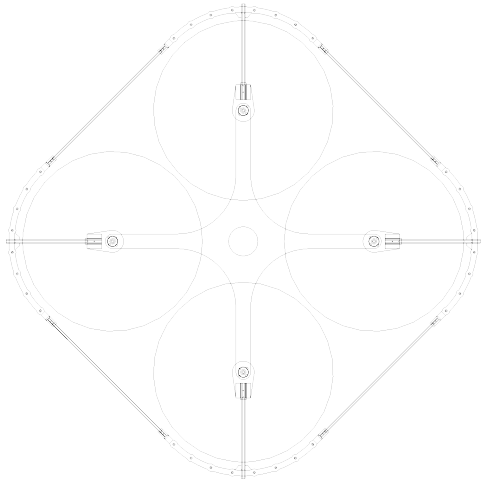
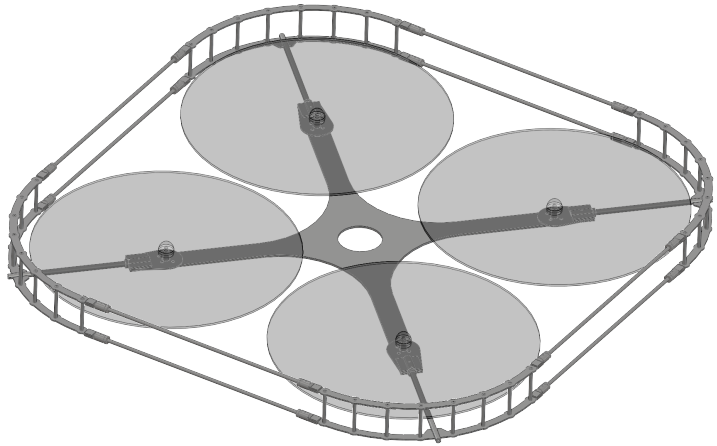




Prop Guard Cage Fabrication

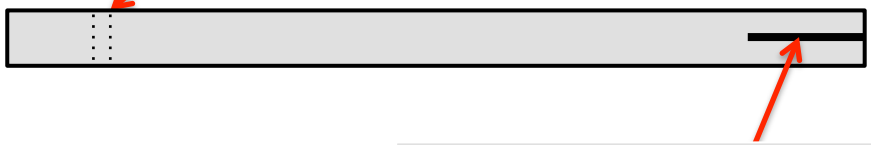
Note, carbon dust is very harmful if inhaled, use a dust removal system when cutting, sanding, or grinding carbon parts. Also fumes from CA and epoxies are harmful, so also use a ventilation system with those adhesives.

For the epoxy, slow cure is stronger, 5 minute cure is okay. DP460NS is a high performance epoxy that would be ideal.

For the CA glues Bob Smith brand thin and medium viscosity glues are good. Regular type is best, but foam safe is okay. Also the foam safe 'Insta Set Accelerator' is good for kicking off the glue, particularly when the kevlar thread is coated with CA glue.

Carbon tube prep

Hole is 0.0591" diameter, centered 0.400" from end. Perpendicular to slot. Chamfer/round over this end. Hole needs to be centered.



Large tube is 0.257" diameter, cut to 6.400" overall length, +0/-.03". 4 pieces per assembly.

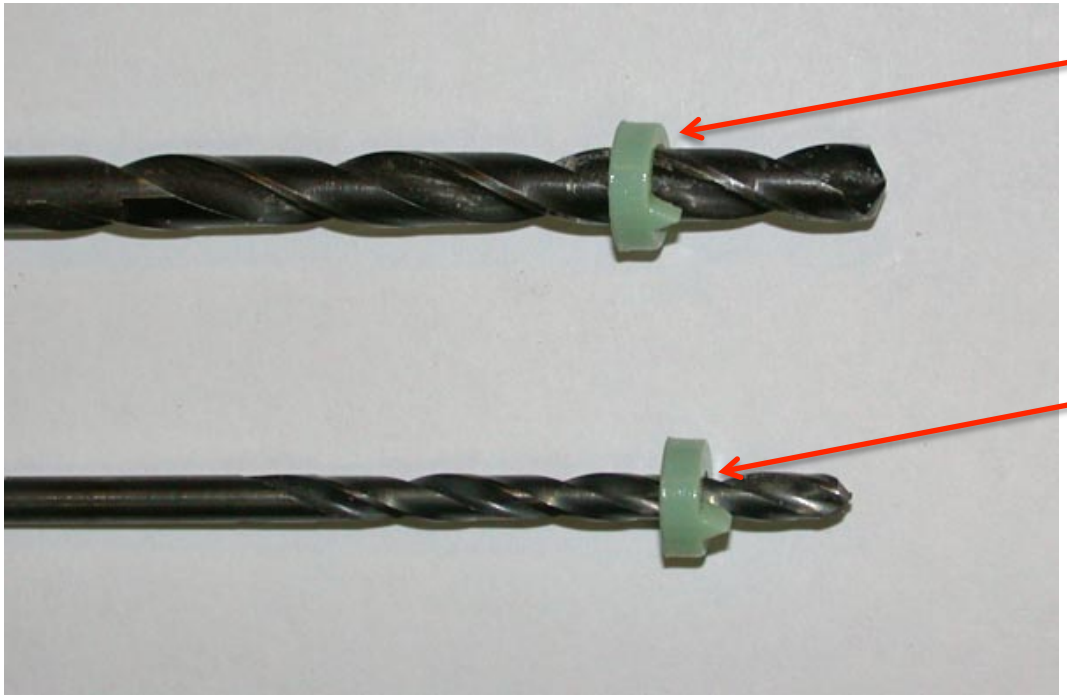
Slot is 0.065" wide, and 0.630" long. Perpendicular to hole on opposite end. Slot needs to be centered.

Small Short tube is 0.155" diameter, cut to 1.930" overall length, +/.02" 32 pieces per assembly. Chamfer/round over the edges.

Small Long tube is 0.155" diameter, cut to 11.300" overall length, +/.02" 8 pieces per assembly. Chamfer/round over the edges.

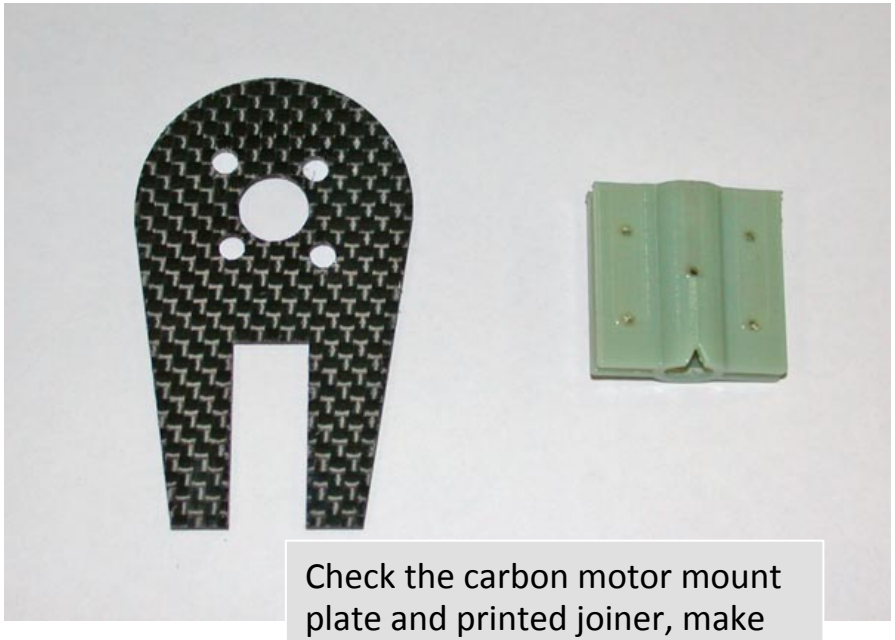
Holes at both ends are 0.0591" diameter, centered 0.230" from ends. Holes need to be well centered, and parallel to each other.

Collar prep

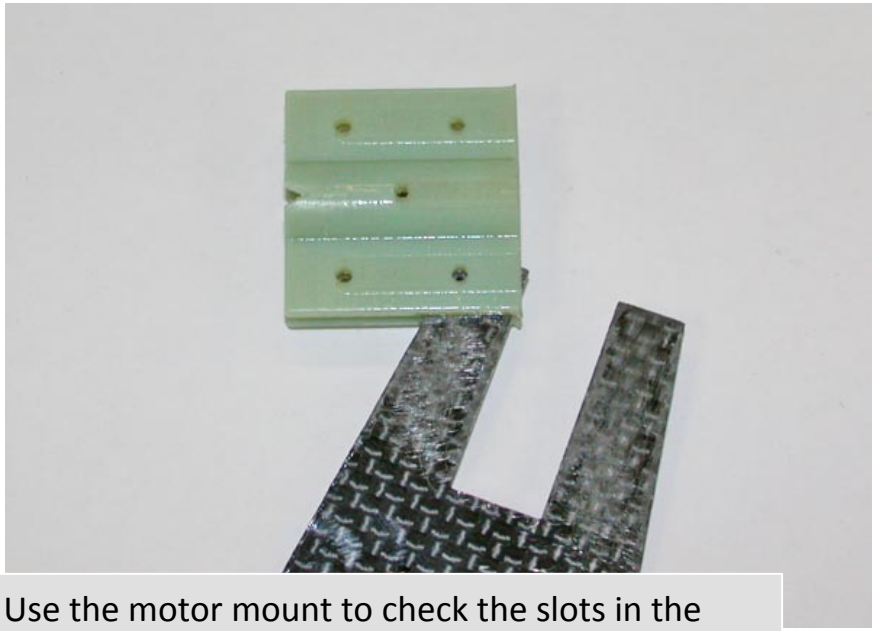


Drill out the large hole collars with a nominal .257" diameter drill, or to fit snug on the large tubes. 4 per assembly.

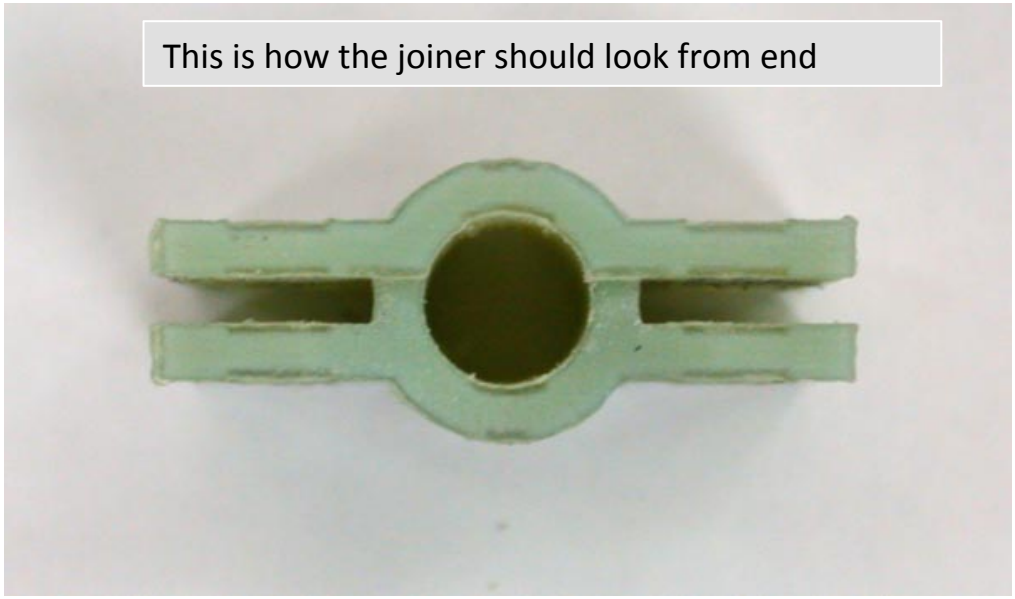
Drill out the small hole collars with a nominal .156" diameter drill, or to fit snug on the small tubes. 16 per assembly.



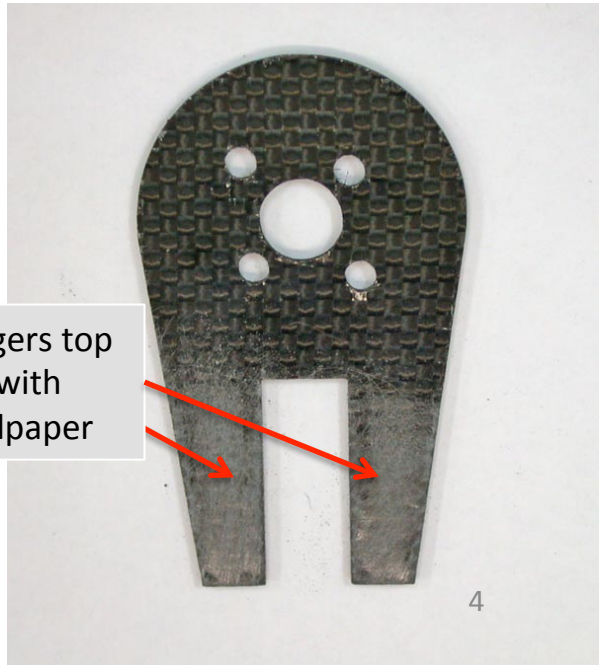
Check the carbon motor mount plate and printed joiner, make sure they are clean, no cracks, etc.



Use the motor mount to check the slots in the joiner, remove any residue from printing.

