

Finishing Composites

The dos and don'ts for paint preparation
30 July AirVenture 2021

Michael Bergen
Custom Technologies LLC
443.597.3720
dmbergen@customtechllc.com
www.customtechllc.com

Richard Kaczmarek
Aviation Composites LLC
937.243.7303
aviationcomposites2018@gmail.com
www.aviationcomposites.net

Description

- Many builders are using antiquated body shop techniques to ready their composite airframes and pieces for paint resulting in unnecessary added weight and potential coating failure.
- Further, builder groups perpetuate the practice of flawed techniques claiming success.
- The dos and don'ts and helpful techniques of readying composite surface for paint application will be presented to provide a lightweight and lasting finish.

Aerodynamic Fairing Putty

- No Bondo directly on epoxy substrate!
- No spot glaze putty



SmittysRV.com Fiberglass 101



- What not to use:
 - West System Epoxy (WEST System Epoxy has T_g of only 130F)
 - Microlight 410
 - Acetone / Lacquer thinner (possible 5% recycled = bond breakers)
 - Do not use WEST System 410 Microlight as it is a plastic sphere
 - Expands in solar heat if under a dark color

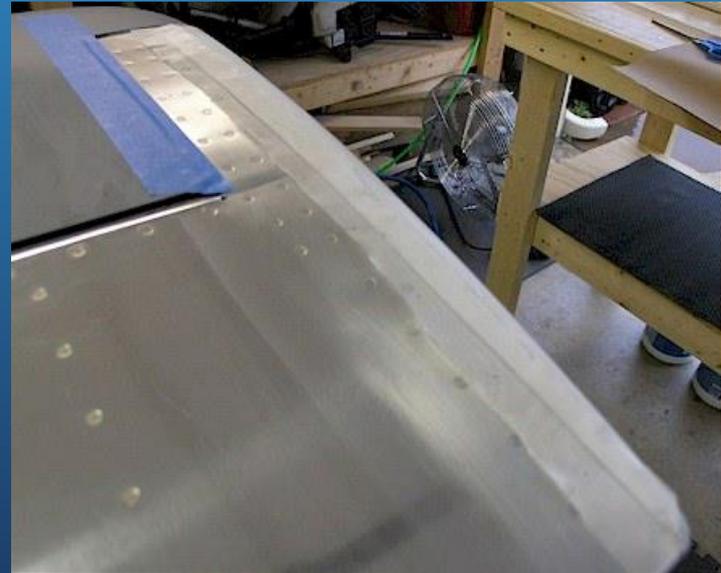
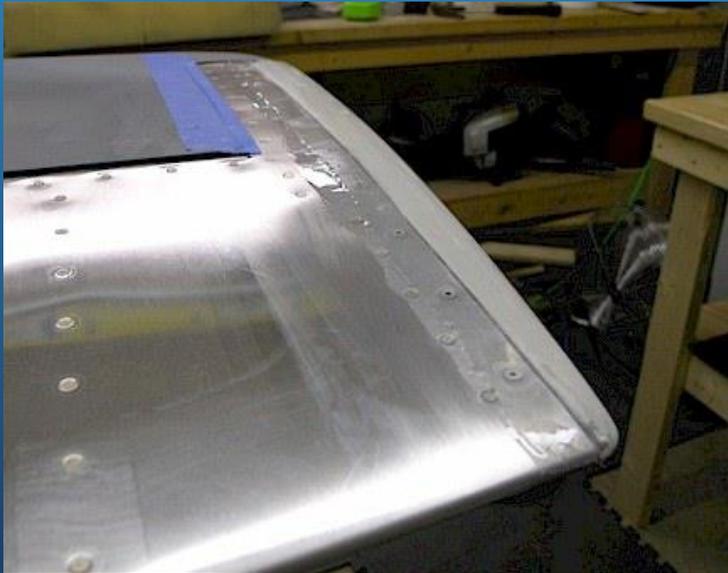
SmittysRV.com Cont.

- What to use:
 - Recommend ProSet, MGS or PTM&W epoxy
 - Higher temperature tolerance (heat distortion temp or T_g)
 - These epoxies have T_g around 180F
 - +95% isopropyl alcohol (medical and laboratory regulated)



SmittysRV.com Cont.

