CARBON FIBER TUTORIAL Part I

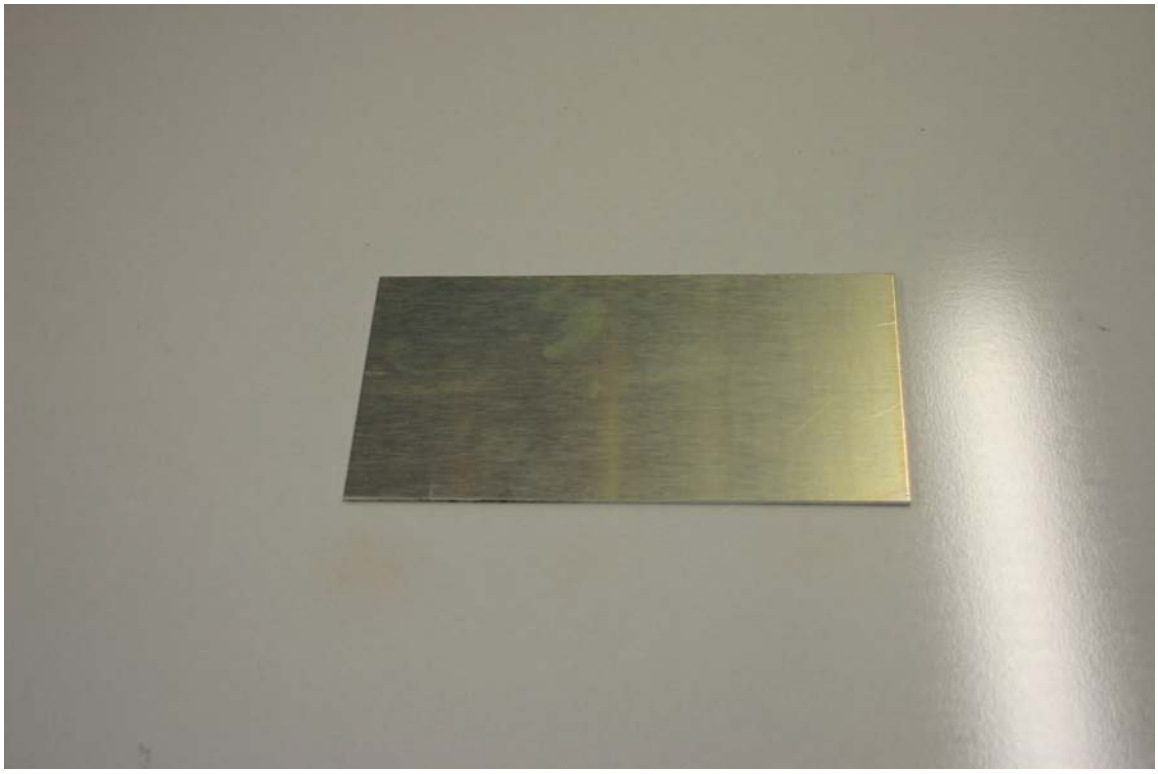
At Synapse Motorsport Inc. we are frequently asked to fabricate parts. Since there is a lot of interest in these techniques I thought I'd show a few techniques to help you along. This should take the mystery out of carbon fiber. This high tech material can easily be used to add that special effect to your car. The investment in materials is small and the procedures used do not require any high tech equipment. If you follow along you will be able to make your own parts.

Any new thing requires some effort but it's very easy. The best place to start is with rather simple forms and build up to more complex projects. In this book I'll be taking you through flat forms to overlays.

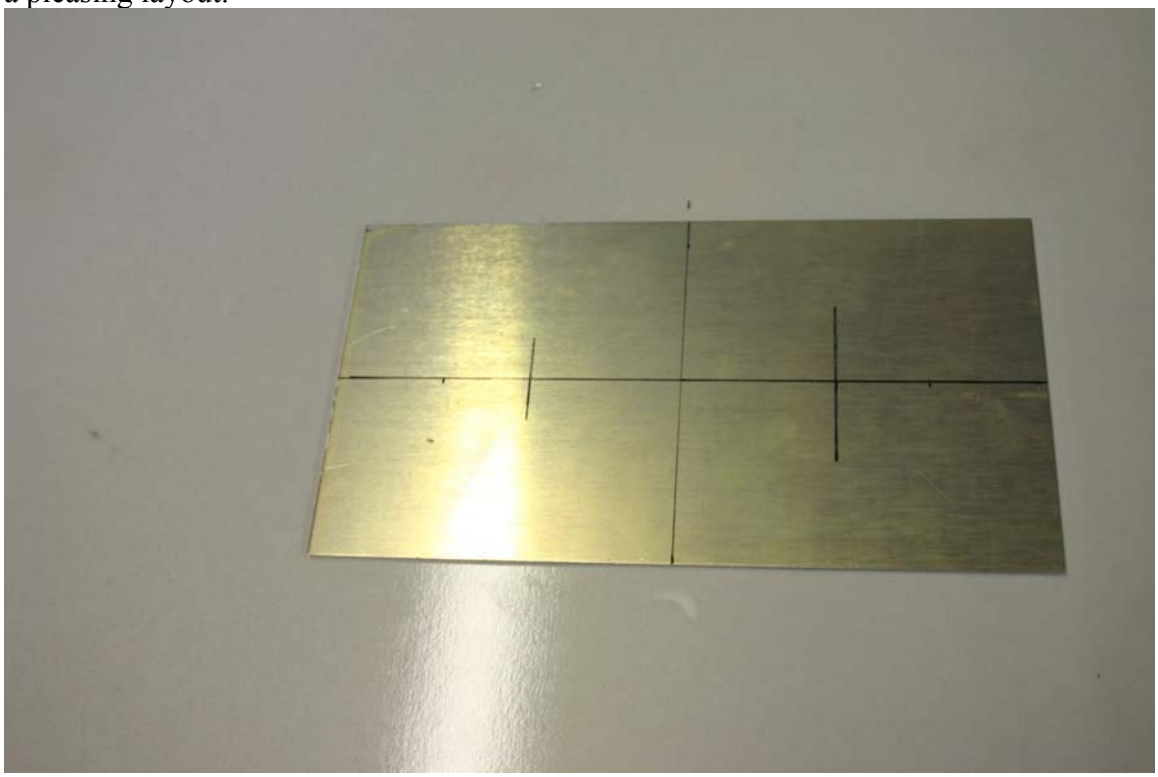
Flat forms- instrument panels, door inserts basically anything, which is flat. Your success here will introduce you to resins and how to handle carbon cloth. This will form the base upon which we build.

Safety- the resins used emit fumes, which can be hazardous, always work in a well-ventilated area, and wear eye protection and an appropriate mask. Disposable rubber gloves are important.etc.

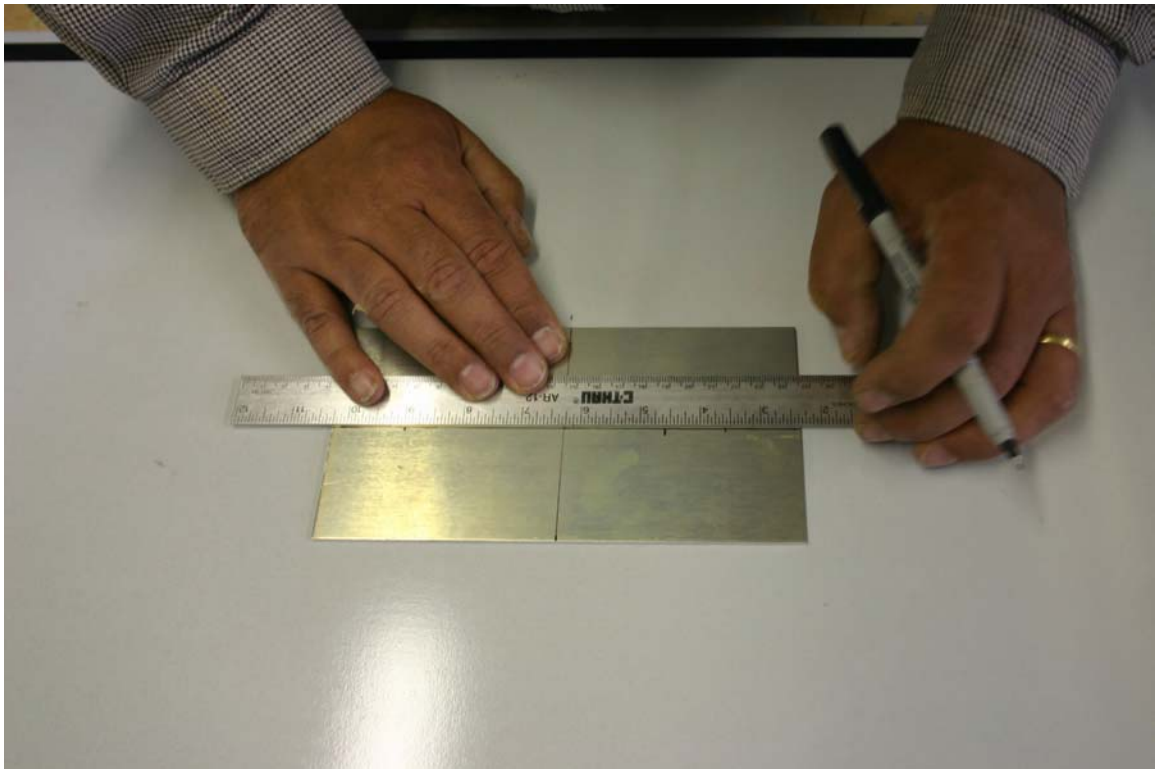
This first part we'll make is a flat instrument cluster panel. We've made several of these to hold boost gauges, air/fuel gauges etc. The design is simple and uses minimal material. For ease of forming I use aluminum.