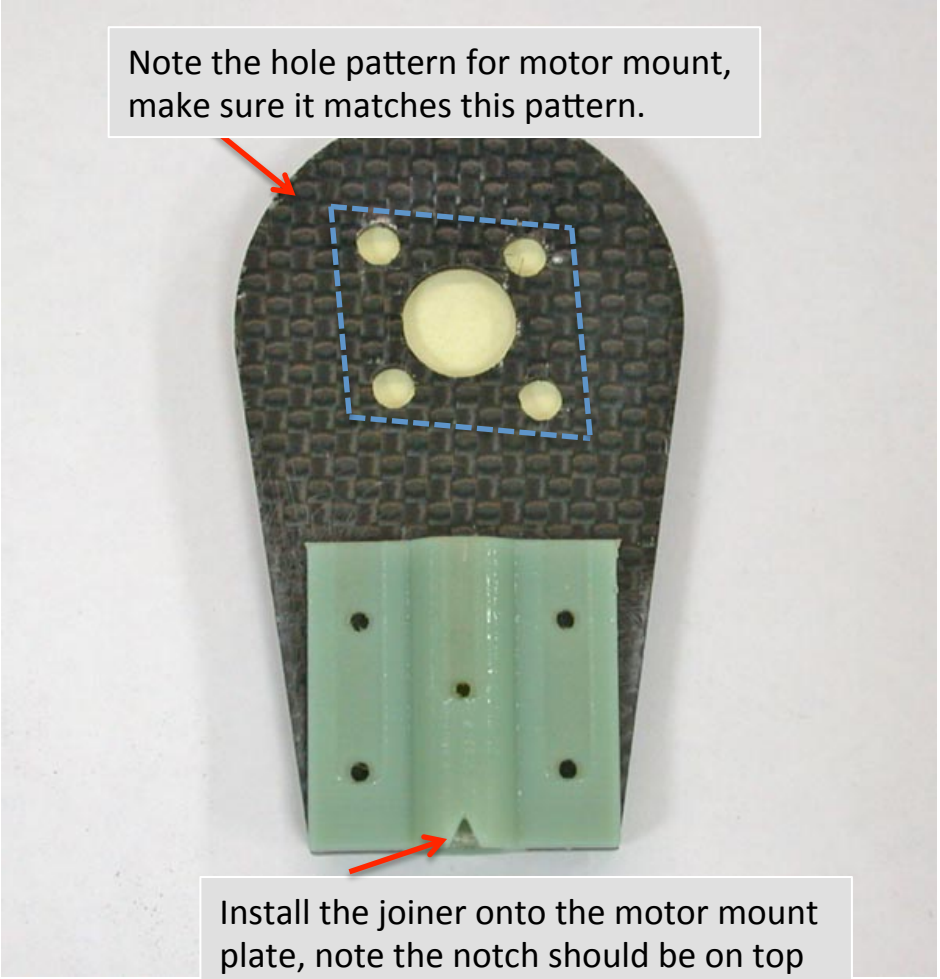


This is how the joiner should look from end



Sand the fingers top and bottom with 100 grit sandpaper

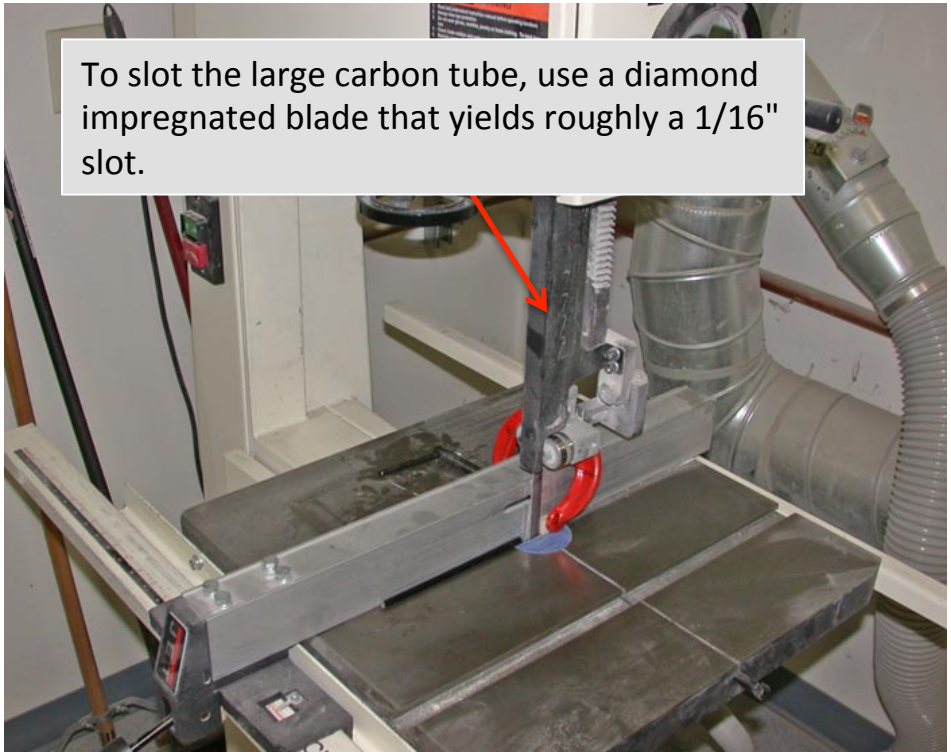
Note the hole pattern for motor mount, make sure it matches this pattern.

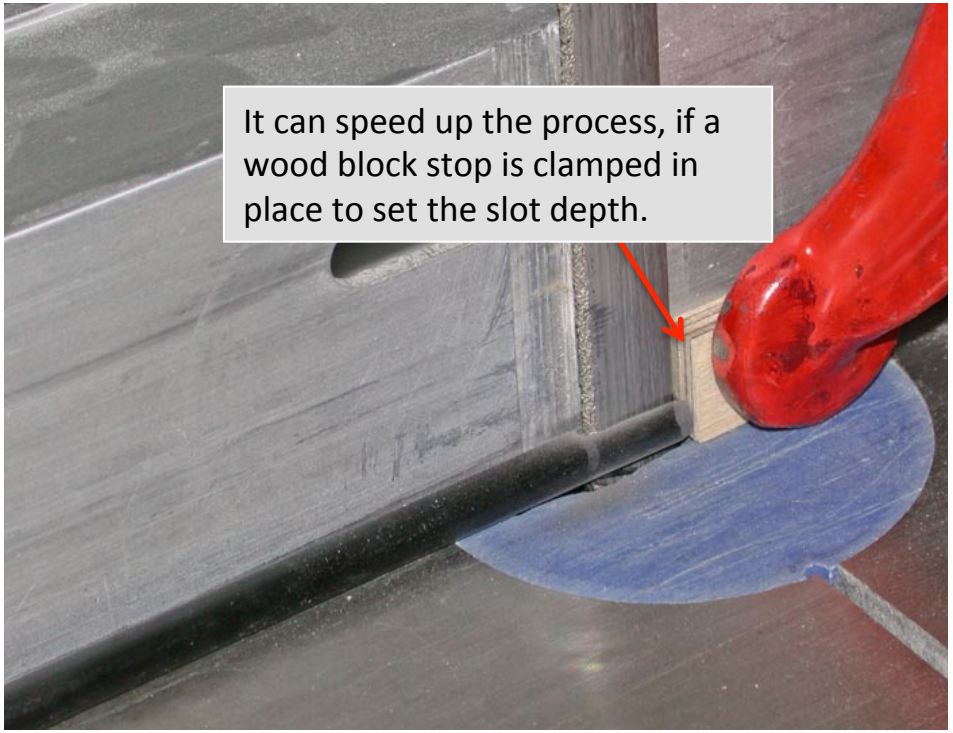


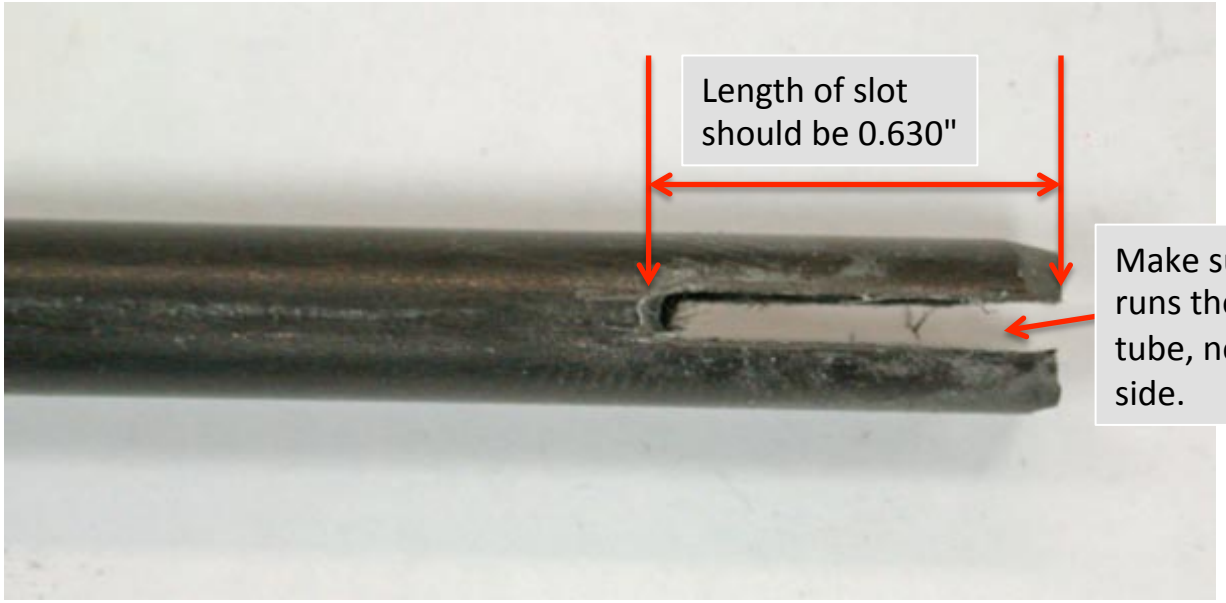
Install the joiner onto the motor mount plate, note the notch should be on top as shown. Glue with CA or epoxy, keep excess glue from inside the large hole.

After the adhesive is dry, drill out the large hole so the large carbon tube slides in easily, but without slop, should be around 0.257" dia. drill bit, drill by hand, or slow speed with portable drill motor.

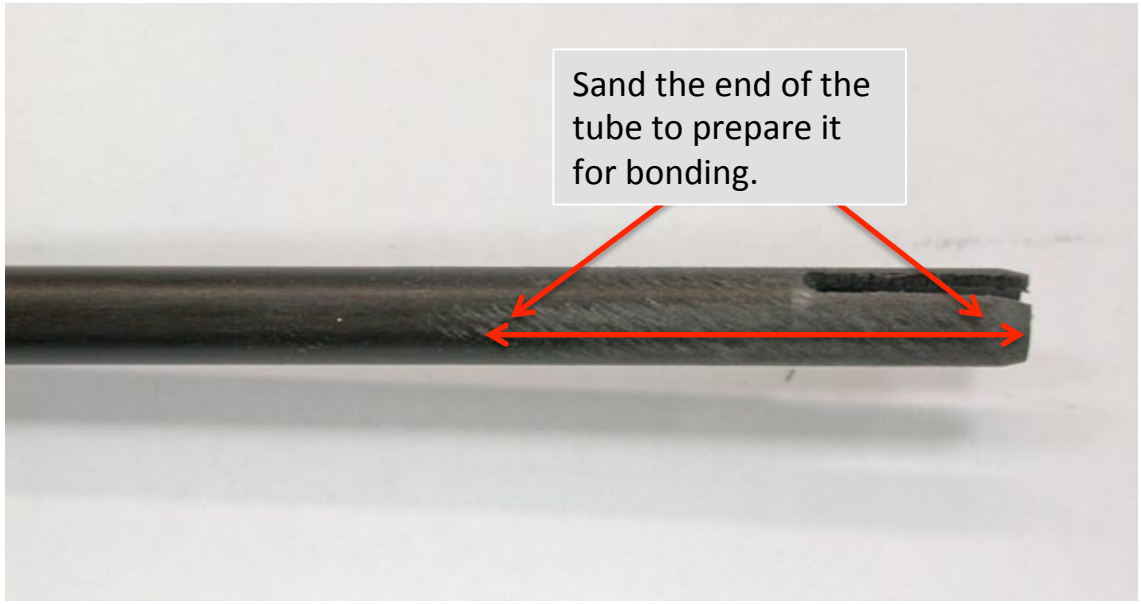
This completes the motor mount assembly procedure. Make 4 of these.

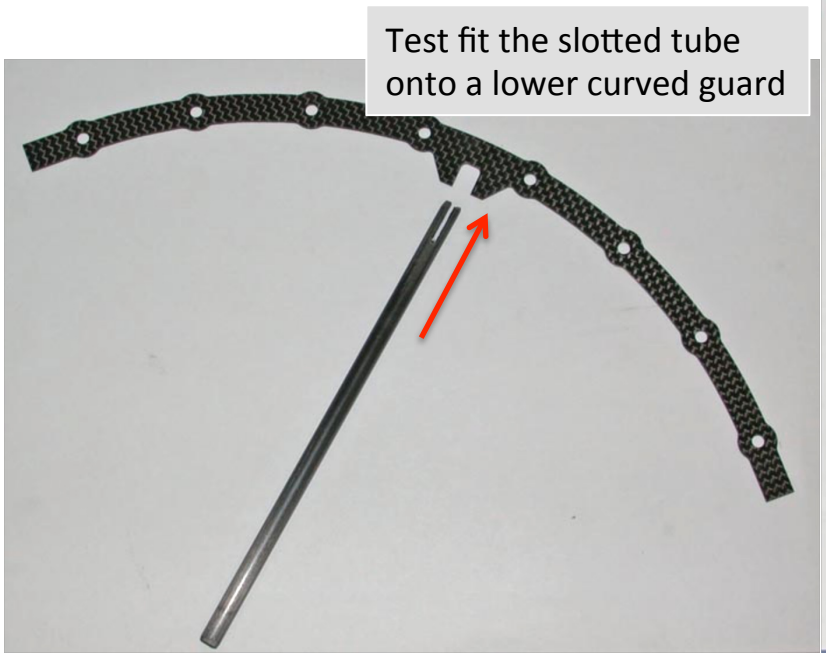

To slot the large carbon tube, use a diamond impregnated blade that yields roughly a 1/16" slot.

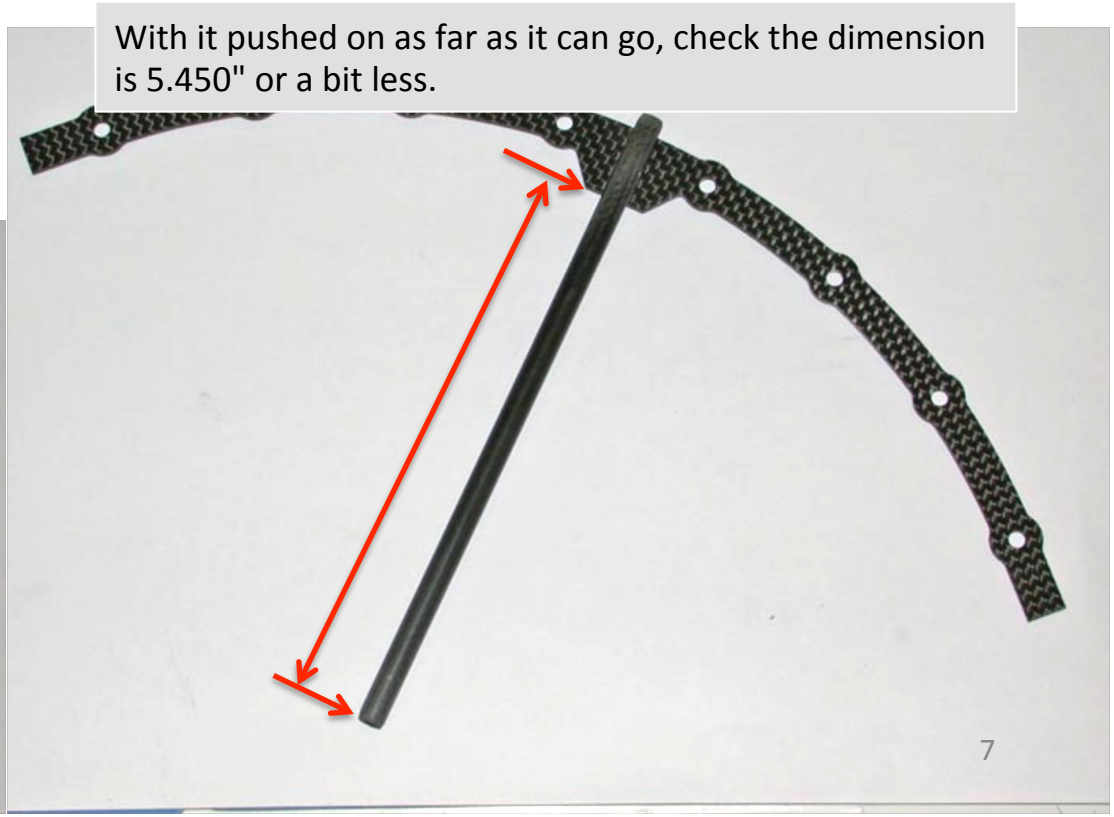

It can speed up the process, if a wood block stop is clamped in place to set the slot depth.


