

Making Your Own Carbon Fiber Parts

Super Cub Floor Pieces--Background

I was blessed in that I stumbled upon a local composite shop whose owner is an EAA member. Tom Greeno at Renegade Composites took me under his wing and taught me how to vacuum bag carbon fiber. Like anything, while there are a few tricks, this isn't rocket science—just try it with small pieces and proudly learn.

Note there are three ways—for the home enthusiast (at least) to make your own carbon fiber floor boards:

- Hand layup of carbon fiber with resin/hardener
- Vacuum bag layup—adds strength and reduces excess resin by 30% (reduction % varies—but it is significant)
- Vacuum resin infusion—additional resin reduction (another 20% ??) to approach theoretical optimal ratio of resin-to-fabric...requires a few additional steps and more parts (i.e. resin trap). I haven't gotten into this—Yet!

You can also purchase pre-made carbon fiber panels from a number of vendors, including some aircraft kit manufacturers. When I was building my SQ-2 none of the kit manufacturers offered pre-built CF floor panels. More fun to learn and build your own anyway, correct?

My goal here isn't to tell you how to do each step; I'll go thru the basics. I think what might be more helpful is to list all the sources that I spent hours upon hours researching as I embarked on setting up my own shop to do parts later. The YouTube videos are helpful—each has a tidbit or two. Unfortunately there is always some minor—yet ultimately critical—thing perhaps missing from each. That's why you have to watch a few before putting it all together—so to speak.

There are thousands of YouTube videos on this stuff. Some better than others (as you might expect). Here are a few I learned from (note: skip thru each to the section you want to learn more about, e.g. laying vacuum bag tap up efficiently):

- <https://www.youtube.com/watch?v=LPXn038ahD4>
<https://www.youtube.com/watch?v=EHLszEmWzJs>
https://www.youtube.com/watch?v=5jSwx_EkJgM&t=371s
https://www.youtube.com/watch?v=aoQCZo_YfGY
<https://www.youtube.com/watch?v=jfuaQK5YdeU&t=10s>

What you need

- Super smooth layup surface. We initially used old glass windows. An alternative that I've successfully since used is “Melamine Shelving” available from your local hardware store.

- Mold release wax
[http://www.fibreglast.com/product/Meguiars Mold Polish Conditioner and Release Wax 118/Mold Releases](http://www.fibreglast.com/product/Meguiars_Mold_Polish_Conditioner_and_Release_Wax_118/Mold_Releases)
 - Alternative (or in addition) is PVA release film (brush or spray on)
[http://www.fibreglast.com/product/PVA Release Film 13/Mold Releases](http://www.fibreglast.com/product/PVA_Release_Film_13/Mold_Releases)
- Epoxy Resin & Hardener
 - [http://www.fibreglast.com/product/System_2000 Epoxy Resin 2000/Epoxy Resins](http://www.fibreglast.com/product/System_2000_Epoxy_Resin_2000/Epoxy_Resins)
 - Alternative is West Systems 105 Resin & 205 Hardener
- Nomex Honeycomb (super strong but super expensive)
 - [http://www.fibreglast.com/product/Nomex Honeycomb 1562](http://www.fibreglast.com/product/Nomex_Honeycomb_1562)
 - Alternative is Divinycell foam
 - [http://www.fibreglast.com/product/Vinyl Foam 4lb Density/Foam](http://www.fibreglast.com/product/Vinyl_Foam_4lb_Density/Foam)
 - I used Nomex on the front floor piece—because we had enough left over from another project. Then I used Divinycell for all the rest of the floor pieces
- Carbon Fiber cloth: “Mid weight” is best, heavier/thicker is Ok. Thinner/lighter is not Ok—because with a single thinner layer you will get base layer color bleed through—you’ll see the foam or honey comb beneath.
[http://www.fibreglast.com/product/1073_6K Carbon/carbon-fiber-fabric-classic-styles](http://www.fibreglast.com/product/1073_6K_Carbon/carbon-fiber-fabric-classic-styles)
- Peel ply cloth: Various kinds—this works:
[http://www.fibreglast.com/product/Nylon Released Peel Ply 582/Vacuum Bagging Films Peel Ply Tapes](http://www.fibreglast.com/product/Nylon_Released_Peel_Ply_582/Vacuum_Bagging_Films_Peel_Ply_Tapes)
- Perforated film: Can use this in addition to peel ply, or in lieu of:
[http://www.fibreglast.com/product/low-temperature-release-film-1580/Vacuum Bagging Films Peel Ply Tapes](http://www.fibreglast.com/product/low-temperature-release-film-1580/Vacuum_Bagging_Films_Peel_Ply_Tapes) Permits better flow of excess resin off of your part—which is the whole purpose of doing vacuum bag layups—to reduce excess resin ultimately making the finished part stronger.
 - I found a YouTube video where a guy make his own perf film from like 2 mil mylar from the hardware store, simply using a hand squeezer punch to create the perforations.
- Breather/Bleeder cloth (soaks up excess resin)
[http://www.fibreglast.com/product/Breather and Bleeder 579](http://www.fibreglast.com/product/Breather_and_Bleeder_579)
- Vacuum bag material: 4mm mylar from hardware store or specialty material such as:
- Sealant tape: [http://www.fibreglast.com/product/yellow-sealant-tape-00580/Vacuum Bagging Films Peel Ply Tapes](http://www.fibreglast.com/product/yellow-sealant-tape-00580/Vacuum_Bagging_Films_Peel_Ply_Tapes)
- Thru-bag vacuum connector: [http://www.fibreglast.com/product/thru-bag-vacuum-connector-00910/Vacuum Fittings](http://www.fibreglast.com/product/thru-bag-vacuum-connector-00910/Vacuum_Fittings) or
<http://www.aircraftspruce.com/catalog/cmpages/vbvacvalve2.php?clickkey=427147>
- Of course you also need a vacuum pump. I did a lot of research on this, seeking to find pumps that are rated for continuous (i.e. over-night) running—don’t want the pump to over-heat in your shop and cause a fire! Stumbled upon this site whose customer service is simply outstanding and whose products are great! I