Any type can be used, just measure carefully to fit the enclosure and space your gauges in a pleasing layout.

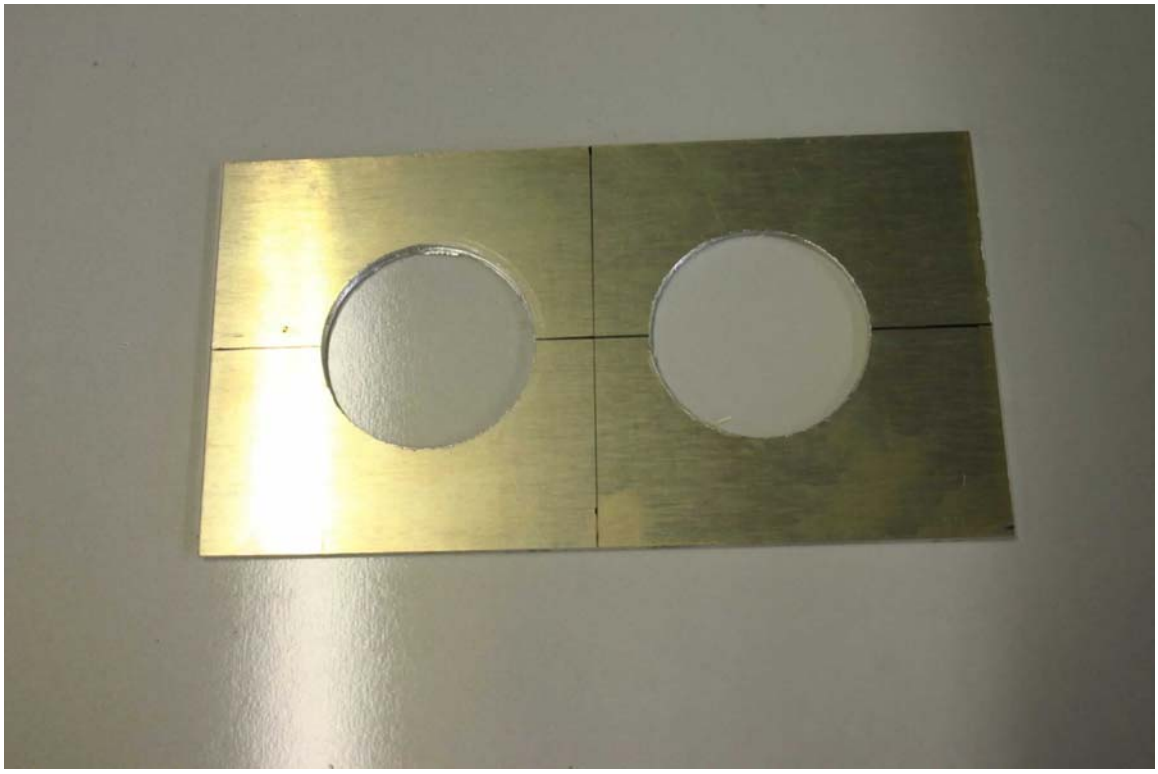


Attachment brackets can be made from the same aluminum and riveted with pop rivets.



Once the center holes have been marked they should be center punched.

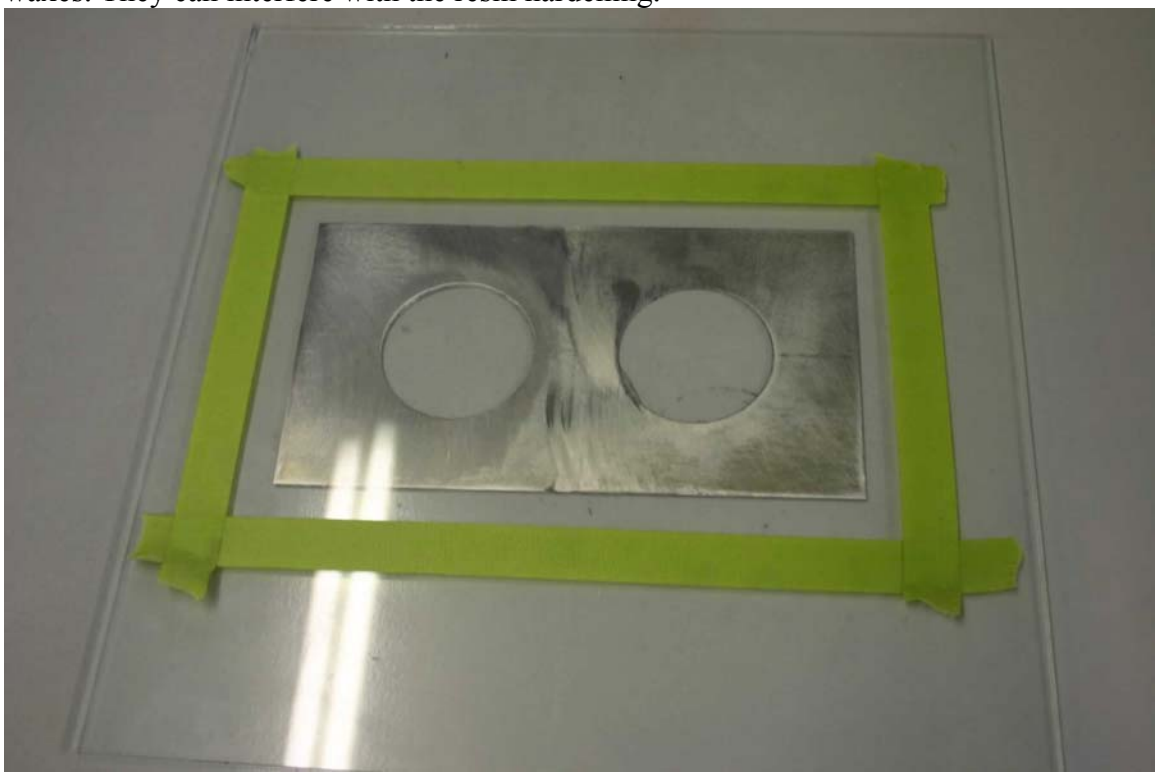
Holes are drilled with a hole saw available at any hardware store. Several places have these cheaply Harbor Freight for one.



Once the aluminum base is made and fitted carefully to your car opening sand the face side thoroughly with 100 grit sand paper. This is so the resin will adhere to the aluminum, it's very important! After sanding wipe the aluminum with acetone.

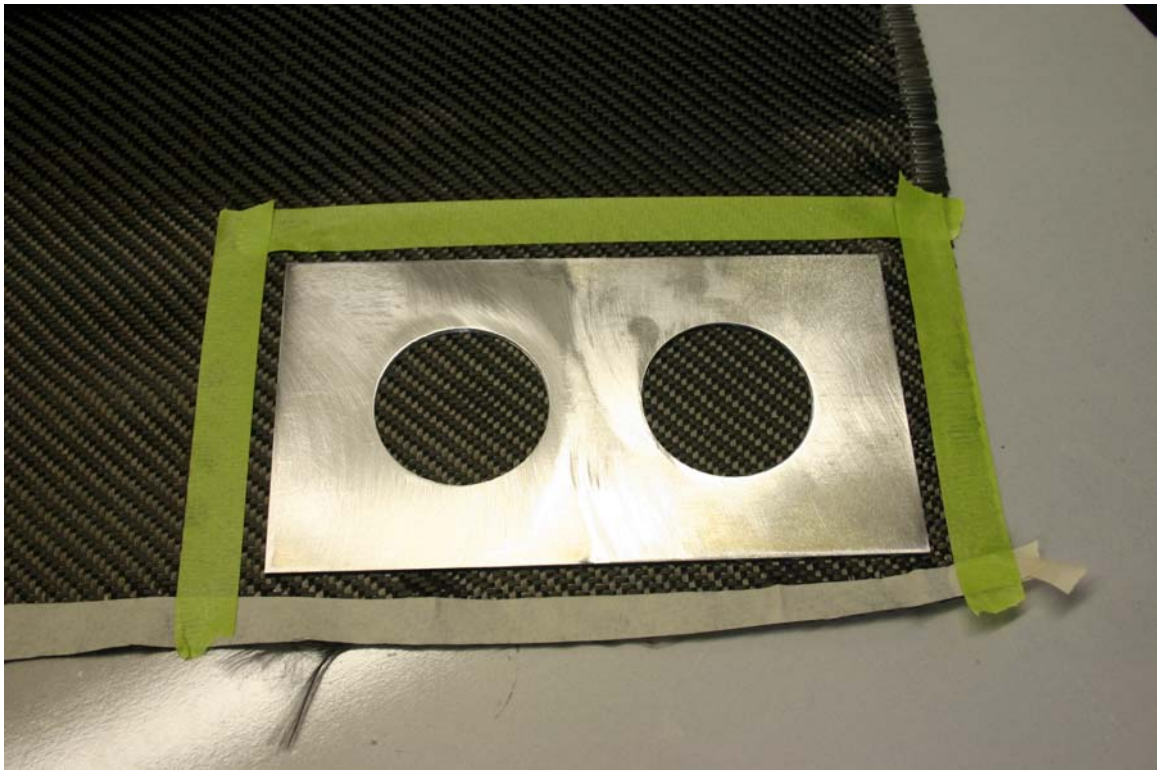
Now for a super smooth surface were going to use a piece of glass. Any piece of window glass will do. First wash the glass with Windex and then wax the surface with Meguire's

carnauba car wax. Any carnauba wax will work, stay away from silicones and solvent waxes. They can interfere with the resin hardening.