Length of slot should be 0.630"
Make sure the slot runs the cener of the tube, not off to one side.

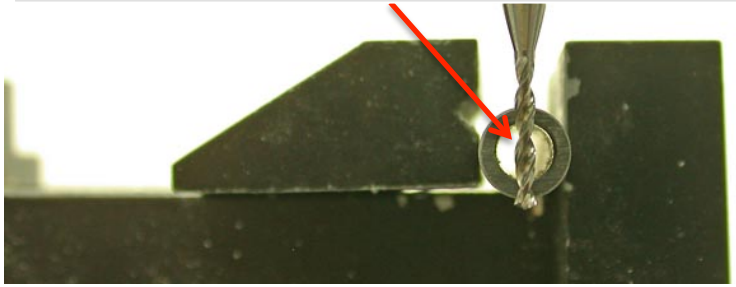

Clean out the loose fibers with a hobby knife.

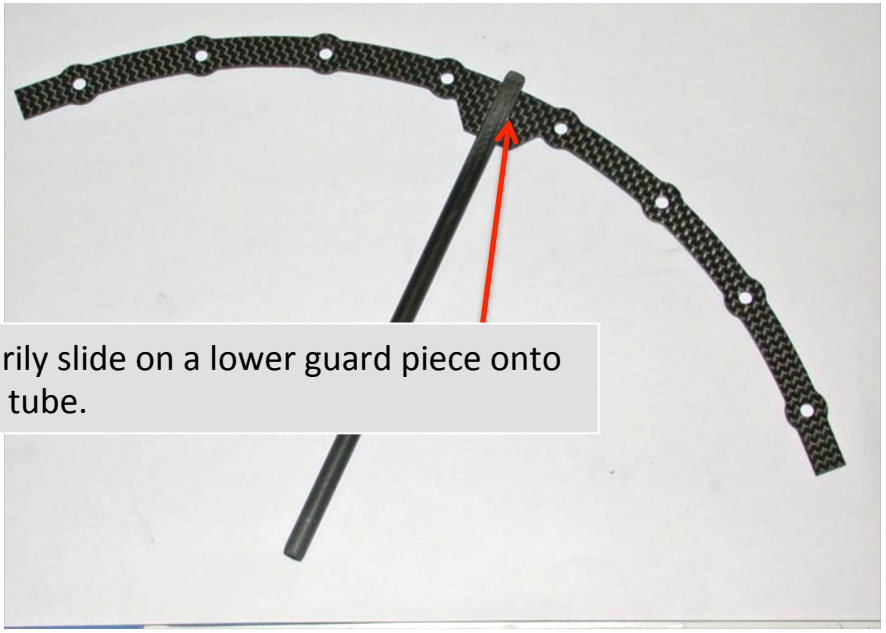

Sand the end of the tube to prepare it for bonding.


Test fit the slotted tube onto a lower curved guard


With it pushed on as far as it can go, check the dimension is 5.450" or a bit less.

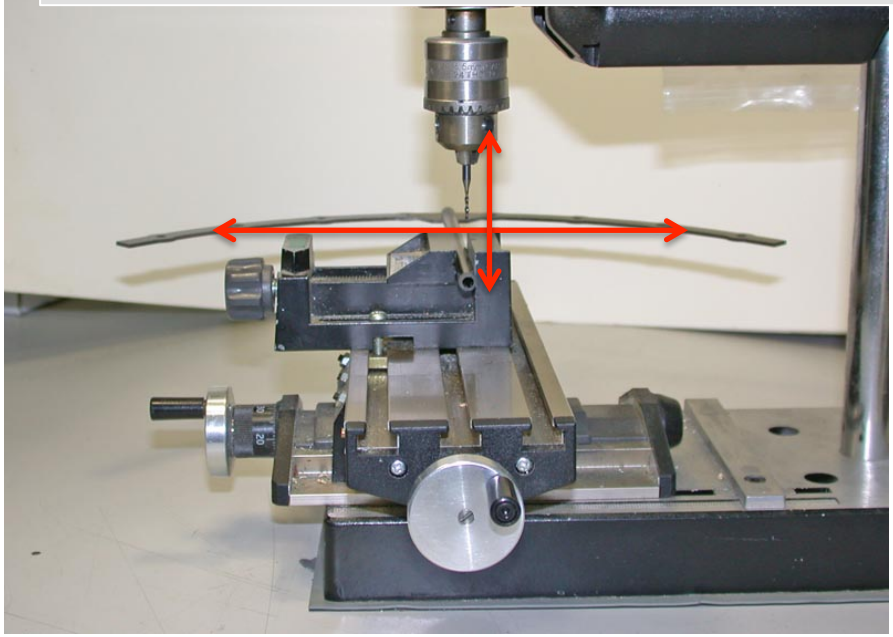
To drill the hole in the large tube, use a .0591" drill in a drill press. Preferably with a good vise and X-Y table that allows carefull positioning. First step is to make sure the drill will be centered on the tube.



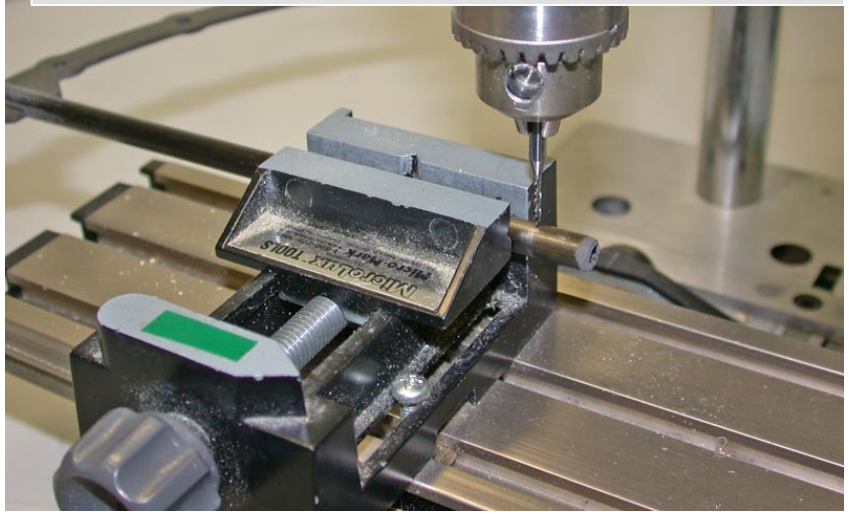


Temporarily slide on a lower guard piece onto the large tube.

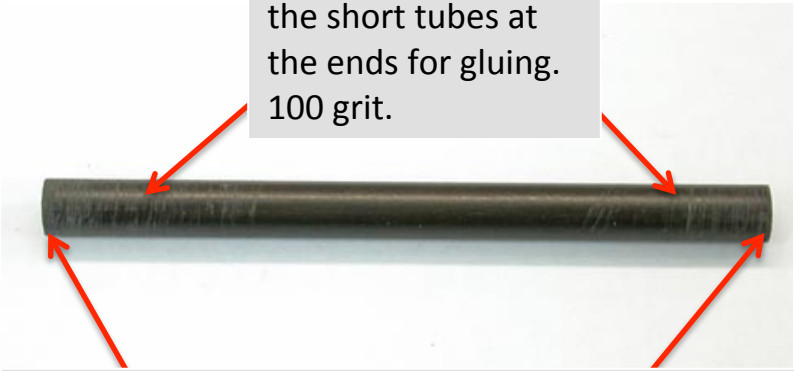
With the tube in the vise, clamp down the tube carefully, making sure the guard piece is perpendicular to the drill bit within a few degrees.



Drill the hole, centered at 0.400" from the end of the tube, drill the hole all the way through the tube.

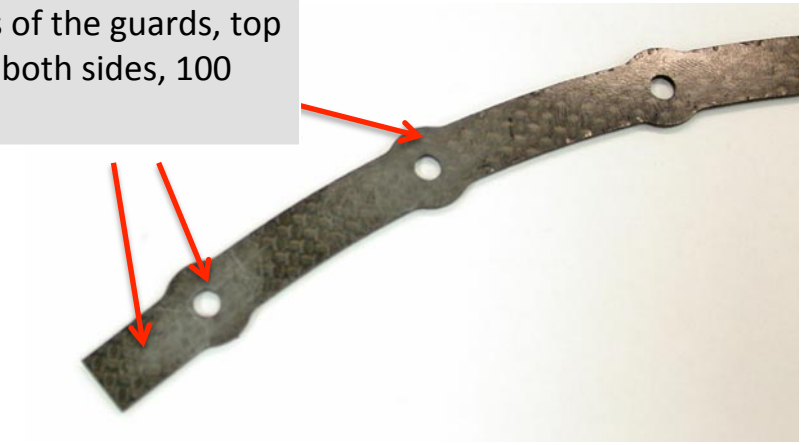


Sand the surface of the short tubes at the ends for gluing. 100 grit.

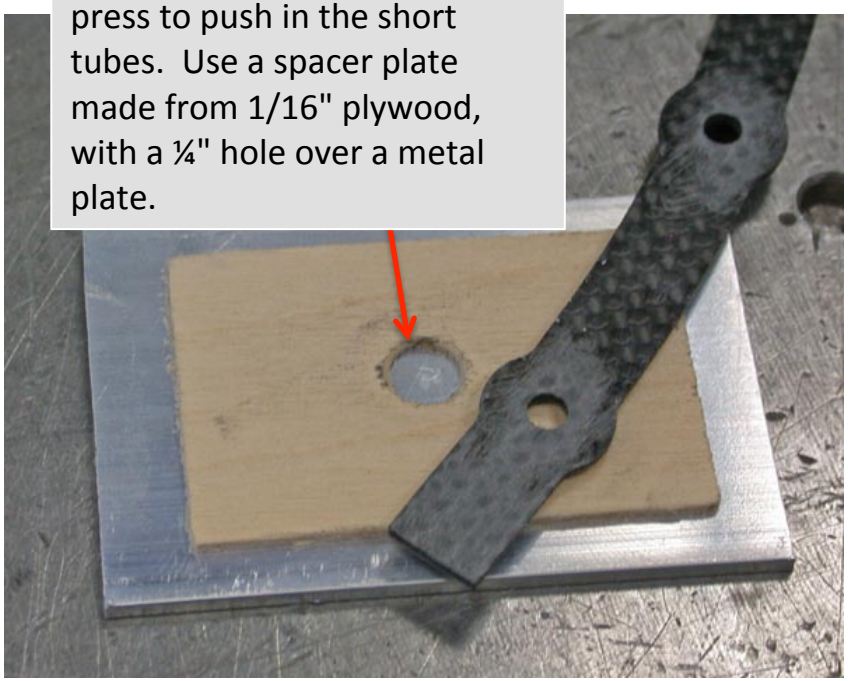


Chamfer/round over the edges to aid in the pressing operations. This image does not show much chamfering, more would be better.

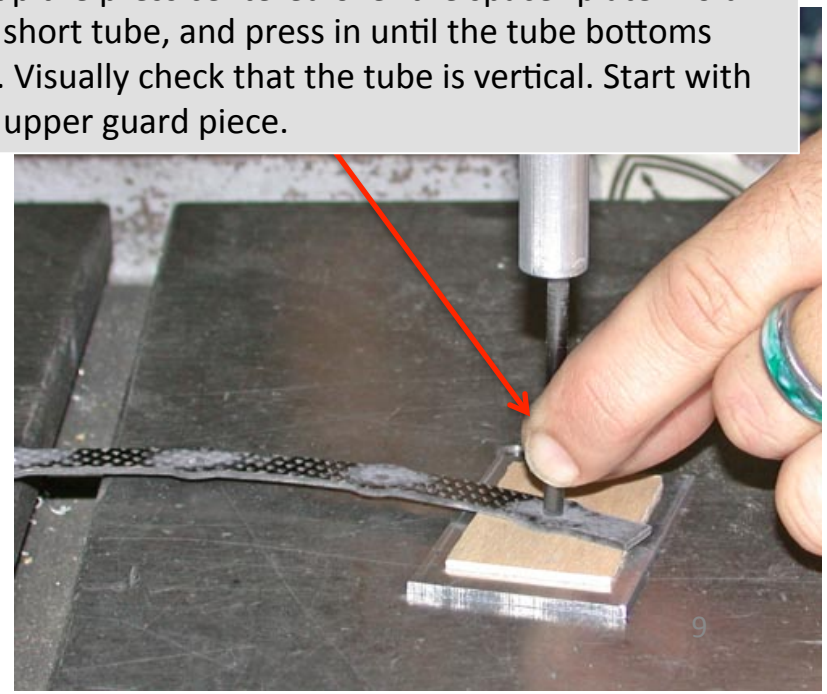
Sand around all of the holes, and the ends of the guards, top and bottom, both sides, 100 grit.



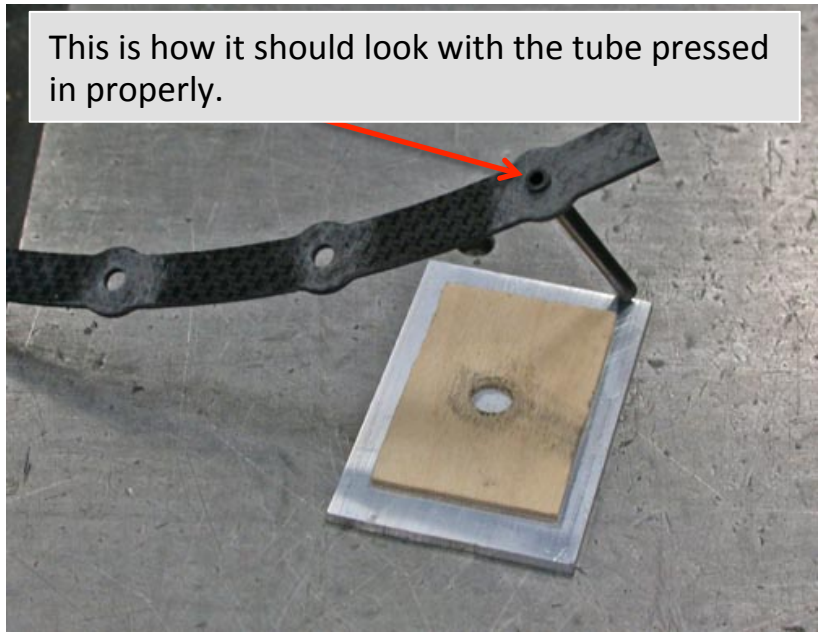
Setup an arbor press or drill press to push in the short tubes. Use a spacer plate made from 1/16" plywood, with a ¼" hole over a metal plate.