bought the Excel 5 system from them

https://www.veneersupplies.com/categories/Vacuum_Press_Items/Vacuum_Press_Kits/

The Process—A summary with a few of the tricks I've learned the hard way

- Figure out how large of an area you will be laying up. Run your sealant tape around the perimeter. Parts of the above noted YouTube videos have minor tips/tricks in doing this, particularly if you later need to create pleats in your vacuum bag
- Use several (4 or 5+) coats of release wax on the surface (glass or Melamine or whatever) inside of the above perimeter
- Cut your carbon fiber—good quality scissors are a must! One trick is to pull a strand of CF out to give you a cutting line. Another similar trick, which I like better, is to lay a piece of ½” good quality masking tape on the CF—this prevents the otherwise almost inevitable fraying that will result when you cut
- Cut your peel ply, perf and breather cloth to the same size. Trick: cut an additional 2” by 4” piece of breather material that will go under your thru bag vacuum connector—you’ll fold this into a 2”x2” square. This square is your last line of “defense” to soak up excess resin and prevent it from ruining your thru bag connector
- Cut your vacuum bag larger than the ultimate size of your piece—if you’re doing flat floor panels then maybe 2” wider and longer is enough. If you’re doing parts that “stand up” like rudder cable fairings then you’ll need more vacuum bag material that you can create pleats with to allow for the raised parts.
- Place your CF material on the flat surface. Wet it out with resin/hardener.
Tricks:
 - Use a paint squeegee from your hardware store to take off some initial excess resin http://www.fibreglast.com/product/plastic-and-rubber-squeegees/Supplies_Tools_Rollers_Squeegees
 - Mix your resin/hardener slowly to avoid excess bubbles forming—there are “How To” videos on YouTube on this minor, yet important, step
 - Make sure your CF is layed out evenly—it is possible, even likely—that your CF weave will be crooked after the above steps. While you still can, straighten out the weave for a good looking finished part
- Now lay your peel ply, perf and breather cloth on top
- Lay your 2”x2” square breather piece and the bottom half of the thru bag vacuum connector on top of that. Cut small slot/hole where there is the corresponding hole in your thru bag vacuum connector
- Seal your vacuum bag to the whole assembly. Again the above note YouTube videos show this being done in a couple of different ways.
- Turn on your pump and let ‘er go! After running over night you should have a good, finished part—well almost...
- You have to now cut out your part to match the exact dimensions of your Super Cub floor board. **This step requires—MUST HAVE—safety measures.**

Carbon fiber is worse than asbestos if you get the filaments in your lungs. Carbon fiber filaments are also the worst slivers you'll ever get—so use both a breather mask, strong vacuum to suck up filaments as you cut and good work gloves. You'll need a die grinder with a good cut-off wheel to cut the carbon fiber (good band saw also works). I cannot emphasize enough the importance of wearing a breather mask and having a good vacuum sucking away fibers as you cut!!

As you can see in one of the pictures, I added tie-down brackets to my floor pieces. Again, as you drill through your new carbon fiber floor boards, please make absolutely sure you wear a breathing mask and use a vacuum to grab the tiny filaments that you create!

Pictures start on next page...