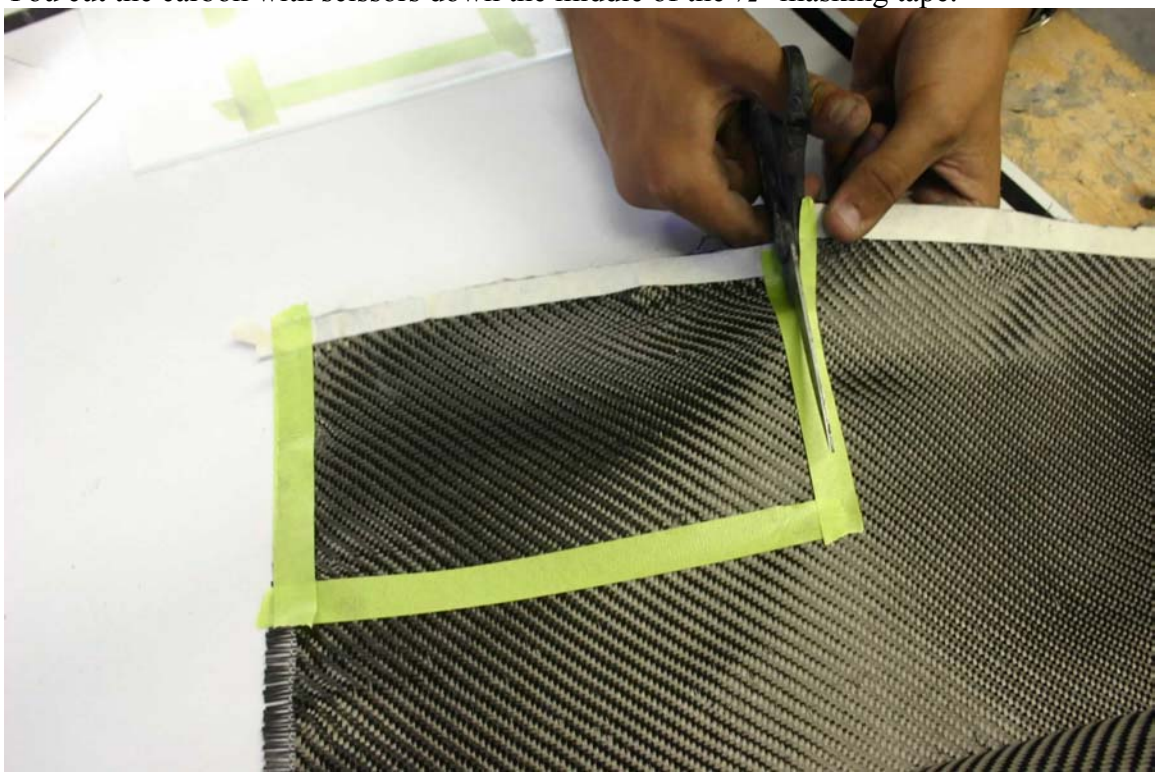
On the glass outline the aluminum plate with tape, this will help to show where to brush the resin.

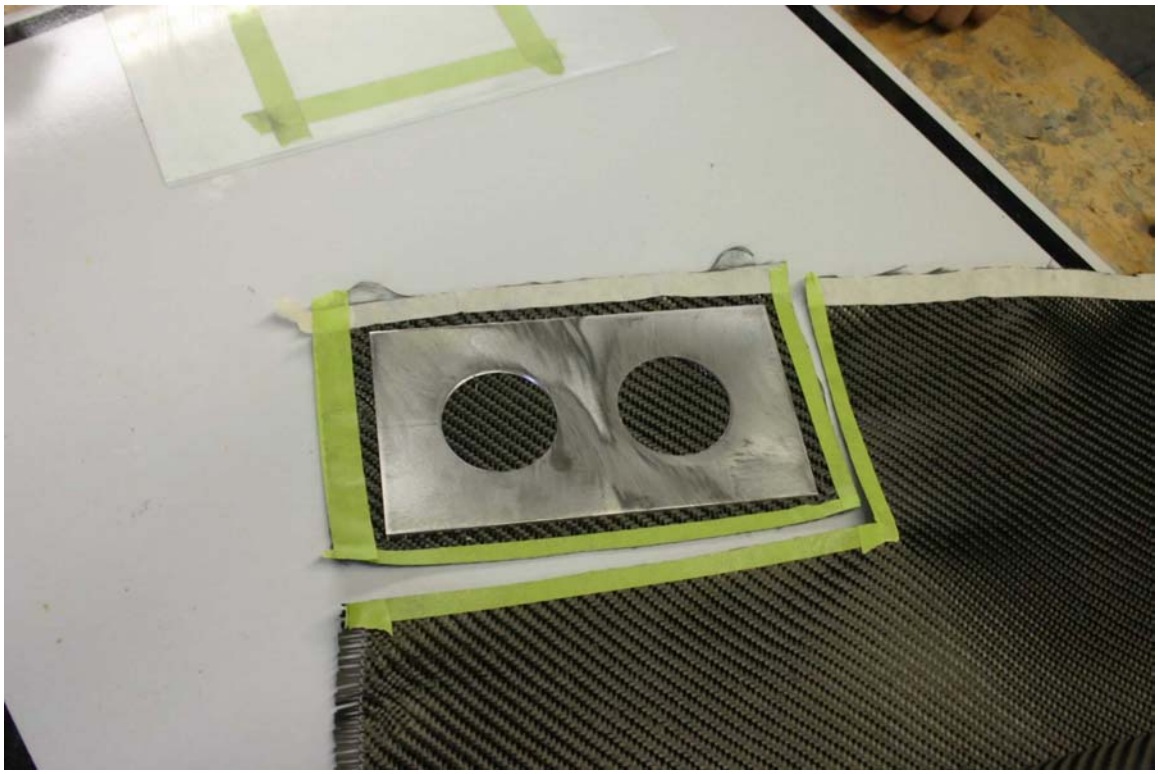
Now we'll cut the carbon to size. This next step is very important. STOP Before you cut your carbon cloth, outline the area to be cut carefully with ½" masking tape. The best tape to use is the painter's masking tape, which releases easily. However, I've made loads of parts with regular masking tape. Just be very careful with the tape, if you overlap, the tape will stick to the carbon fiber and ruin the weave. You want to keep waste to a minimum.



The purpose of taping out the cloth is to maintain the weave without distortion or fraying. By following this simple method you'll keep your carbon pattern straight and will waste very little.