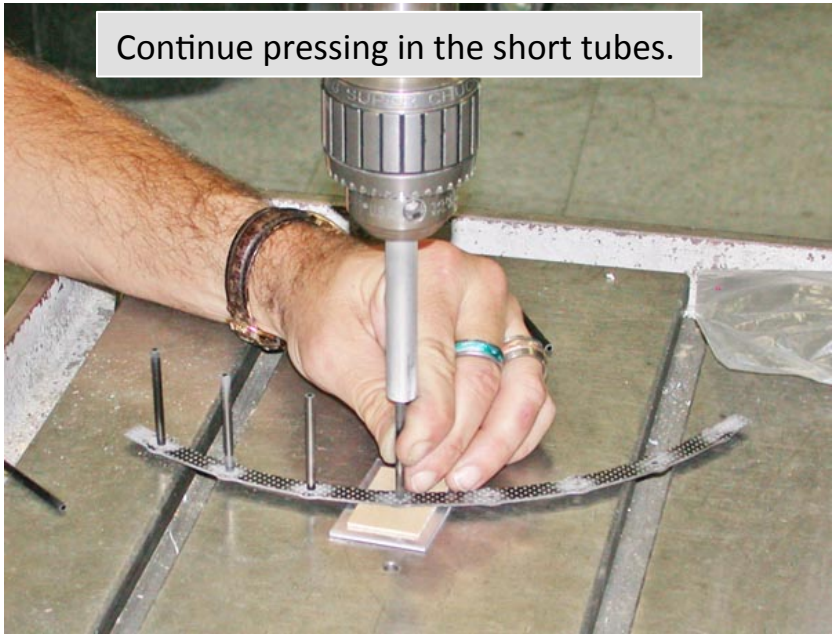
Setup the press centered over the spacer plate. Hold the short tube, and press in until the tube bottoms out. Visually check that the tube is vertical. Start with the upper guard piece.



This is how it should look with the tube pressed in properly.

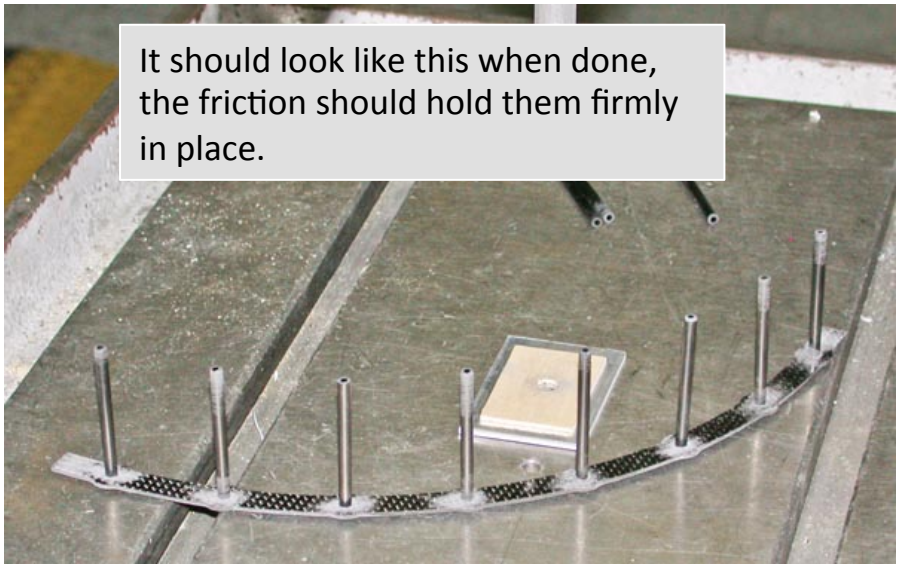


Continue pressing in the short tubes.

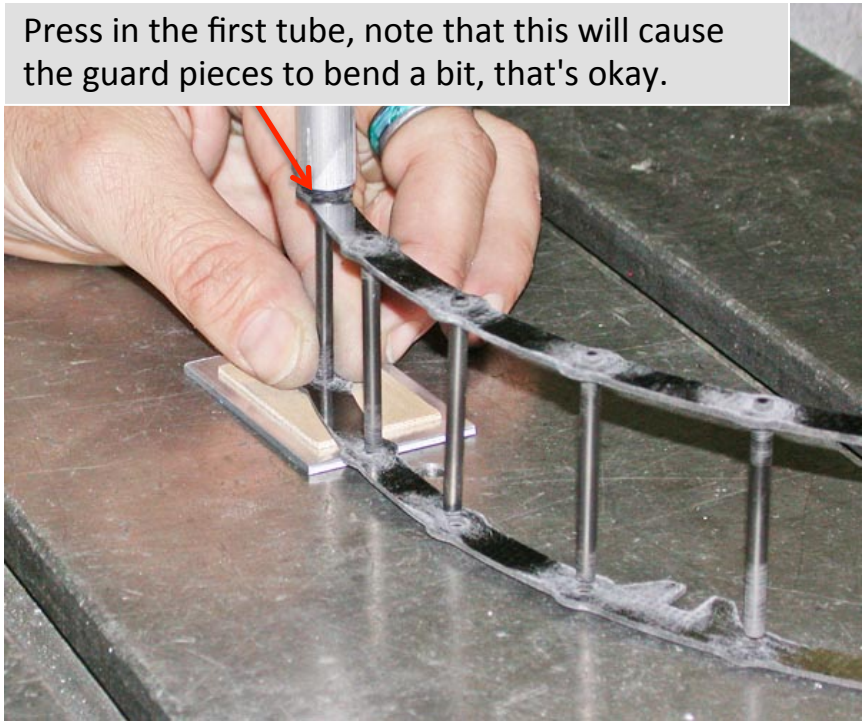


Flip over that assembly, and take a lower guard piece and alight the first two tubes, and get ready to press in the first one.

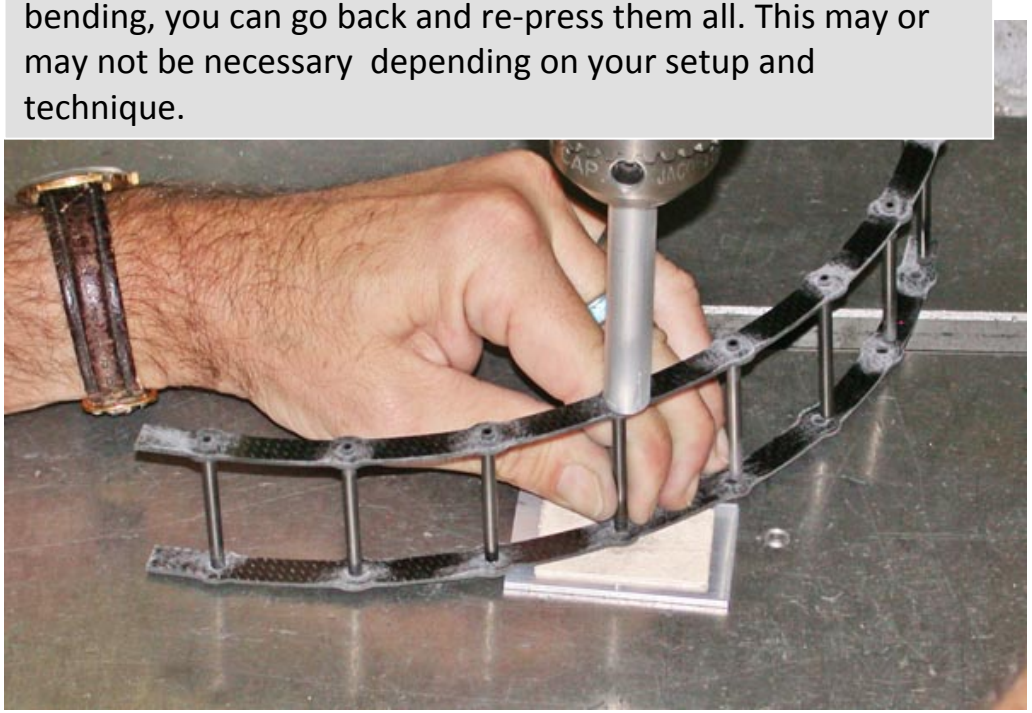
It should look like this when done, the friction should hold them firmly in place.

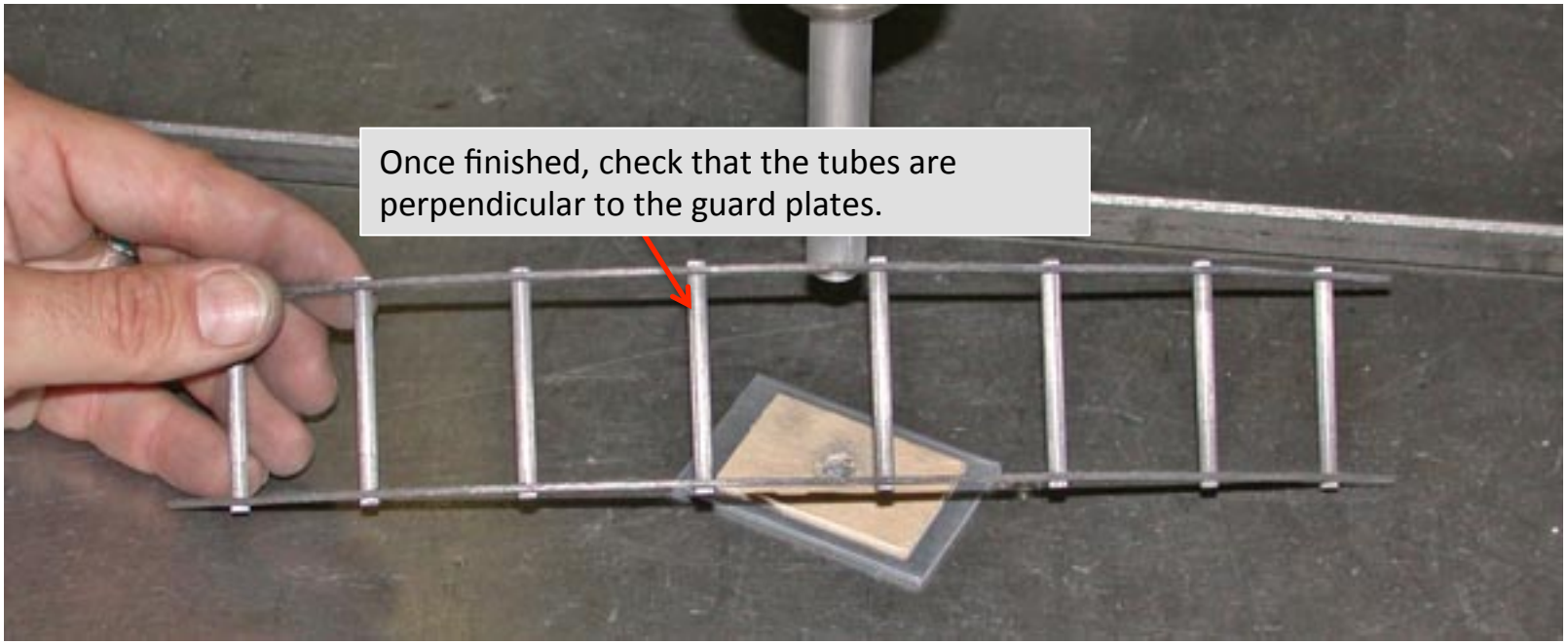


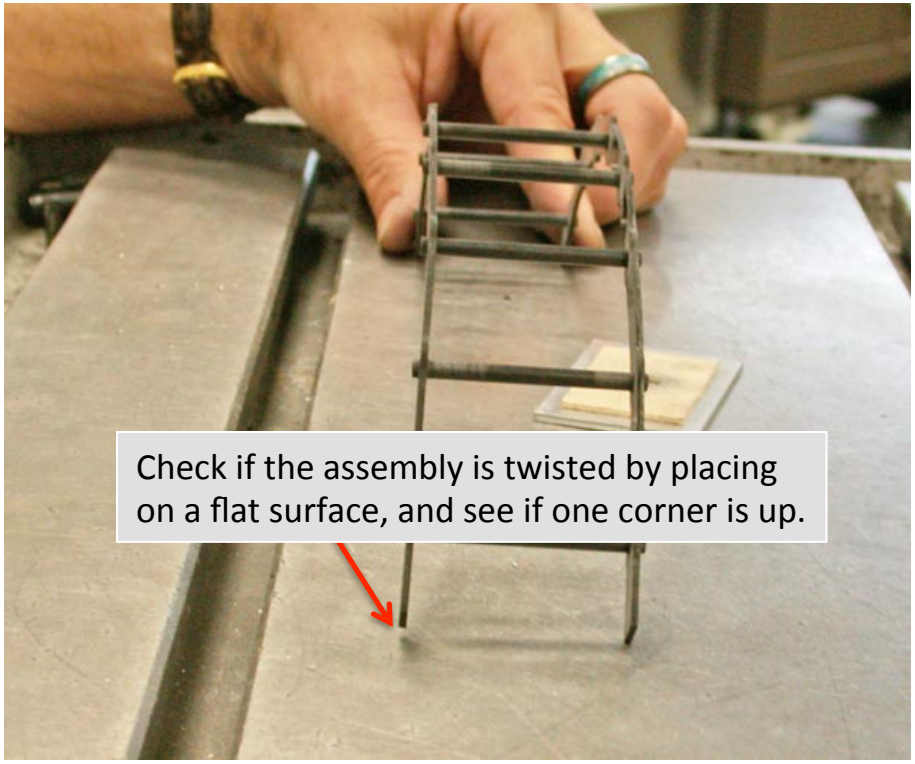
Press in the first tube, note that this will cause the guard pieces to bend a bit, that's okay.

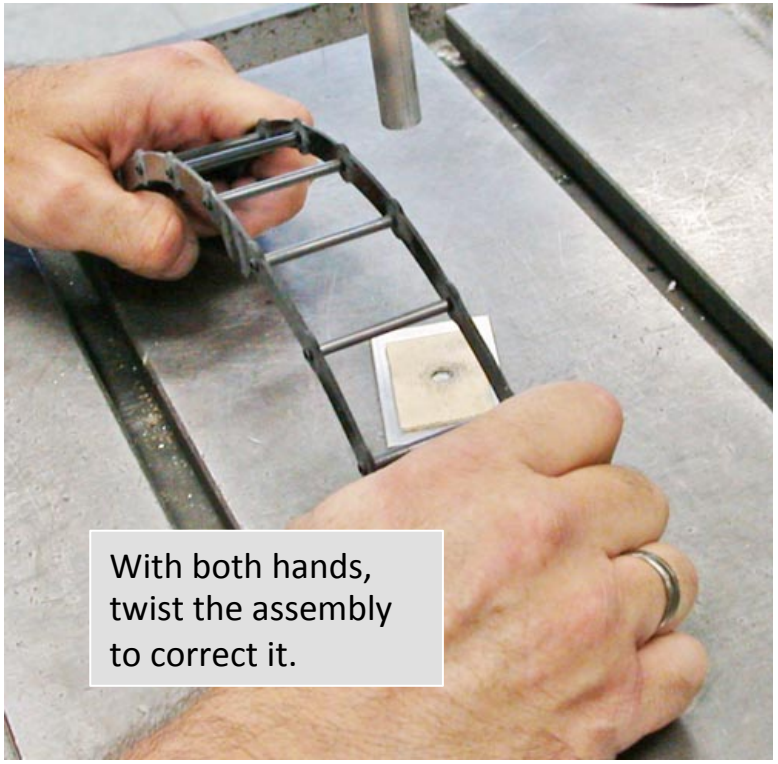


Press in all the tubes in the lower guard piece. Because of the bending, you can go back and re-press them all. This may or may not be necessary depending on your setup and technique.