- “First I scuffed up the surface of the aluminum and fiberglass tips with a scotchbrite pad where the fiberglass tip and aluminum meet and then cleaned it off with lacquer thinner. Then I cut a thin strip of 1.5 oz lightweight fiberglass cloth and layed it over junction between the aluminum and the fiberglass tip.”
- The interface between the fiberglass and the metal will eventually crack



SmittysRV.dot com Cont.

- Do not use polyester or vinyl ester putties /fillers directly over epoxy substrate
 - The amines in the epoxy frustrate the cure
 - Can use over primed surfaces
- “Then I used a plastic spreader and put an initial thin coat over the resined area.” Yet the photo on the right shows putty applied over primer.



SmittysRV.com Cont.

- Why build in aluminum and want your plane to look like a composite!?



Proper Aluminum Prep

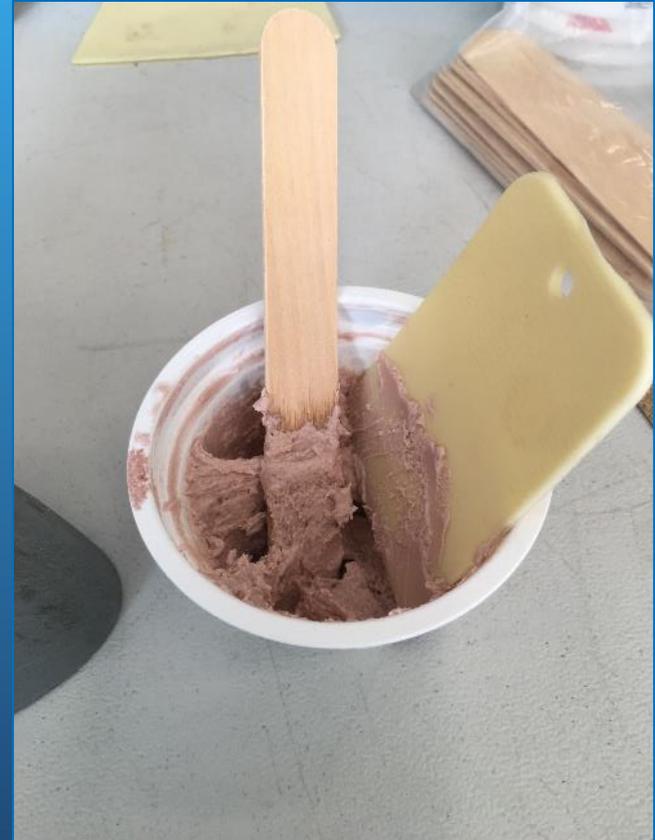
- Etch with Phosphoric Acid (PPG DX-330 or equivalent)
 - 4 minutes with Scotch pad
- Rinse well with fresh water and dry quickly
 - Use paper towels not cloth rags (bond breaker)
- Apply 3M AC-130 (Sky Geek has in stock)
- Let air dry in accordance with instructions
 - Go to lunch or dinner
- Apply resin and fiberglass using common practices

Dry Micro Mix

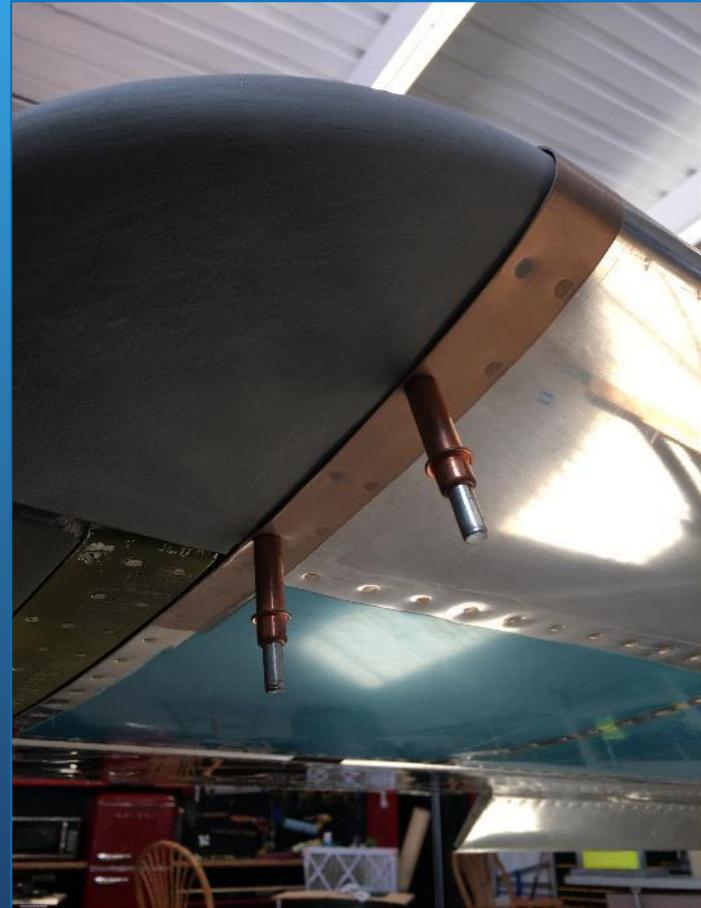
- Need materials:
 - Epoxy resin Glass microspheres
 - Mixing cups
 - Tongue depressor(s)
- Mix small quantity of epoxy resin (mix thoroughly for ≥ 2 min)
- Add micro-balloon a little at a time with tongue depressor and keep stirring
- Continue adding balloons until peanut butter consistency