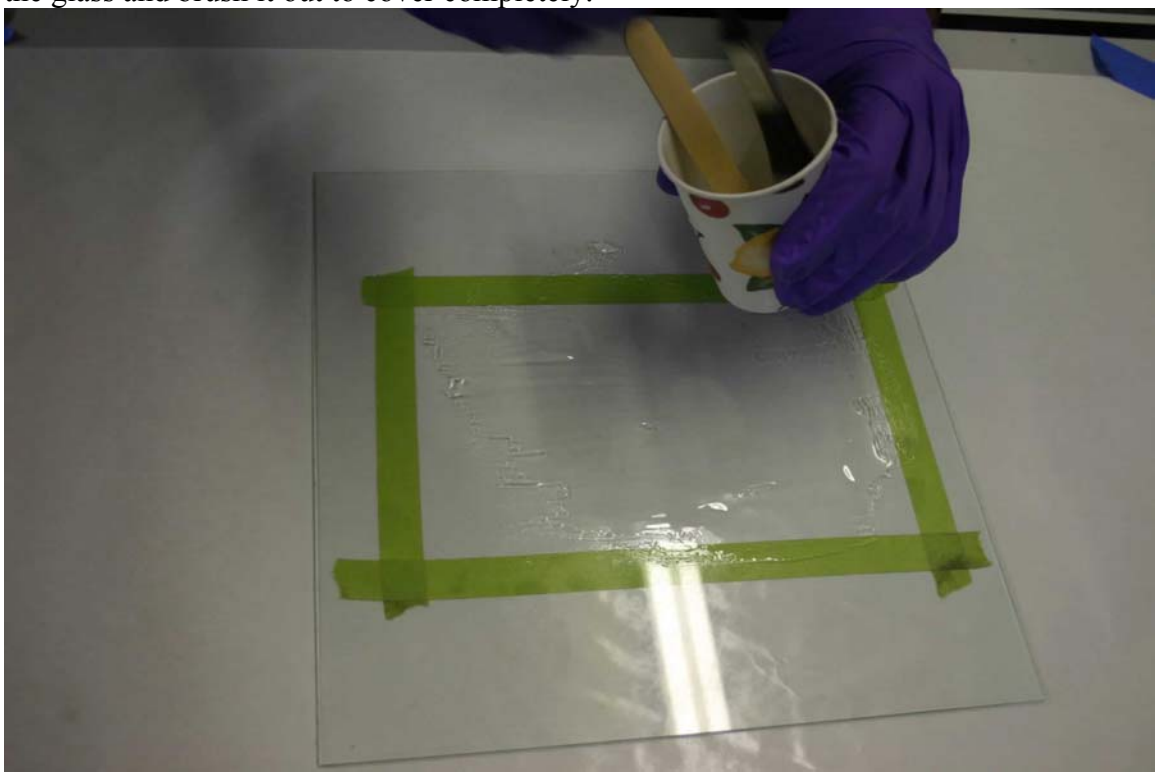
You cut the carbon with scissors down the middle of the ½" masking tape.





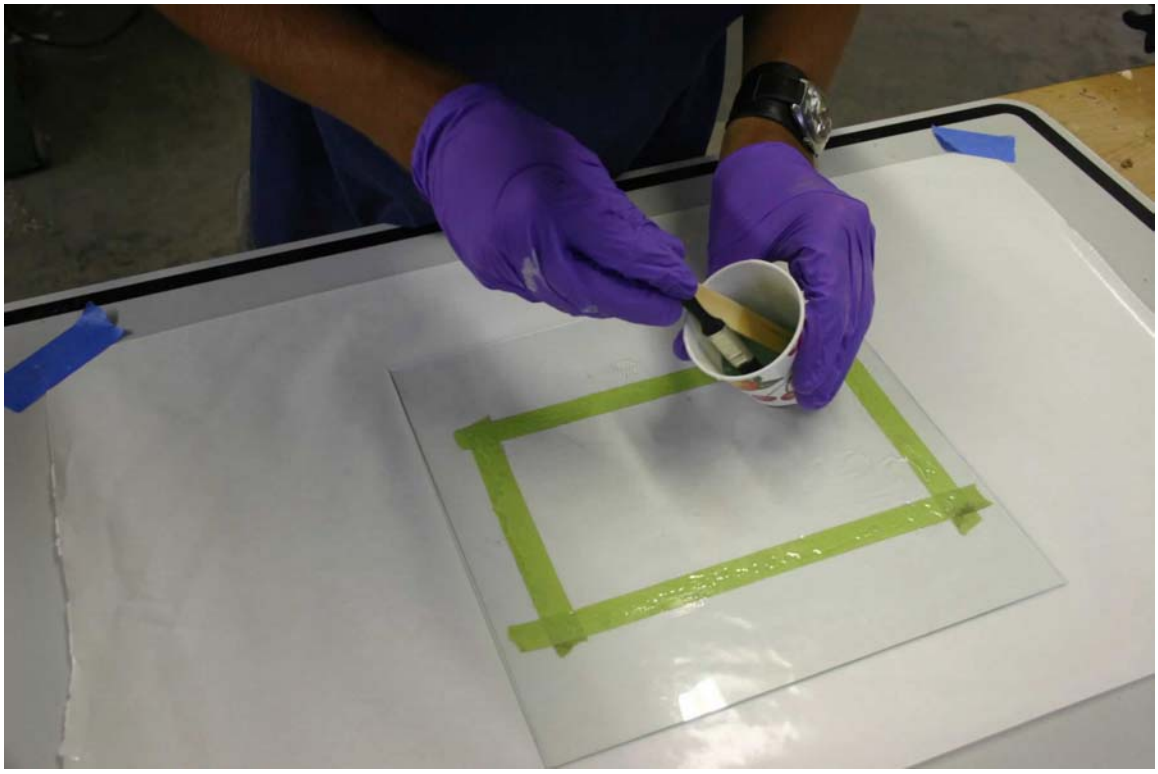
To mix resin you need unwaxed cups. The best ones to use are hot cups sold at most grocery stores. Popsicle sticks work great as disposable stirrers. This isn't a very big project so the total amount of resin used is about a quarter of a cup.

For this step only mix about 1/8 a cup of resin and 5 drops of hardener. Pour the resin on the glass and brush it out to cover completely.

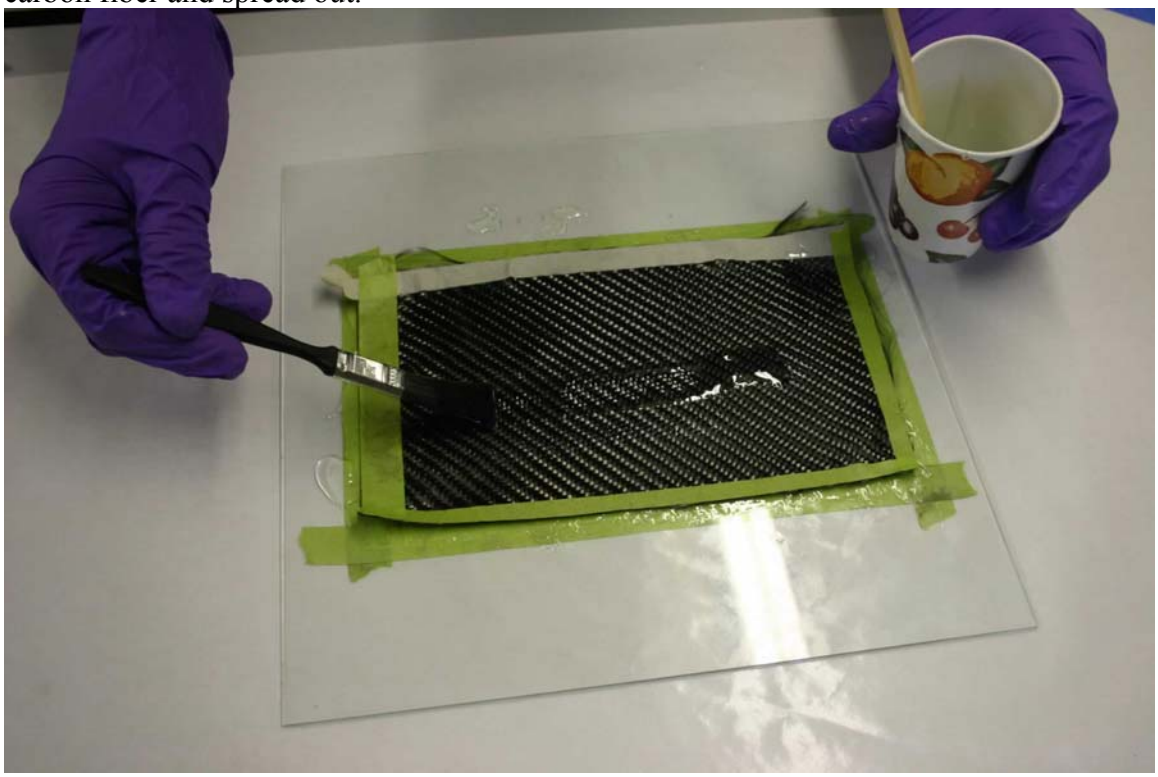


Because the glass is waxed the resin may separate. Don't worry, just slowly brush to fill any voids until you have a uniform surface. Sit back, have a coffee or whatever and allow this to dry. It will take about an hour at 70 degrees. If it's below 55 don't even try, it will take forever!