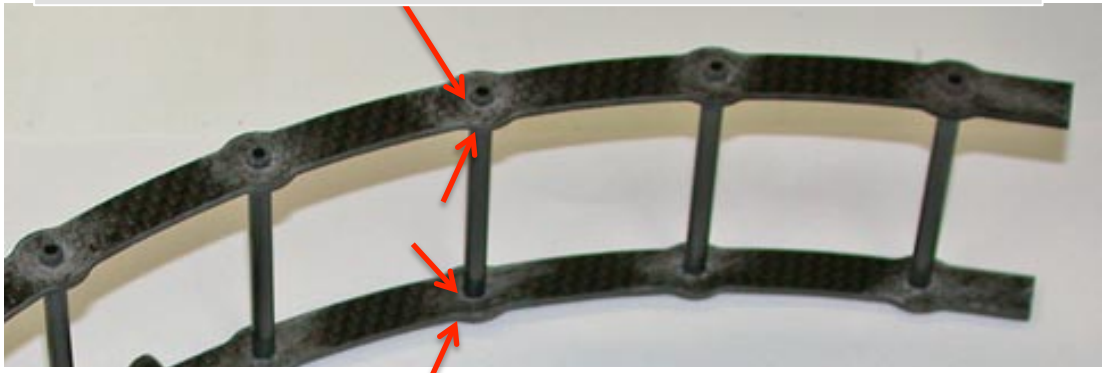


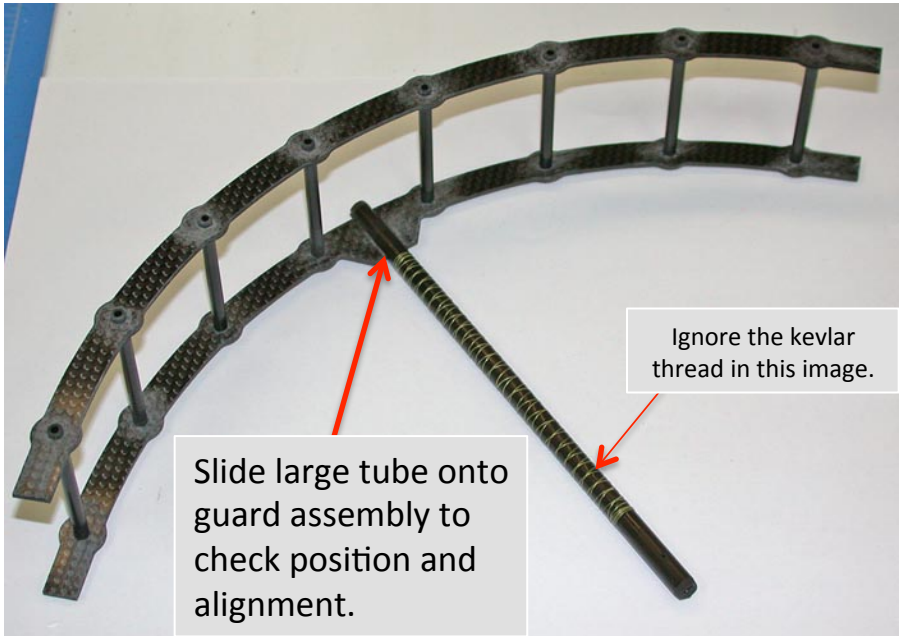


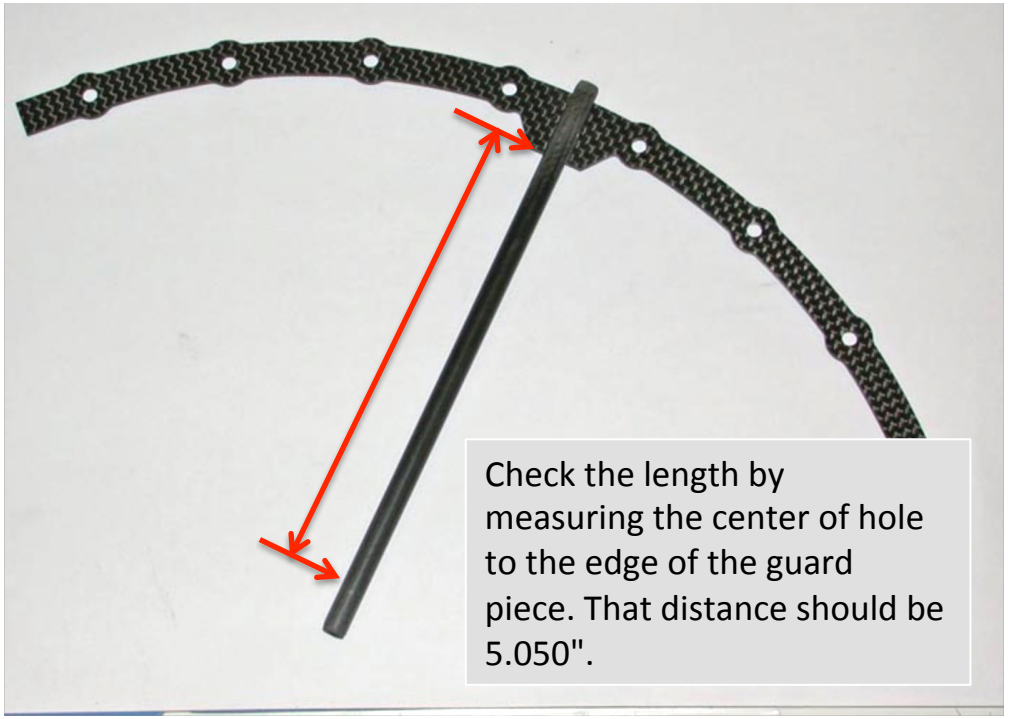


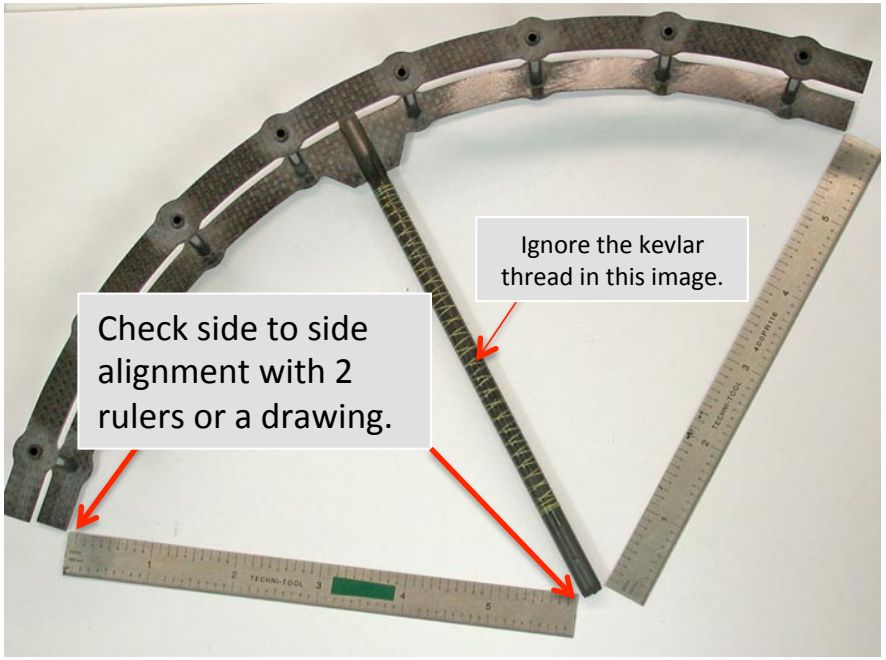


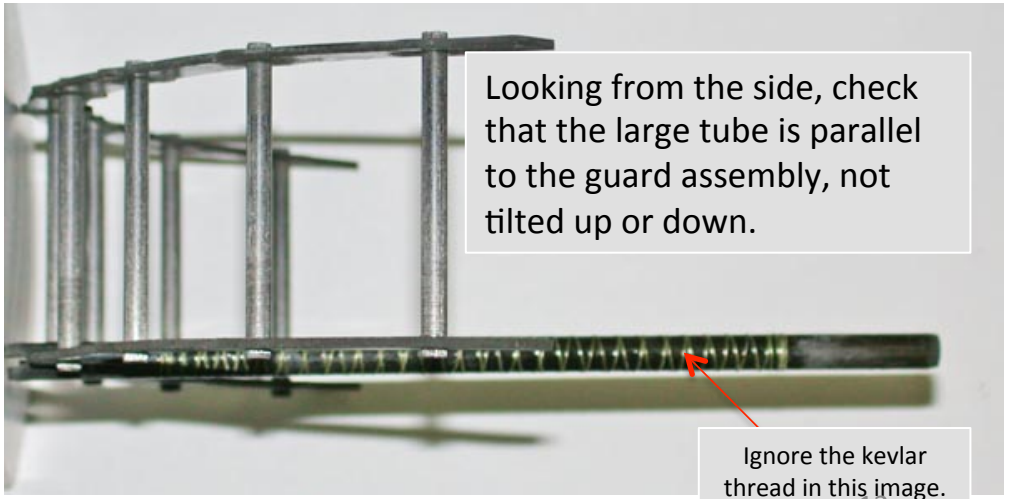
Then bond all of the tubes in place, top and bottom on all joints. Medium thickness CA glue is probably easiest. Epoxy is fine also. A syringe is probably good to use for epoxy.

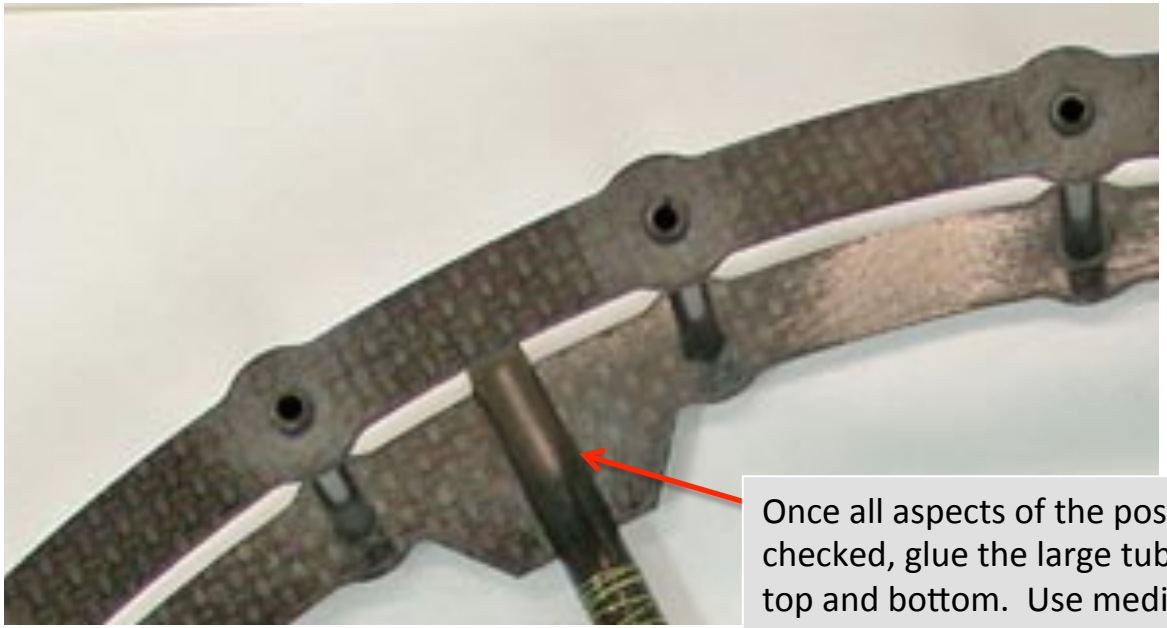



Ignore the kevlar thread in this image.
Slide large tube onto guard assembly to check position and alignment.

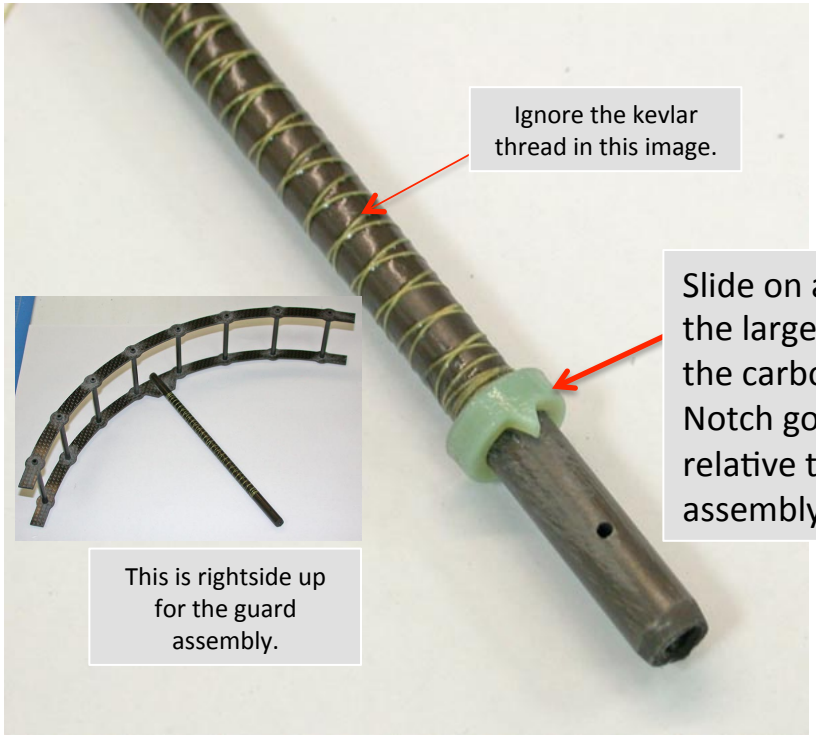

Check the length by measuring the center of hole to the edge of the guard piece. That distance should be 5.050".

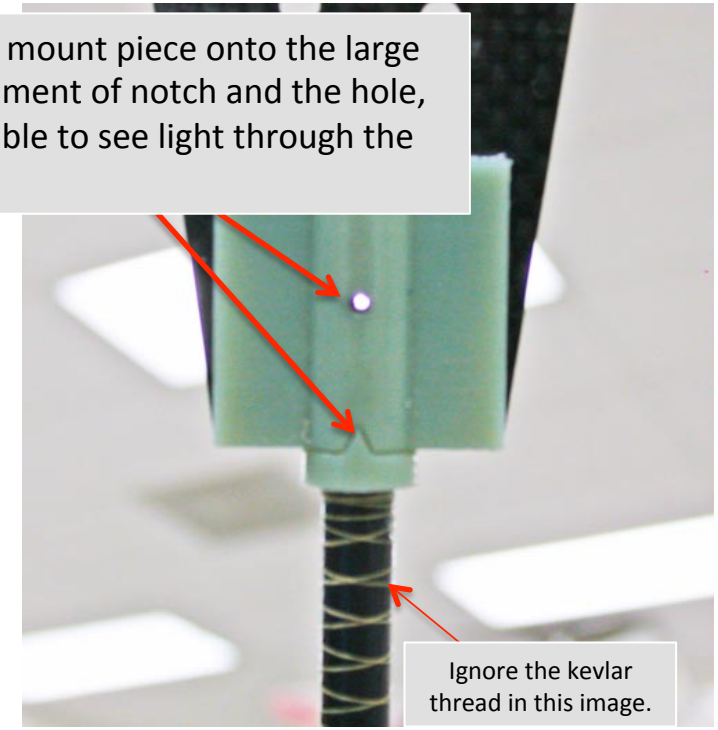

Ignore the kevlar thread in this image.
Check side to side alignment with 2 rulers or a drawing.