Pictures (including rudder fairing parts that I've recently been experimenting with)



Figuring out the right size area for the layup
(existing wood piece template from my kit)



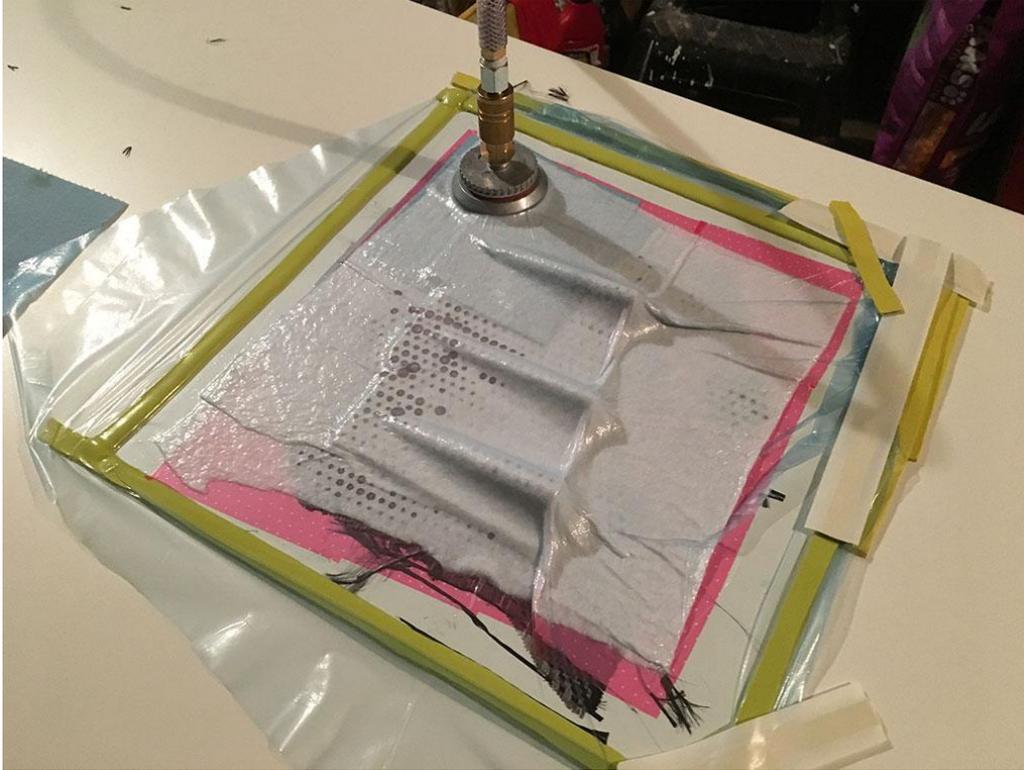
Cutting CF with strand removed as guide



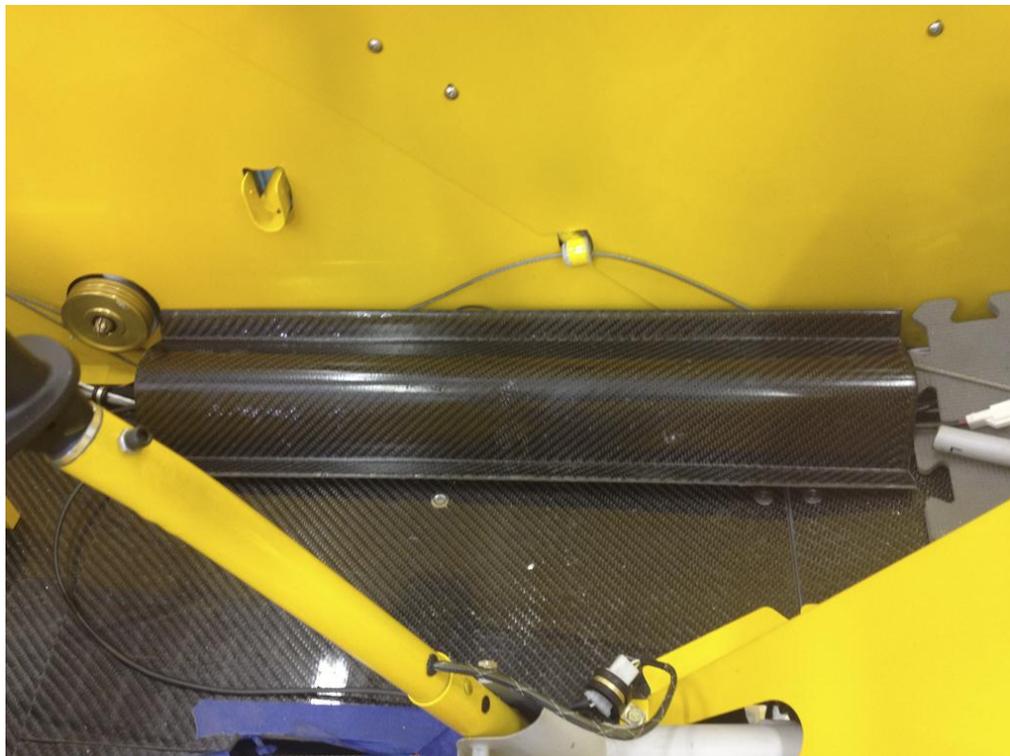
Glass, Carbon Fiber, peel ply, Perf, breather & Vacuum bag with connector in place



Vacuum running; Excess Resin soaking into breather Cloth is visible



View of entire assembly
(this is of rudder fairing layup—lots of excess sealant tape due to leaks)



Finished floor piece
(Also made a CF channel for wires/lines inside the cabin seen here)



Cargo anchors installed



Sample rudder fairing piece

Questions / Comments: ted@eaerofab.com