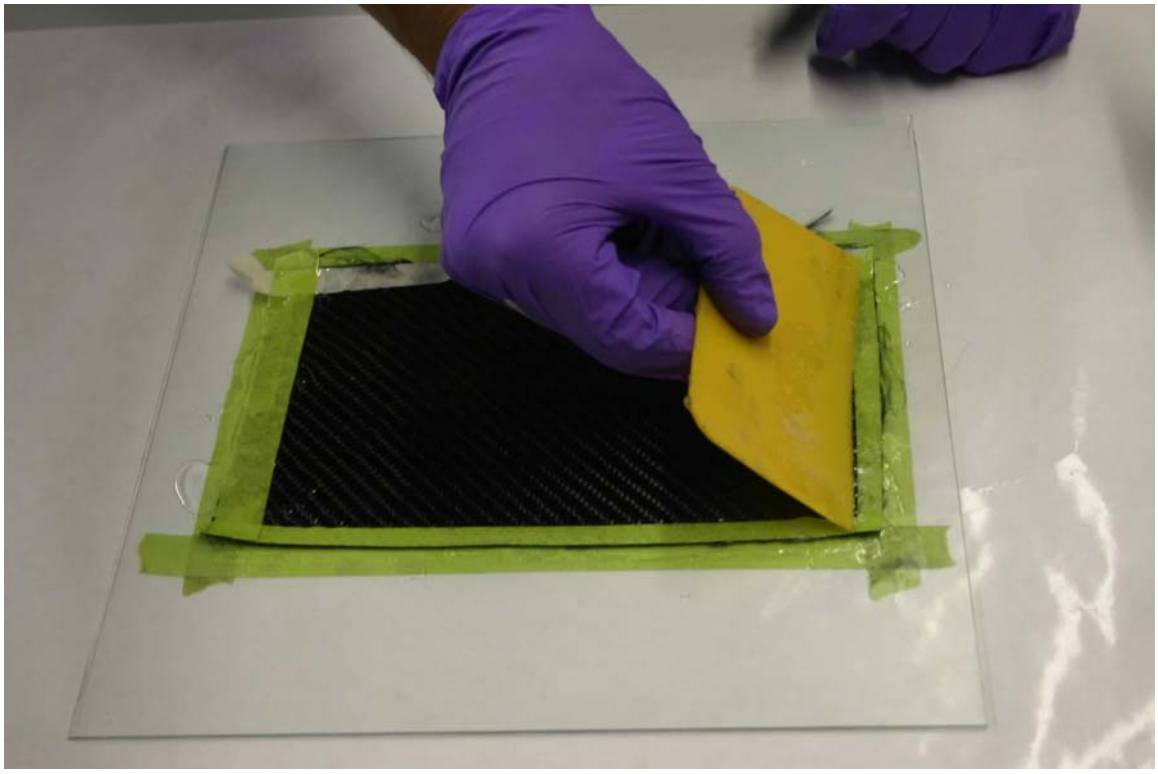
Once the resin has dried to slightly tacky, brush on another coat of resin evenly.



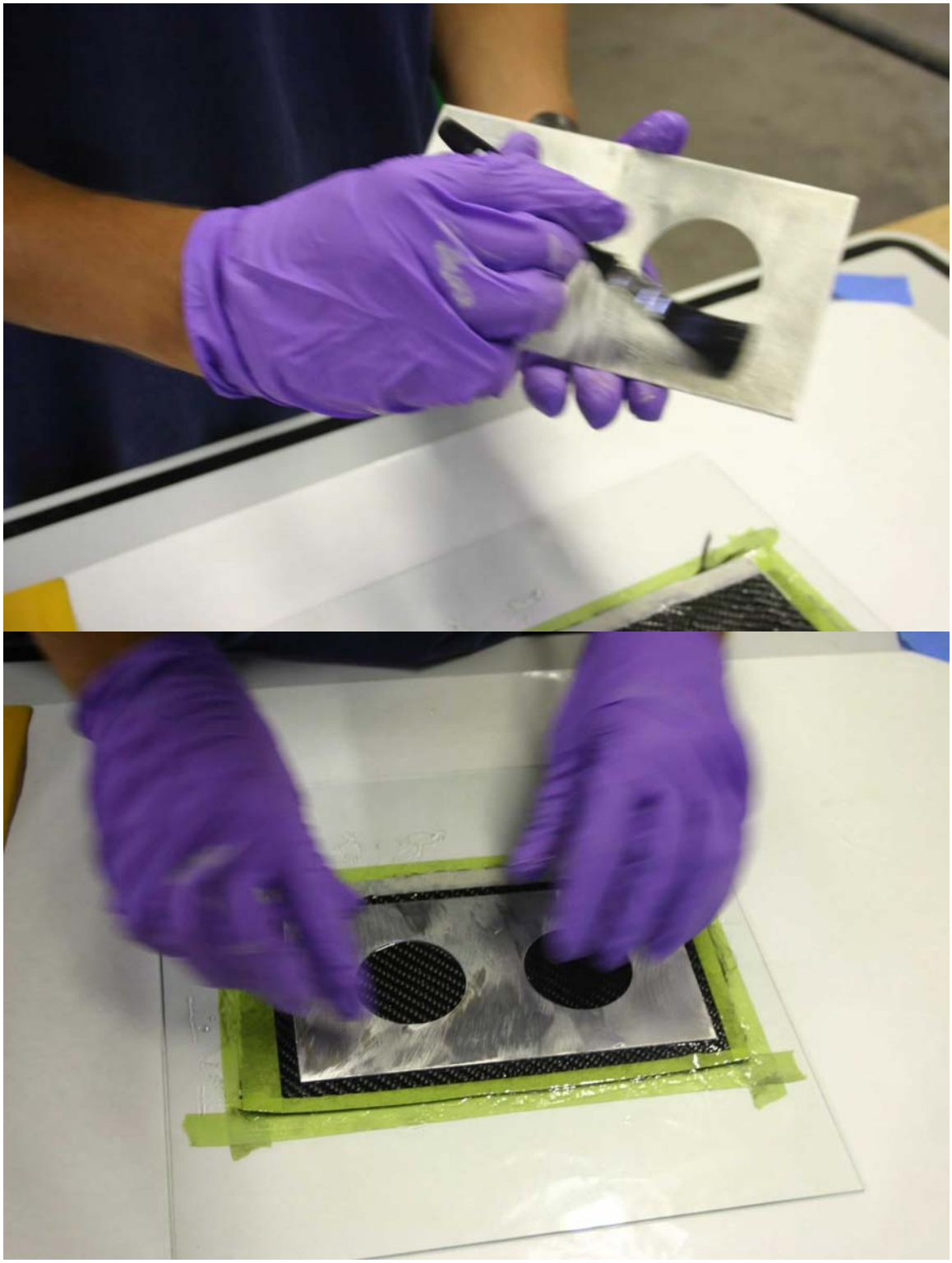
Now lay down your carbon fiber on the wet resin. Pour more resin on the back of the carbon fiber and spread out.



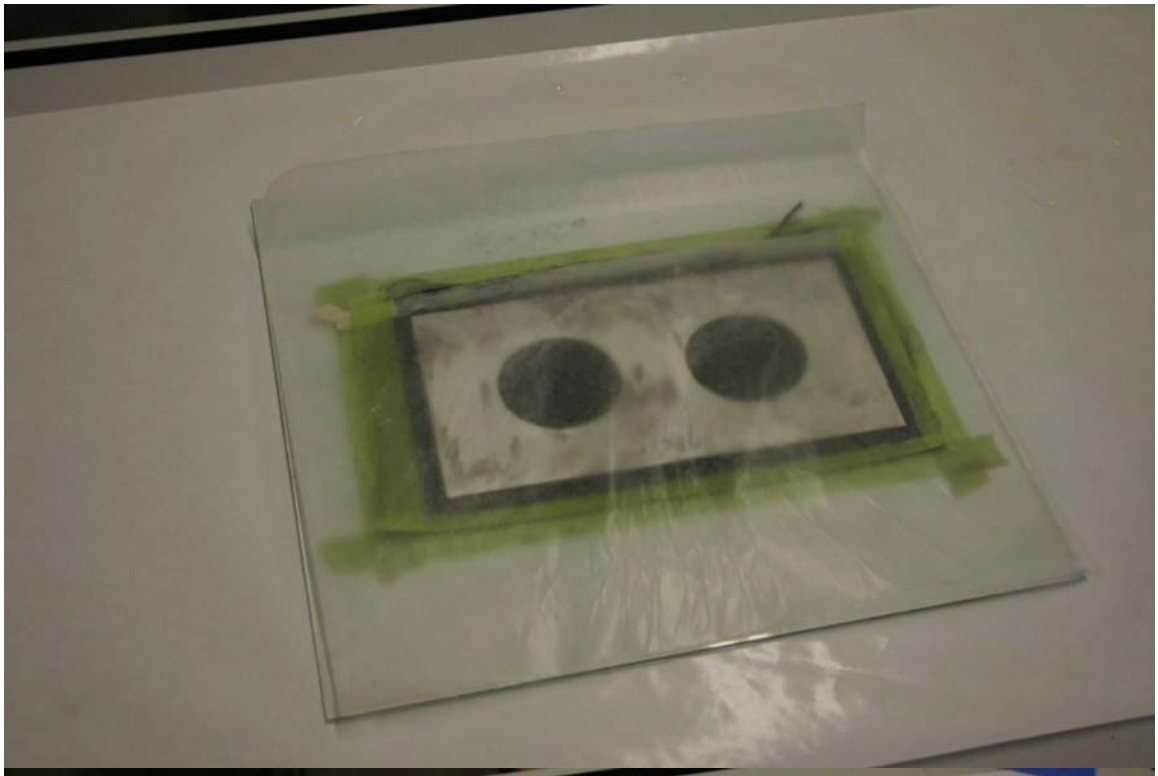
If you use very little pressure a bondo spreader works great. You want to work the resin throughout and be sure not to leave any dry areas.