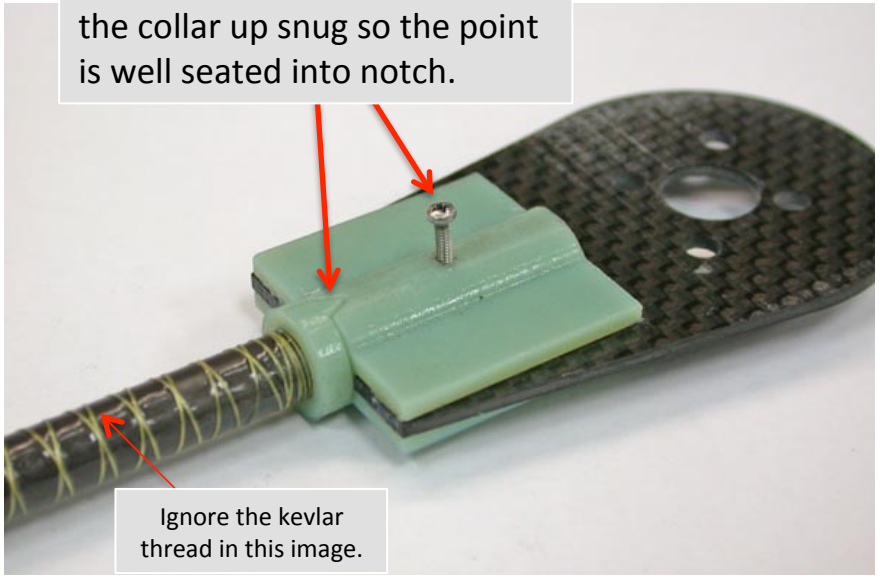

Looking from the side, check that the large tube is parallel to the guard assembly, not tilted up or down.
Ignore the kevlar thread in this image.

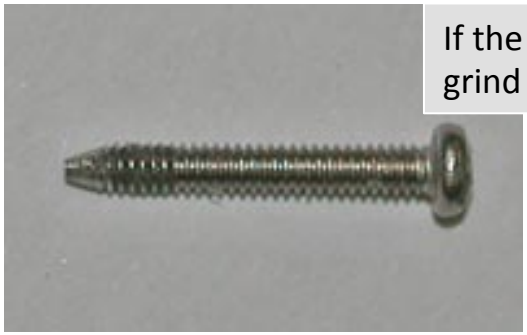


Once all aspects of the position and alignment are checked, glue the large tube to the guard assembly, top and bottom. Use medium CA glue or epoxy. This joint will be wrapped with Kevlar thread after this step, so you don't need to use a lot of glue on this step.

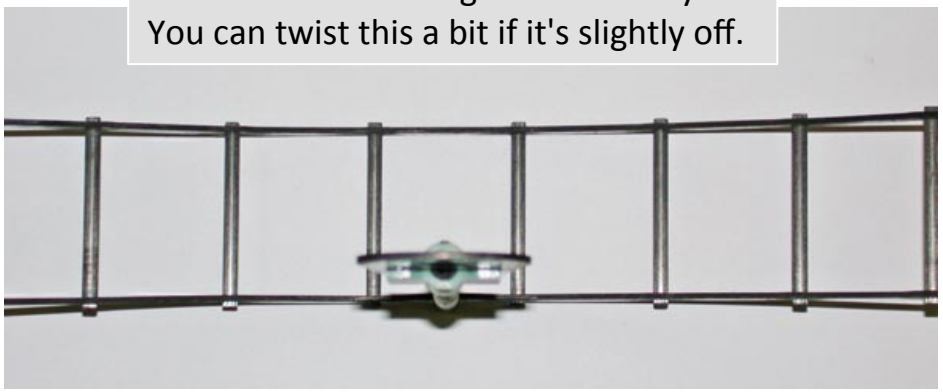

Ignore the kevlar thread in this image.
Slide on a collar with the large hole onto the carbon tube. Notch goes up relative to guard assembly.
This is rightside up for the guard assembly.


Push the motor mount piece onto the large tube, note alignment of notch and the hole, you should be able to see light through the hole.
Ignore the kevlar thread in this image.

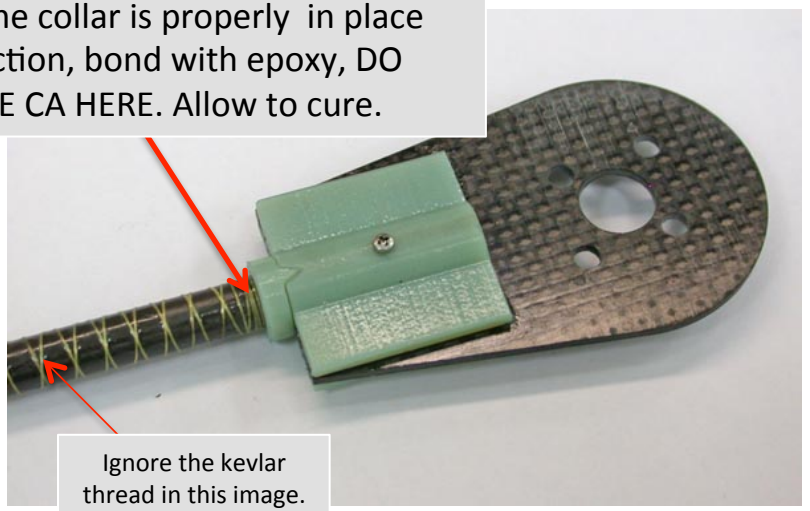

Install a screw into the hole, from the side shown. Also push the collar up snug so the point is well seated into notch.
Ignore the kevlar thread in this image.


If the screw is difficult to start, grind a point onto one.

Check the rotational alignment of the motor mount to the guard assembly. You can twist this a bit if it's slightly off.

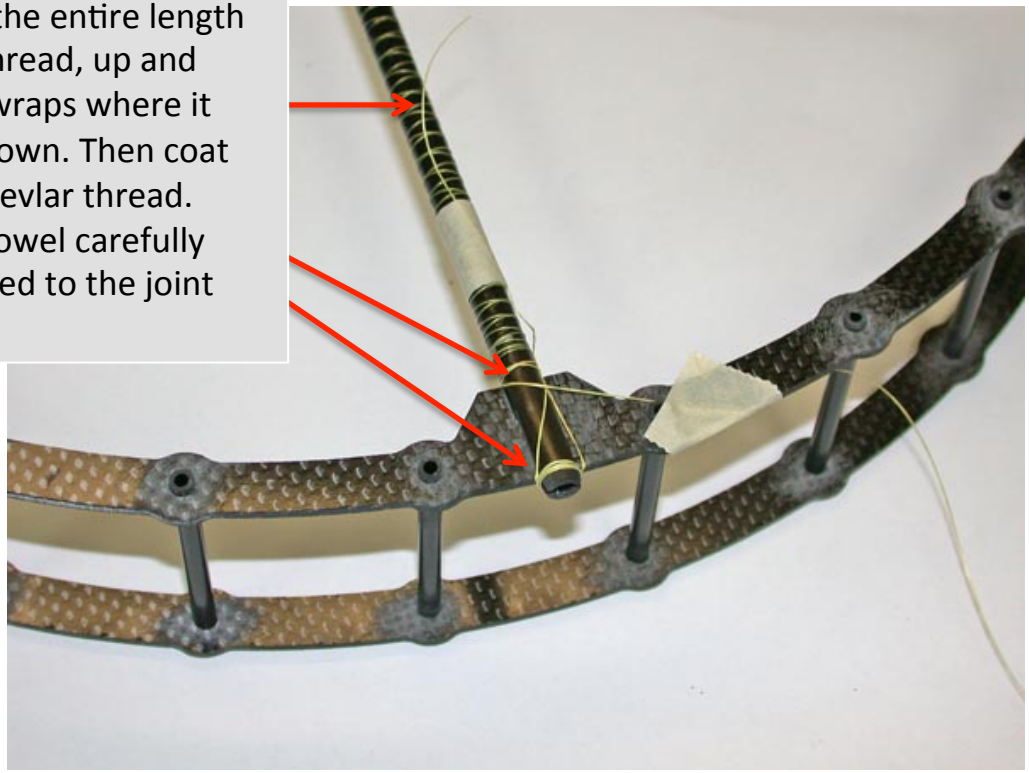


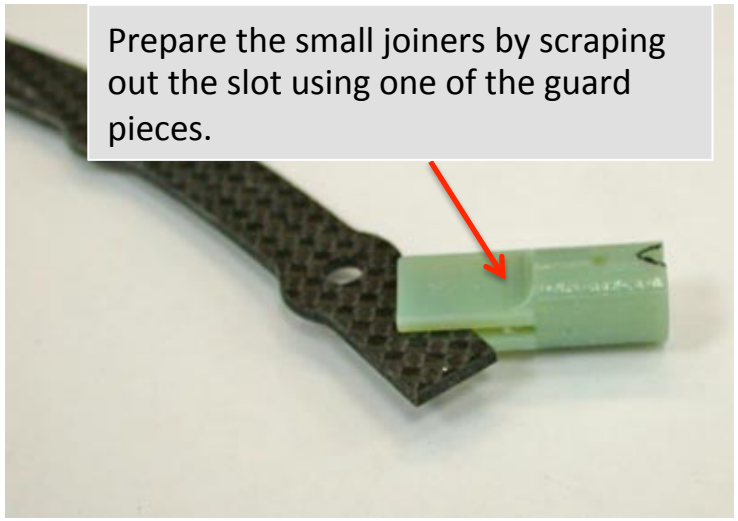
While the collar is properly in place with friction, bond with epoxy, DO NOT USE CA HERE. Allow to cure.

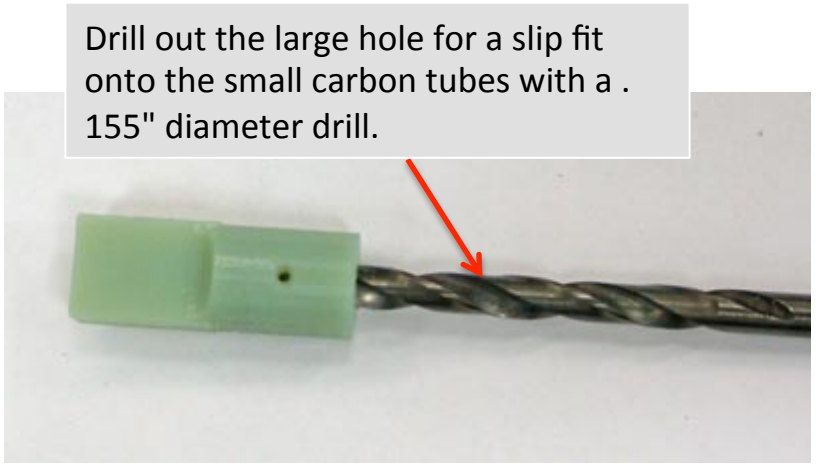


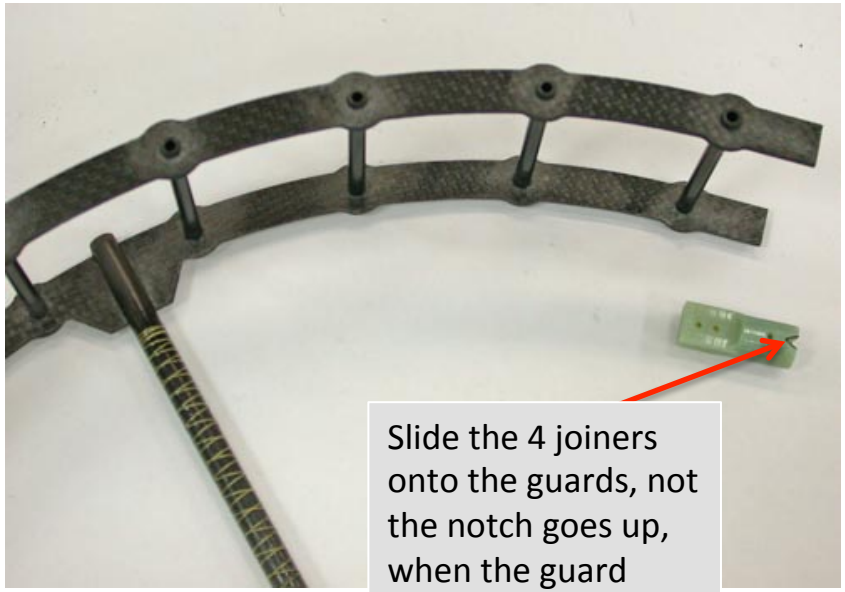
Ignore the kevlar thread in this image. Kevlar gets added in next step.

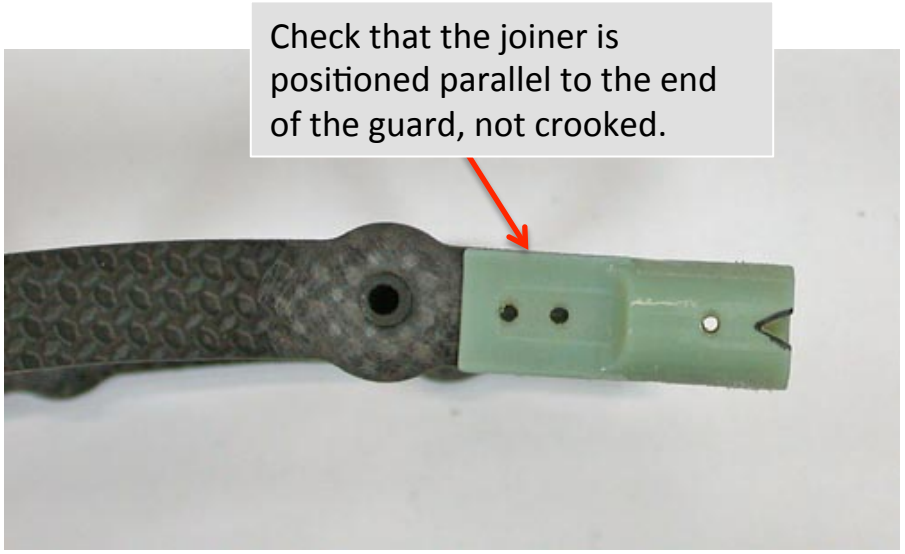
After the collar is cured, wind the entire length of the large tube with kevlar thread, up and down the length, and several wraps where it joins the guard assembly as shown. Then coat with thin CA glue all over the kevlar thread. Wipe the CA on with a paper towel carefully and quickly. Epoxy can be added to the joint afterwards for extra strength.



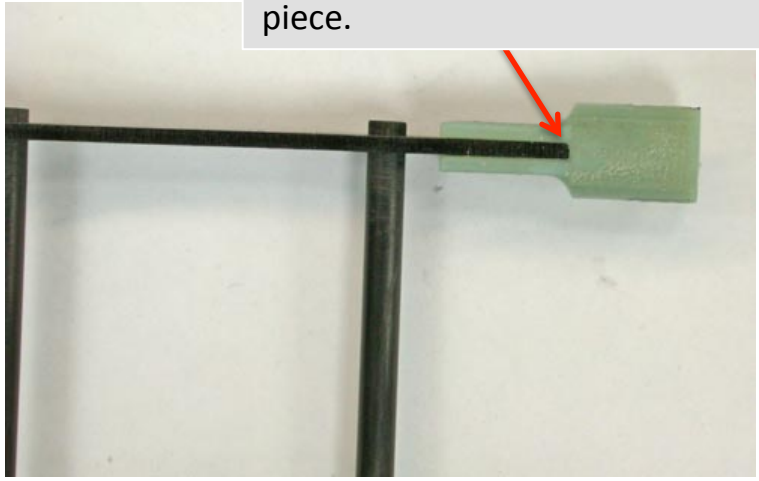

Prepare the small joiners by scraping out the slot using one of the guard pieces.


