will not stick.
- Start covering the wing on the bottom first. Begin applying strips of covering tape by working from the trailing edge forward. Overlap each layer of tape by at least $\frac{1}{4}$ ". Leave enough tape at the leading and trailing edge to wrap around to the top. Let excess tape hang off the ends of the wing until you are done.
- When you are done with the bottom, flip the wing over and repeat the process for the top.
- When taping is complete, trim the tape even with the ends and edges of the wing.
- The above steps are repeated for the outboard panels.
- Use a heat sealing iron to set the tape firmly to the adhesive. Do not try to shrink the tape at this stage.
- Hold the center panel up and sight down it, checking for any warps. Packing tape will heat shrink a little, so the iron can also be used to take care of any warps. Set first for low temp, twist the wing in the direction it needs to go to be straight, and iron out the wrinkles. EPP is resistant to sealing iron temperatures, so it's doubtful you will melt it at the working temperature of the tape as long as you keep the iron moving.
- The outer panels have a pre-determined amount of washout set in them, so check them by placing them back in their core beds. Straighten as necessary with heat sealing iron.

Covering the Wing with Iron On Material:

Gather:

- Outer panels
- Inner panel
- All upper and lower core beds
- Ultracote or Oracover

- Iron on covering heat sealing iron

Procedure:

- Pre-cut the covering for each panel.
- Pick a panel to start with. Start with the bottom of the wing. Rub down your covering as best you can.
- Get your heat sealing iron. For Ultracote and Oracover, set the iron on 350° F. You will **NOT** hurt the foam as long as you don't leave the iron in one spot too long.
- Start with the covering iron over the spar at the center of the wing.
- Work outward from your first stake down in a gradually widening circle. The goal is to attach the covering without warping the wing by taking the covering shrink out as you go.
- Flip the panel over and repeat for the top surface.
- Examine panels for warpage. Correct with the heat sealing iron as required.
- Repeat for the other wing panels.

Joining OUTER PANELS:

The wing panels have been pre cut to provide approximately 15° dihedral between the main wing core and the tip. However, it is more important that the tip dihedral be even than for exactly 15° to be maintained.

The wing tips are taped on, not glued, for survivability reasons. In tip impacts the tape breaks away cleanly without ripping out foam. If the joints are glued, then every time a tip comes off you lose a little foam and add a little weight.



Gather:

- Wing tip panels
- Wing center assembly
- Clear packing tape.

Procedure:

- Put the wing tip and center section panels top down on a flat surface.
- Weight the cores so that the trailing edges of the cores are flat against the surface.
- Butt the cores together and align them.
- Run a strip of packing tape along the panel seam from the spar to the trailing edge.
- Flip the wing over and weight down the center panel so that the trailing edge is flat on the surface.

- Block up the wing so that the bottom spar is approximately $2\frac{7}{8}$ " above the work surface and the panel joint is as tight as possible. Make sure to take note of the position of the block relative to the tip of the panel so you can replicate the same height for the other tip.
- When satisfied with the panel fit, run a strip of packing tape down the panel seam. Wrap the tape around the leading edge to close off the bottom seam.
- Repeat for the opposite panel.
- Check the tip panels to make sure that they are the same height off of the work surface. If not, detach the offending tip and reattach. It may be necessary to sand the dihedral joints slightly to adjust the angle.