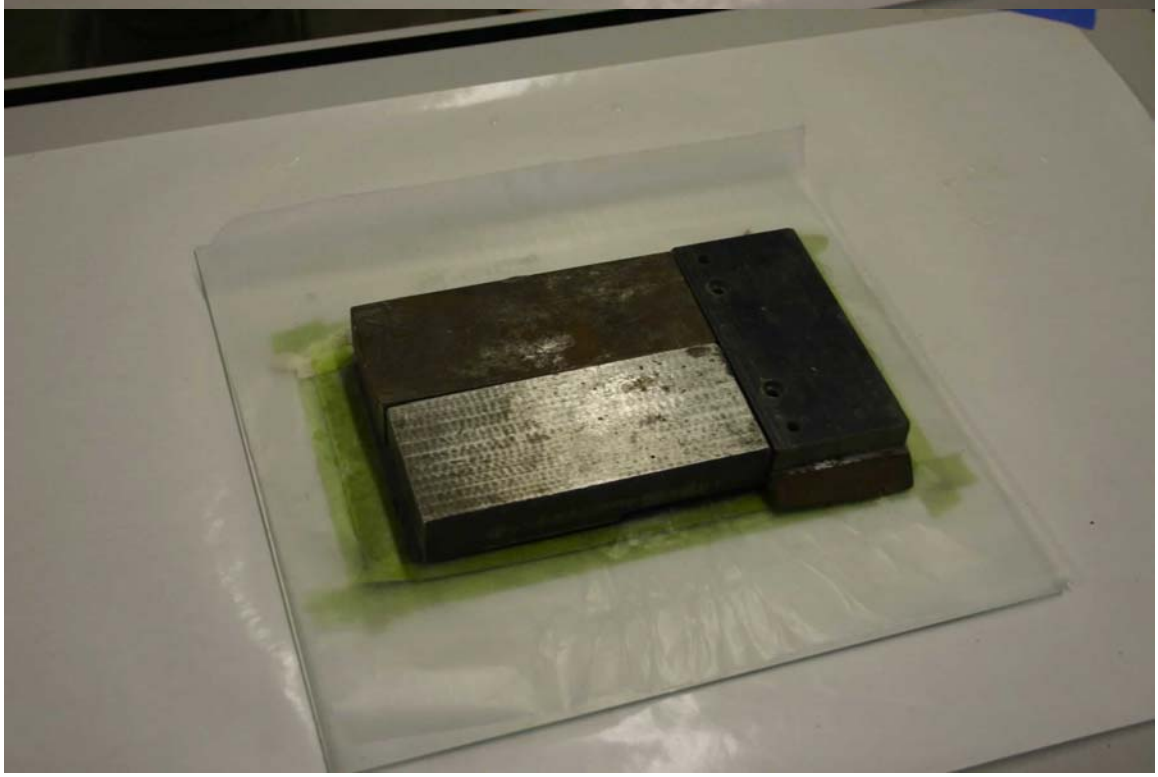


Coat the sanded aluminum side with resin. Place the aluminum down onto the carbon fiber.



Place a piece of wax paper over the aluminum and place weights, soup cans, metal, whatever, to weigh it down.

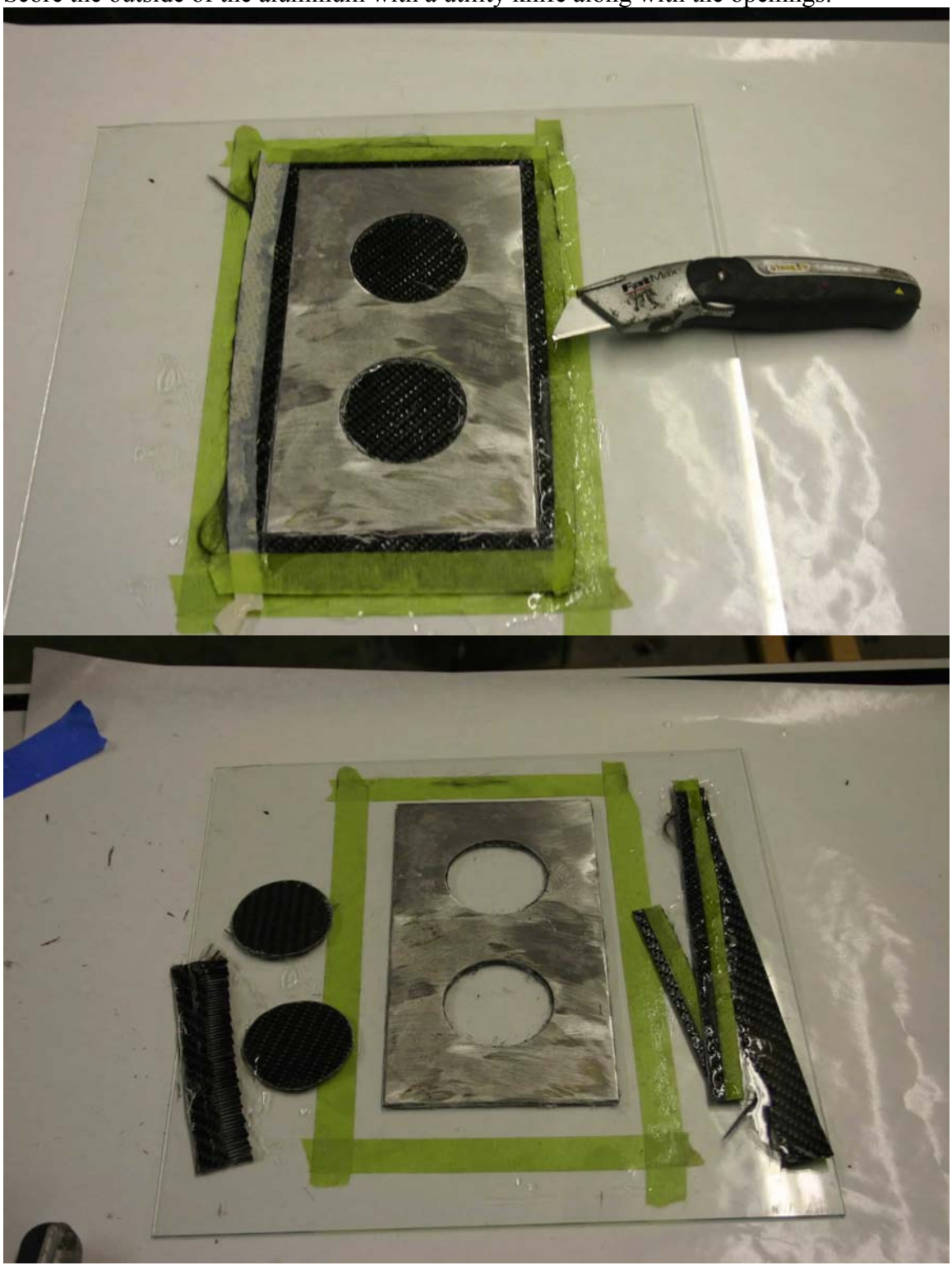




You need to exert even pressure. Leave it alone overnight. Again it's best if your work area is about 70 degrees. Tomorrow will be the unveiling. Don't rush it or you'll ruin your part.

Great! You waited..Remove the weights and the wax paper.

Score the outside of the aluminum with a utility knife along with the openings.



The piece should separate from the glass with little effort. You can use the bondo spreader to ease the part from the glass. The edges will need some trimming. For this the easiest is a dremel tool with a cut off disc and a sanding drum. A sharp xacto blade also

works if you're very careful. Trim flush with the aluminum edge. If the aluminum shows around the edges take a black magic marker to cover the exposed aluminum. Before doing anything else its important to remove any wax which may have transferred from the glass. A mild detergent works well. Dry thoroughly. The next step is to add depth and more gloss to the piece. Krylon clear spray works great. If you have access to urethane clear coats that's the best. Practice on cardboard to spray a thin even wet coat. Let this dry and then spray two more. Following instructions on the can.

You should have a completed custom piece that will wow your friends.