Drill out the large hole for a slip fit onto the small carbon tubes with a . 155" diameter drill.


Slide the 4 joiners onto the guards, not the notch goes up, when the guard assembly is rightside up. As shown.

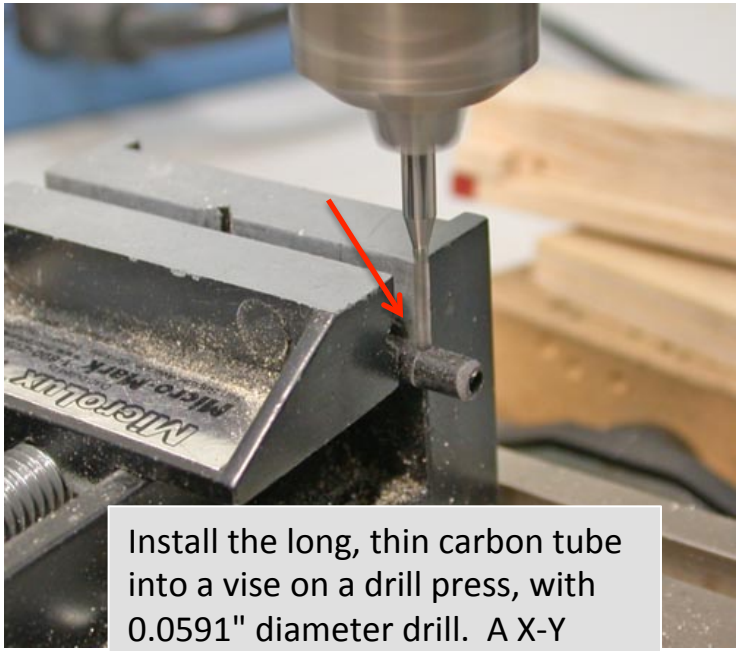

Check that the joiner is positioned parallel to the end of the guard, not crooked.

Check that the joiner is completely seated on the guard piece.

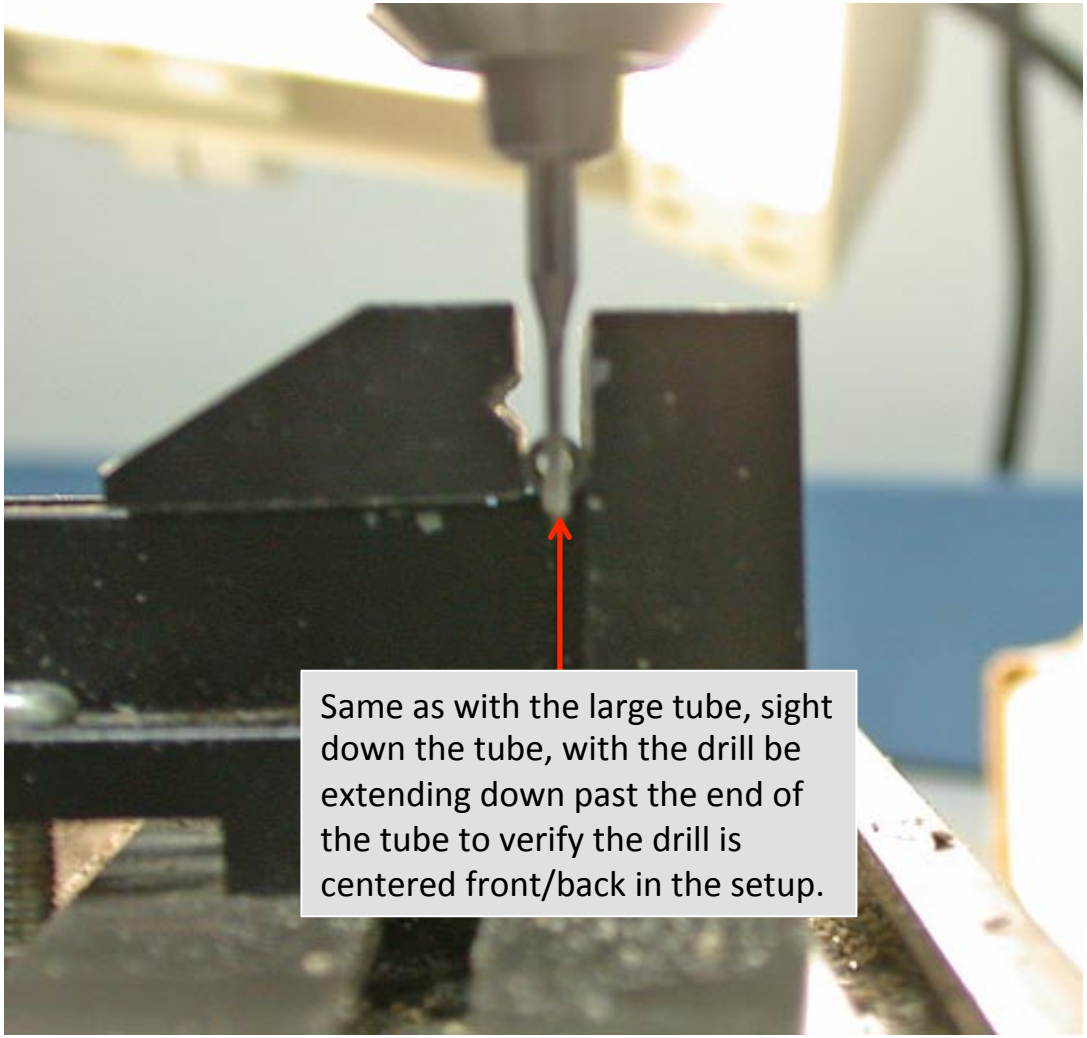


Glue the joiner onto the guard with CA glue or epoxy, be careful not to let glue harden inside the large hole. Drill out afterwards if necessary.

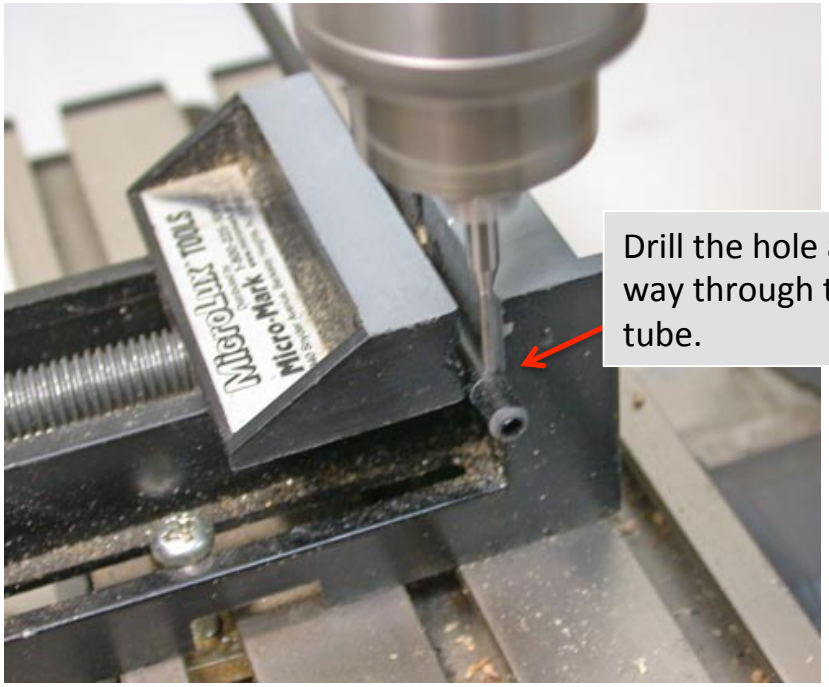
After installing all 4 joiners onto the guard assembly, this completes the guard assembly procedure. Make 4 of these.



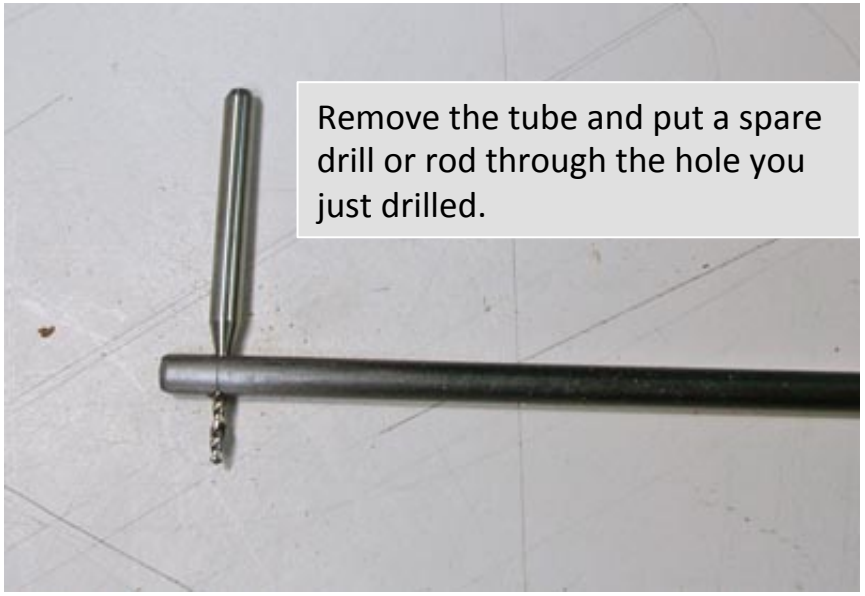
Install the long, thin carbon tube into a vise on a drill press, with 0.0591" diameter drill. A X-Y table and good vise is preferred. The hole center should be 0.230" from the end of the tube.



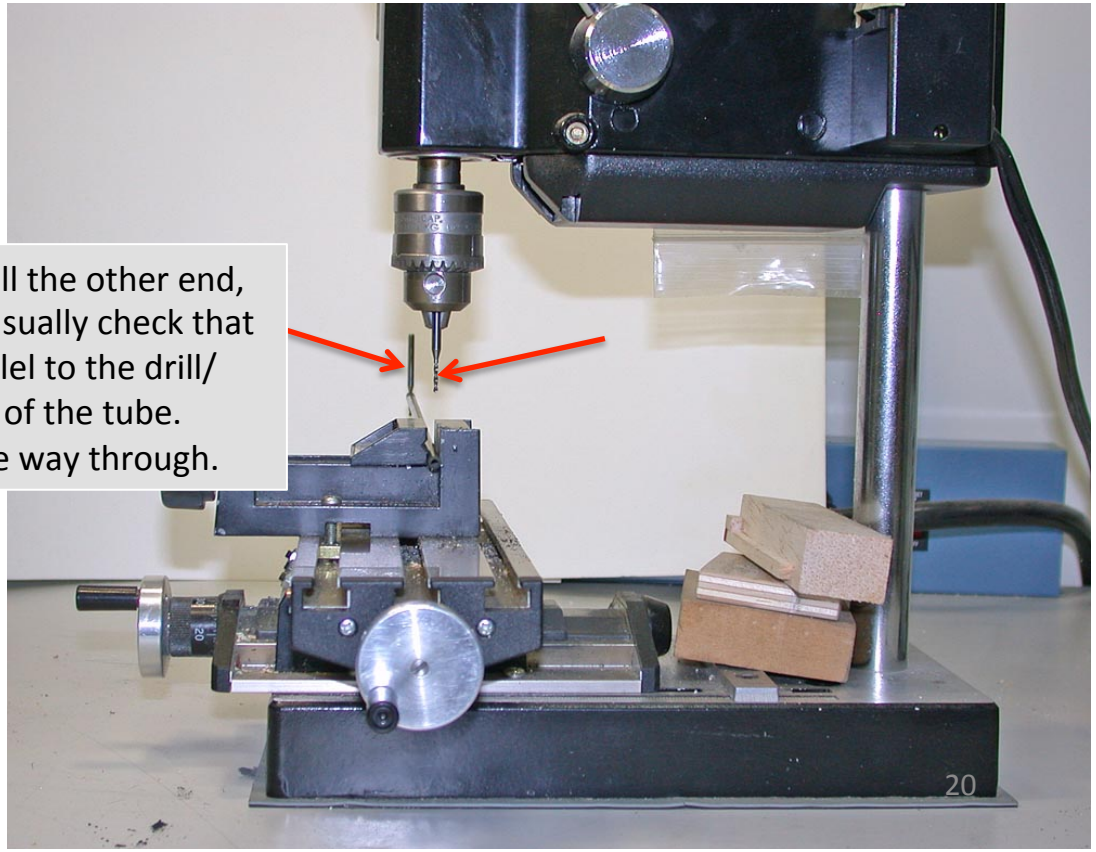
Same as with the large tube, sight down the tube, with the drill be extending down past the end of the tube to verify the drill is centered front/back in the setup.



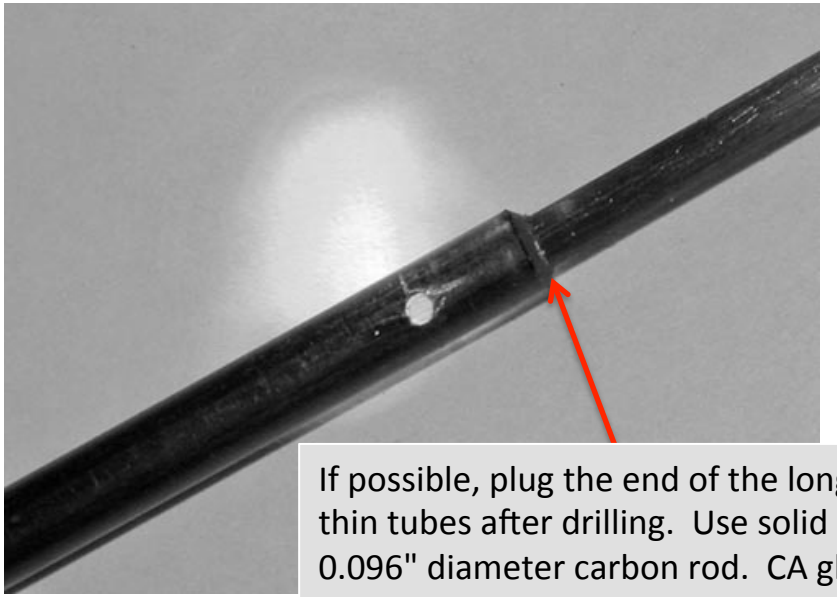
Drill the hole all the way through the tube.