Trouble shooting-
Bubbles-you didn't lay the first coat of resin on smoothly or stirred the resin-catalyst mixture too vigorously

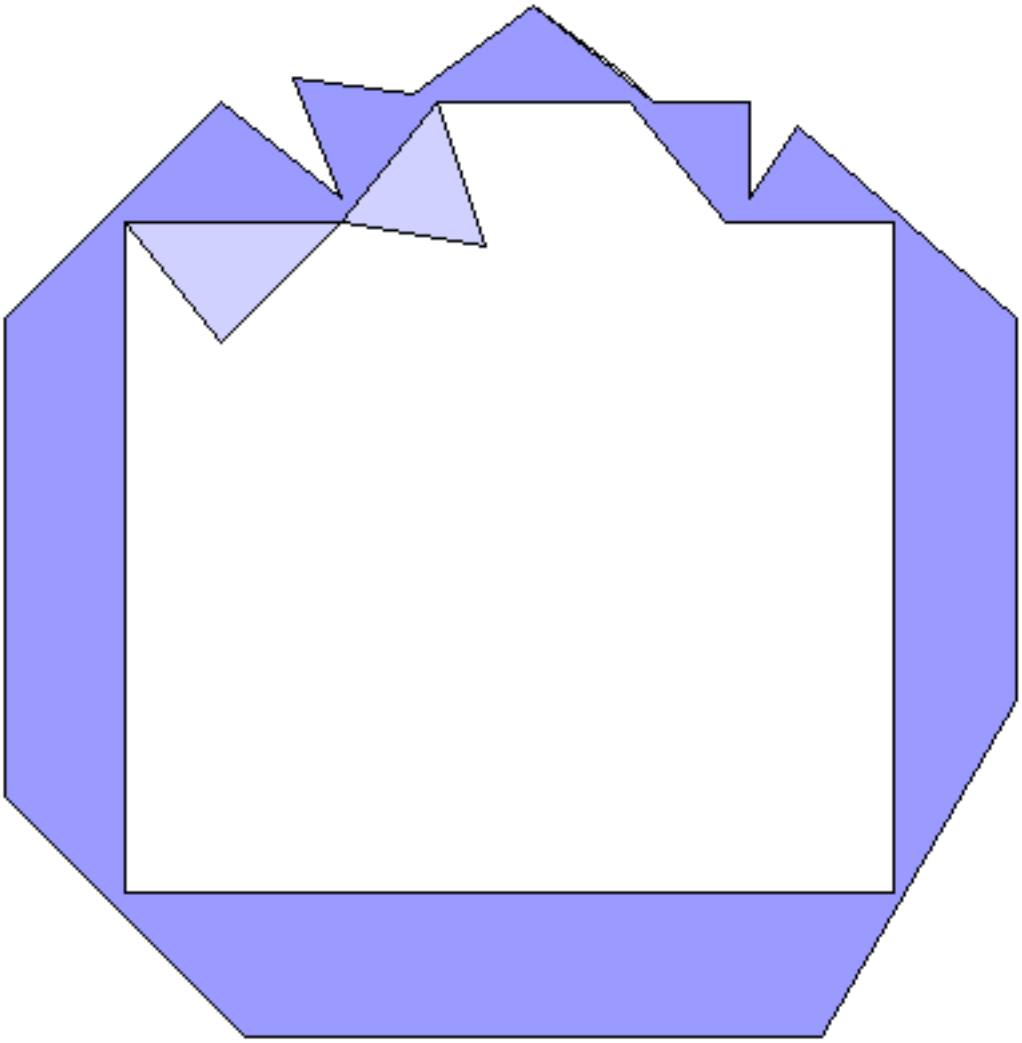
Aluminum shows through the carbon fibre-if your weave is too loose this can occur. A helpful hint here is to tint the resin you place on the back of the carbon fibre with black tint. This is available from resin suppliers.

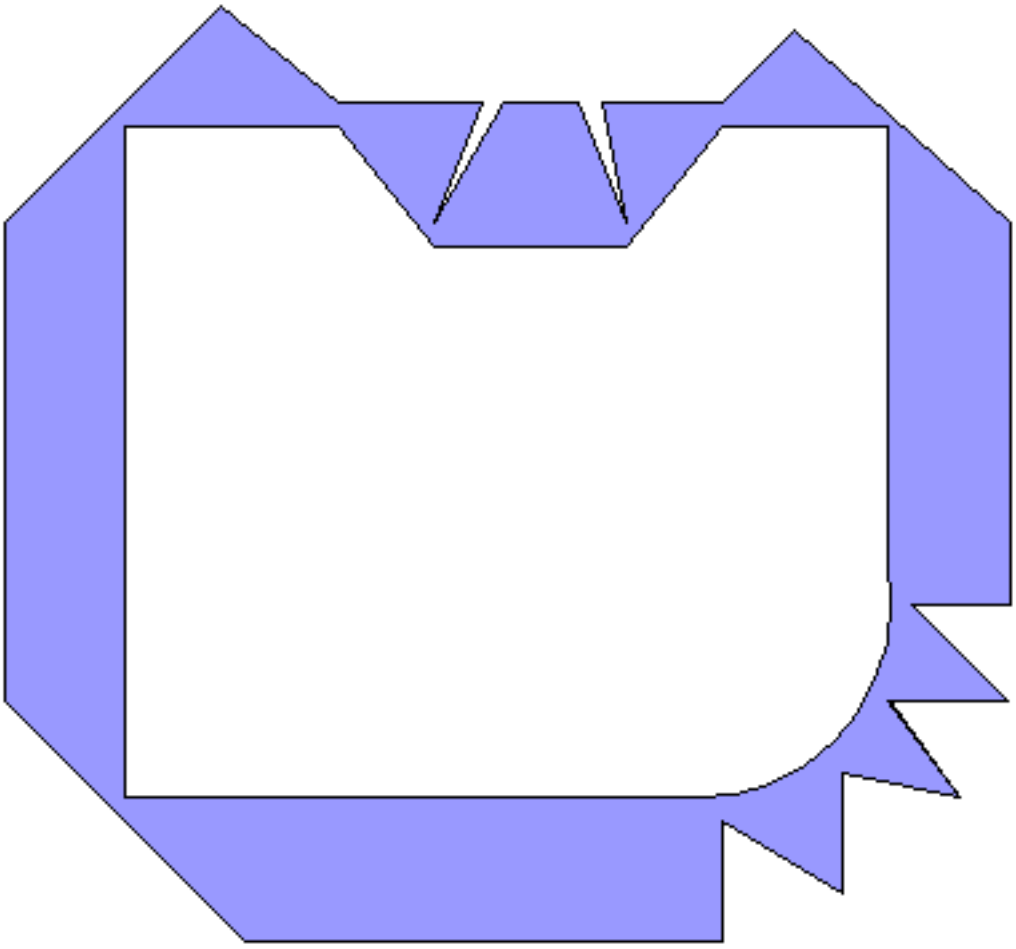
Resin-clear surfboard resin is the best for non structural parts. The experts will say you should only use epoxy or vinyl ester resin for carbon fiber, but for non structural parts surfboard resin is fine. I can't recommend Bondo resin as these leave a yellow or colored tint. Your best results are with a clear resin. I've tried many different suppliers and their prices are comparable, the shipping is what really costs. If you have a supplier locally definitely buy from them.

Now that you've got the hang of it, perhaps you want to do a bit more for your interior. This is where you can start to be creative. This is a bit more involved but again can be done easily and without any special tools. This technique is referred to as overlay. Usually used to cover interior pieces with CF. This can be used for exterior parts but the technique uses the stock piece and you mold the CF over the piece. The stock piece remains in place, so the finished piece is slightly larger than the stock piece. This involves considerably more hand work. The concept is covering the piece with carbon and resin. Then more resin to build up the thickness. Most of this resin is sanded off until a smooth surface is achieved. This is time consuming but the end result is worth the effort. After all, you're doing this to make your car look great.
The part I'm going to demonstration is a B-pillar from a VW.

The technique-
If the piece is hard plastic you can sand the piece with 100 grit sandpaper. If there is a fabric covering you have two choices. The first is to remove the fabric and sand the base

material with 100 grit paper. The second approach, although I don't recommend it, is to cover the fabric with masking tape and then spray on three coats of clear Krylon. Allow the Krylon to dry and then scuff the surface with sandpaper.
The procedure is the same from this point on.
Before we go too far you will need to cut the material to fit around the piece. To help in how to make the cuts I've provided the following illustrations.