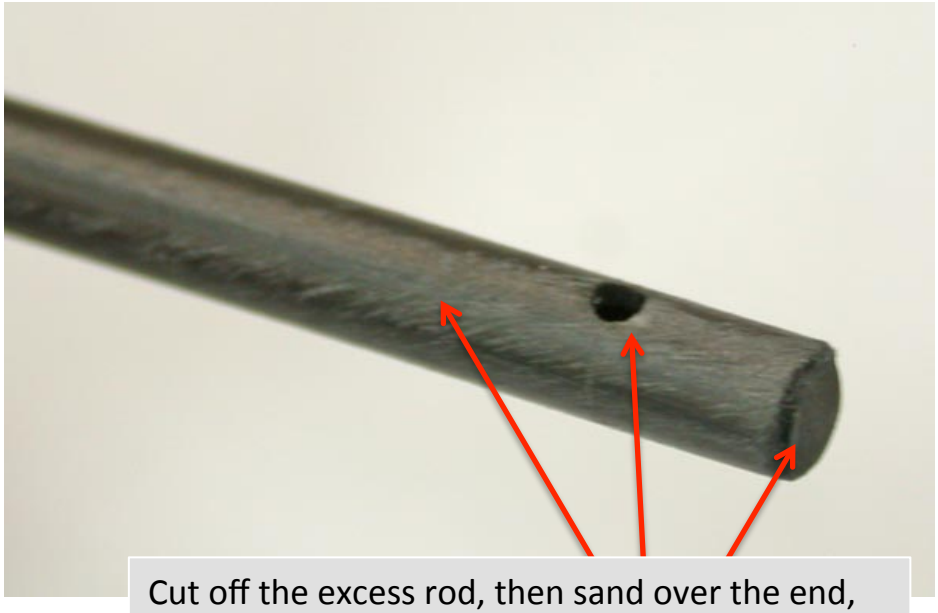
Remove the tube and put a spare drill or rod through the hole you just drilled.



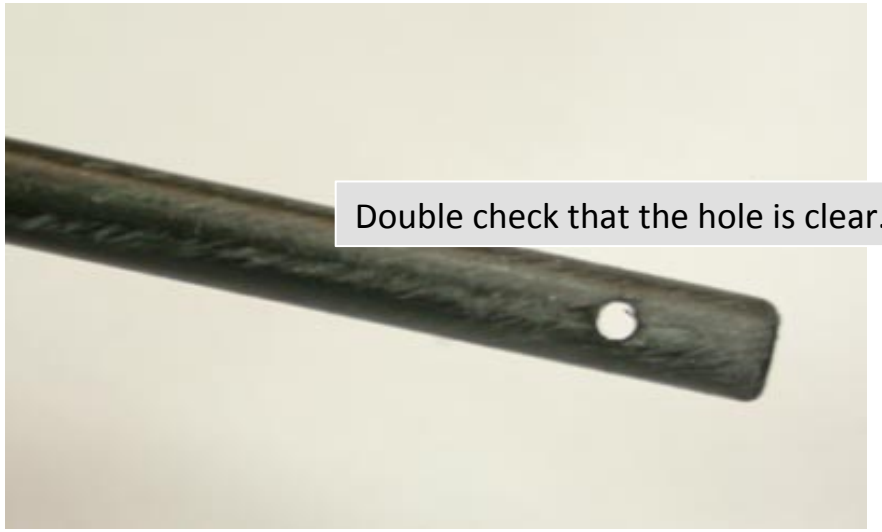
Clamp the tube in the vise to drill the other end, same as the first one, but also visually check that the drill in the drill press is parallel to the drill/ rod sticking up from the far end of the tube. Then drill the second hole all the way through.



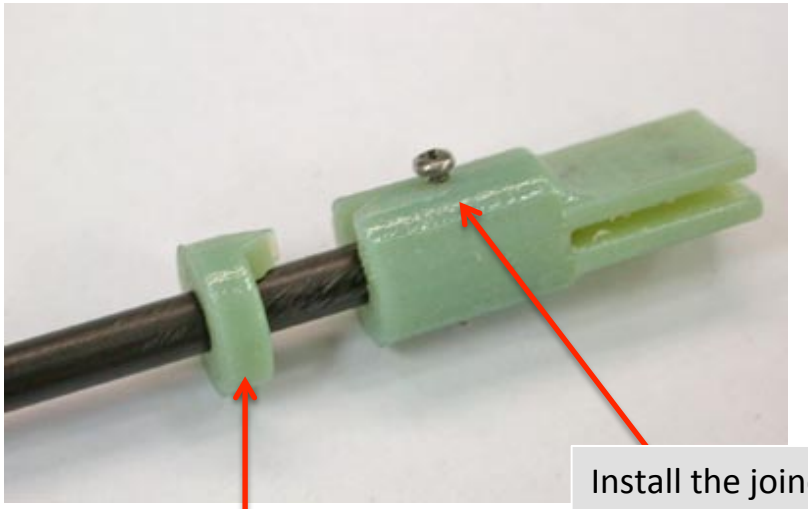
If possible, plug the end of the long, thin tubes after drilling. Use solid 0.096" diameter carbon rod. CA glue the rod into the end as shown, don't cover the hole.



Cut off the excess rod, then sand over the end, and sand the tube around the hole to remove and burrs, and prep the surface for gluing of the collars.

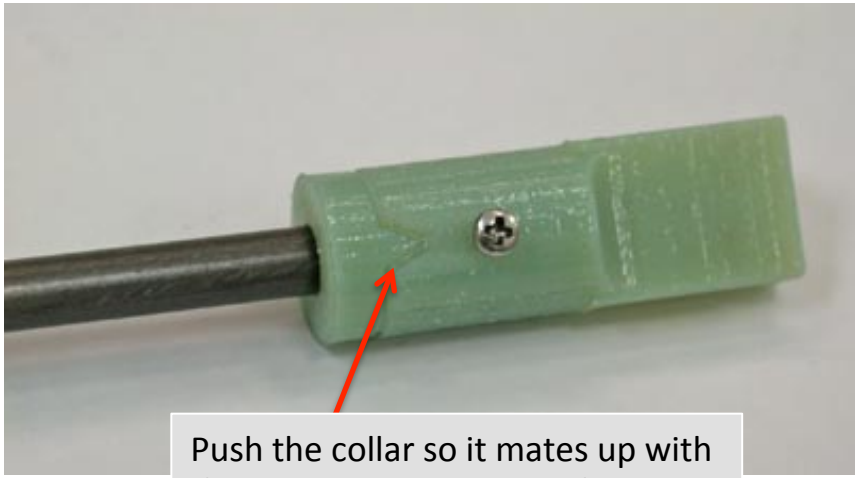


Double check that the hole is clear.

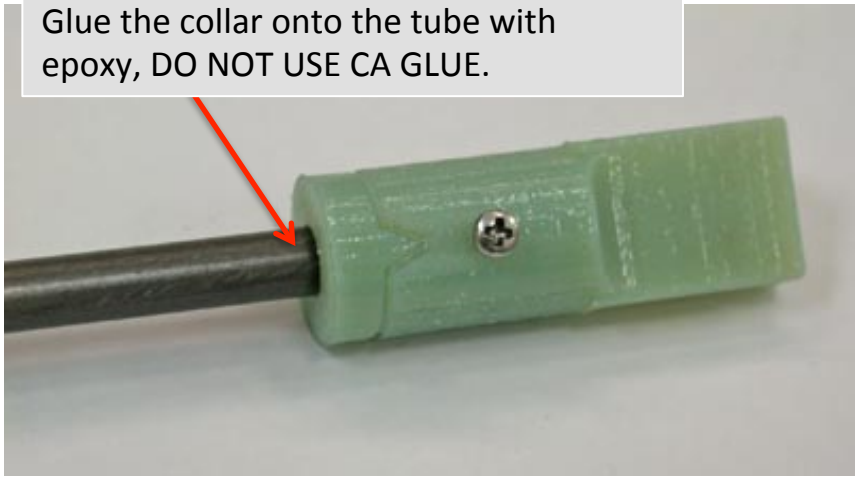


Slide a small collar onto one end of the tube.

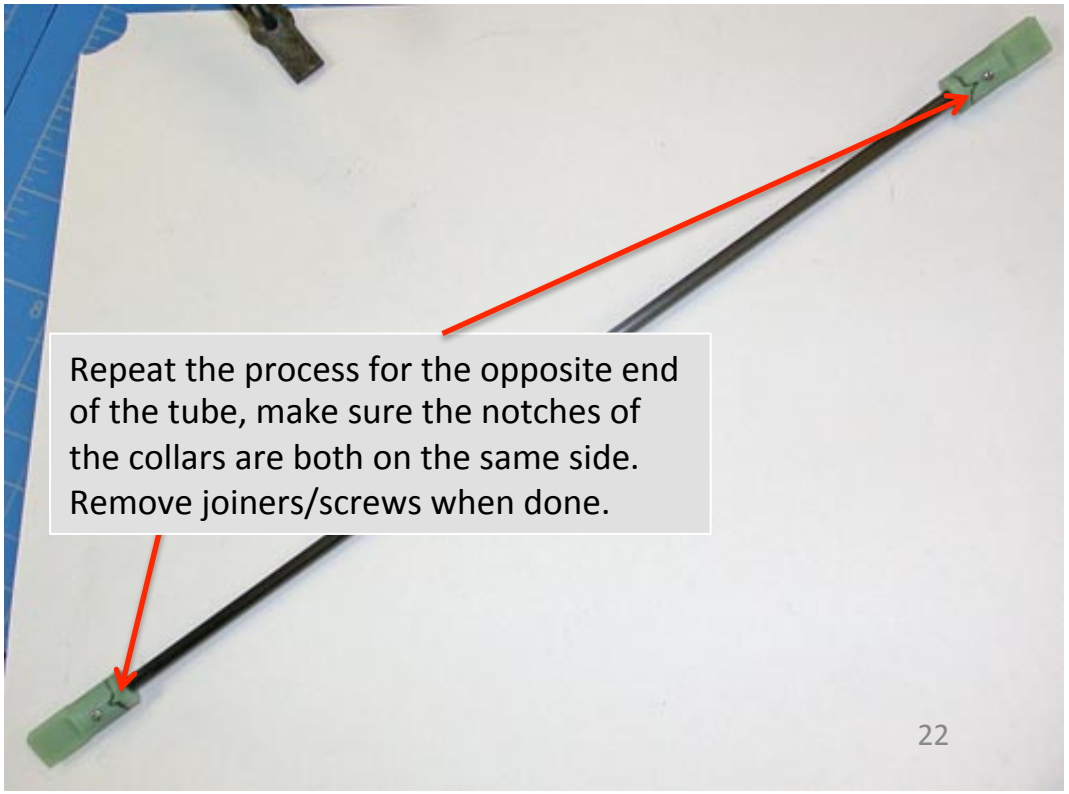
Install the joiner and screw. Use a pointed screw if necessary.



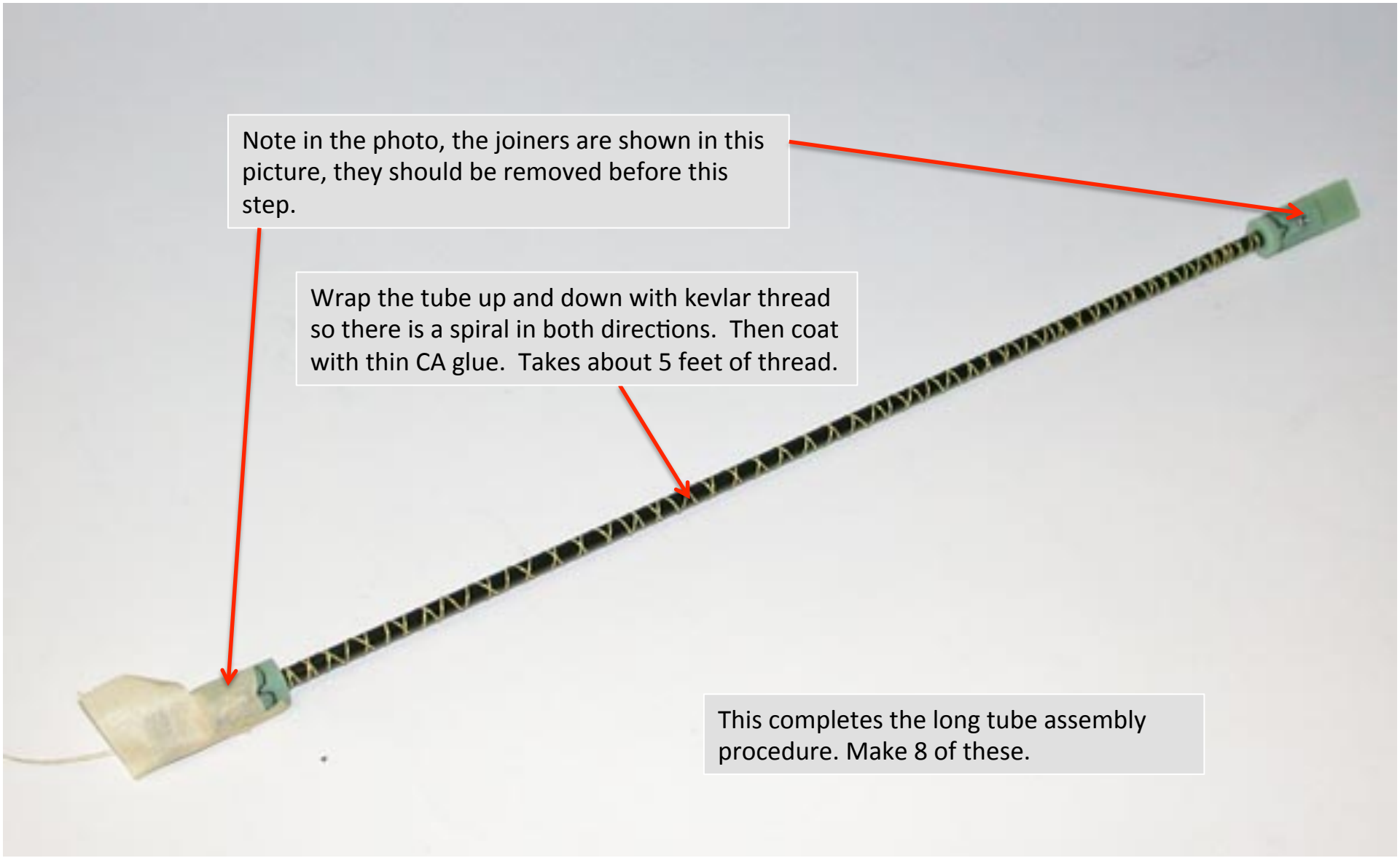
Push the collar so it mates up with the joiner, point into notch.



Glue the collar onto the tube with epoxy, DO NOT USE CA GLUE.



Repeat the process for the opposite end of the tube, make sure the notches of the collars are both on the same side. Remove joiners/screws when done.


Note in the photo, the joiners are shown in this picture, they should be removed before this step.
Wrap the tube up and down with kevlar thread so there is a spiral in both directions. Then coat with thin CA glue. Takes about 5 feet of thread.
This completes the long tube assembly procedure. Make 8 of these.

This completes the steps to build all of the prop guard sub-assemblies.

To install the prop guard cage onto the aircraft for the first time:

1. Install the new motor mount piece under the motor, note notch goes up. Use long motor mounting screws, not the factory supplied DJI ones. Do not tighten down firmly, allow the motor mount to move a bit, they will be tightened at the end.
2. Take two of the prop guards, and install 4 of the long tubes into each of them.
3. Slide the two prop guards with the long tubes on the motor mounts on opposite sides of the vehicle, but do not insert all the way, leave about a ¼" gap.
4. Install the other 2 prop guards, again leaving around a ¼" gap.
5. Flex the assembly as necessary, and insert the long tubes into all of the prop guards, so all of the long tubes are inserted, at least a little bit.
6. Insert the prop guards into the motor mounts further, and then insert the long tubes into the prop guards a bit further, and keep going around the vehicle doing this until everything is fitted tightly.
7. Install all of the small screws, there are 20 total.
8. Then tighten the 4 screws under each motor.
9. This completes the first installation process.
10. To remove the prop guard cage, do the same process in reverse, but don't touch the motor mounting screws. Just remove the 20 tiny screws.