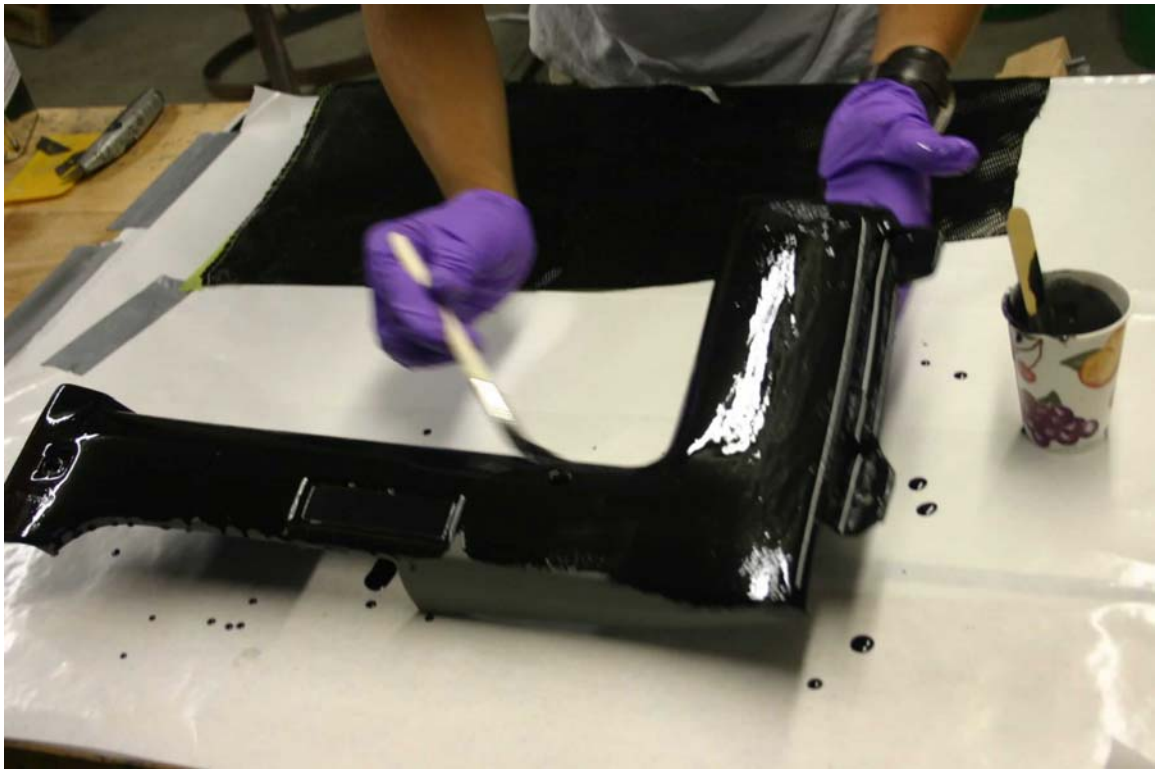




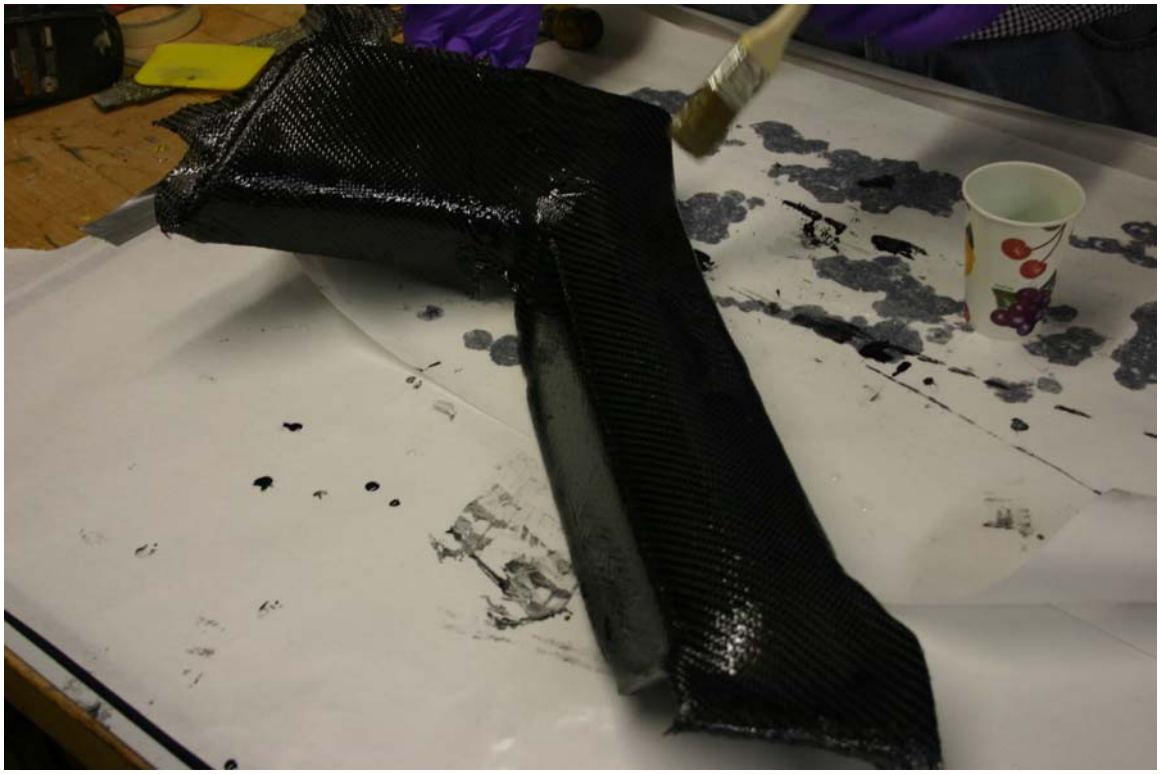
Leave about 1/8” extra material to fold around the edges. This varies with the thickness of the piece. You will need to experiment here.

Just like before, place the piece on the carbon and tape the edges.

This how the carbon frays if you don’t tape the edges.



Lay down a coat of resin mixed with hardener over the surface of the piece. Because the part is a light gray I tinted the resin so the gray would not show through the carbon. Tint is very cheap and a little goes a long way. It won't bleed through the carbon fiber. Let the resin dry enough so that when you touch it with your finger it leaves an imprint but doesn't come off on your finger.

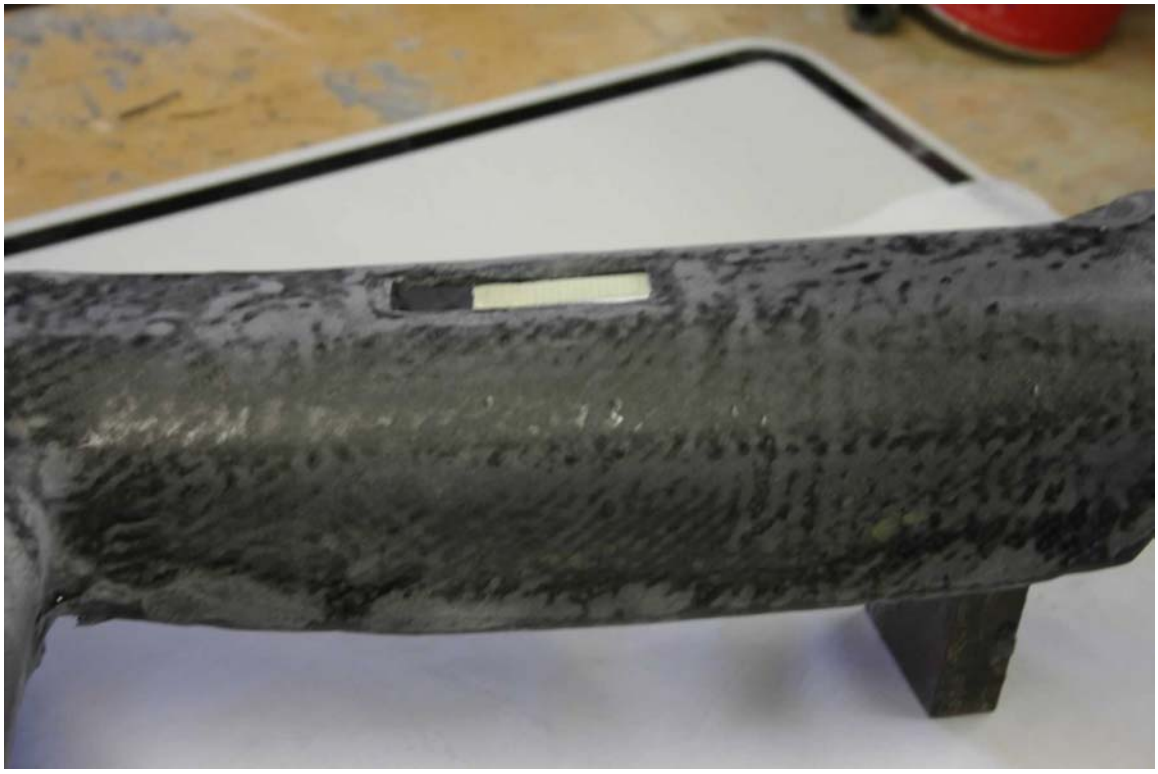


. Spray the back of the piece with 3M 77 adhesive and let it tack. Place the carbon over the piece. Fold the fiber over the edges and press into the adhesive, it should hold. For extra security, use masking tape to hold the edges in place. **For the top coats on the carbon use clear resin.** Use your brush to coat the edges of the part. Set it aside to dry. Don't worry that things look messy at this point. This first coat is to adhere the carbon to the part and form a solid base for the remaining resin

coats.

Once the part is tacky you can brush on the next coat of resin.

Allow each application of resin to tack before laying more on.
Continue brushing on more resin on the part until the fabric is covered and there is no sign of the twill weave showing through. **This is important, you will be sanding these top coats of resin and don't want to sand into the carbon.** If you do the part will be ruined.



Sand to level the resin. **I know this looks horrible and you think you just ruined everything!** Don't worry just apply more resin to build up the low spots. Add a layer or two and sand again. Soon there will be a level surface.
Once the surface is level sand with 220, 400,600,1000 grit wet sandpaper. Clean with soap and water then allow to dry. The surface will be dull. Now spray on several coats of clear Krylon. Urethane is superior! Isn't amazing how instantly the twill appears and the depth. To achieve a deeper finish, spray on more Krylon.
Admire your work.

Overlays are simple to do but do take time. The resin needs to be completely dry before sanding. The steps are just as outlined. The most difficult part is wrapping the edges. You should practice the cut techniques I outlined. Try these with some inexpensive fabric so that mistakes won't ruin the carbon fiber.

I'm working on the next installment. This will cover making a form (plug) and molding parts. It will cover multi-part molds and vacuum bagging. I really recommend you try the above techniques before moving to molds. Some familiarity with basic techniques will make the move easier with fewer failures.