Dry Micro Mix Cont.

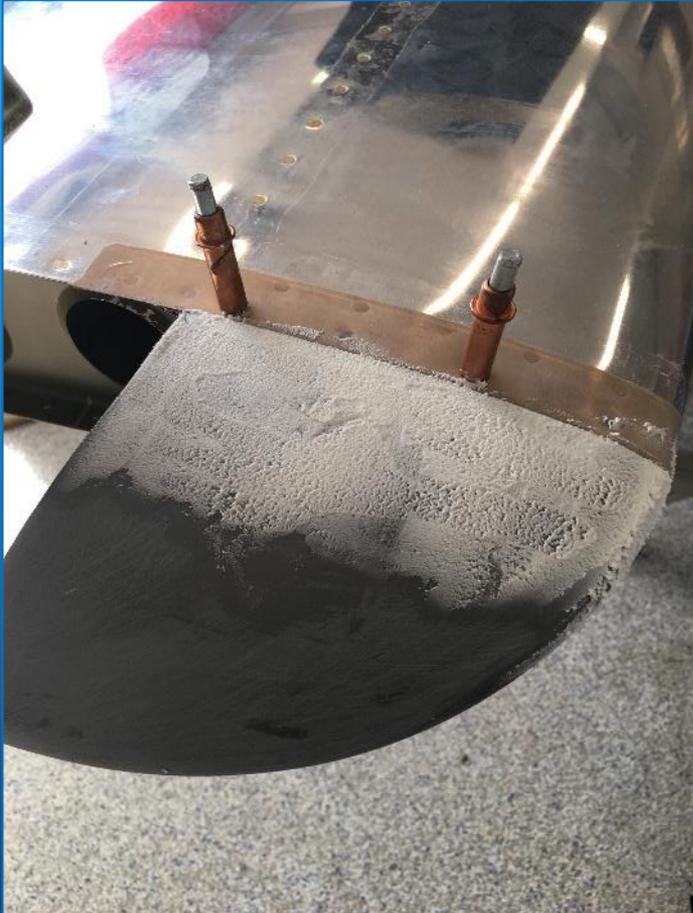
- Mix check consistency:
 - Make peaks of micro by pulling up with tongue depressor
 - Tip of peak should stand up and not curl over
 - When getting close to this consistency add very little balloons at a time as it changes over quickly
 - Don't want to have to mix and have to add more epoxy



Epoxy Putty Approach



Epoxy Putty Approach



Multiple Steps Required

- 2nd Coat



Preparing the Seam

- Common for seam to be raised
 - Need to sand flush
 - There is a technique for this
 - Assured to go through gel coat
 - Voids will be exposed as a result
- Sand with 80 grit paper & flexible sanding pad
 - Sand to the edges
 - Sand at plus-minus 45°
 - Don't hesitate to expose voids
 - Pick off the 'skin' over hidden void (could blister later)

Sanding on Seam $\pm 45^\circ$



Sand to the edge using a proper sanding pad.

RV-10 Wingtip Bubble Buster

Voids



Pick



'Popped Bubbles'

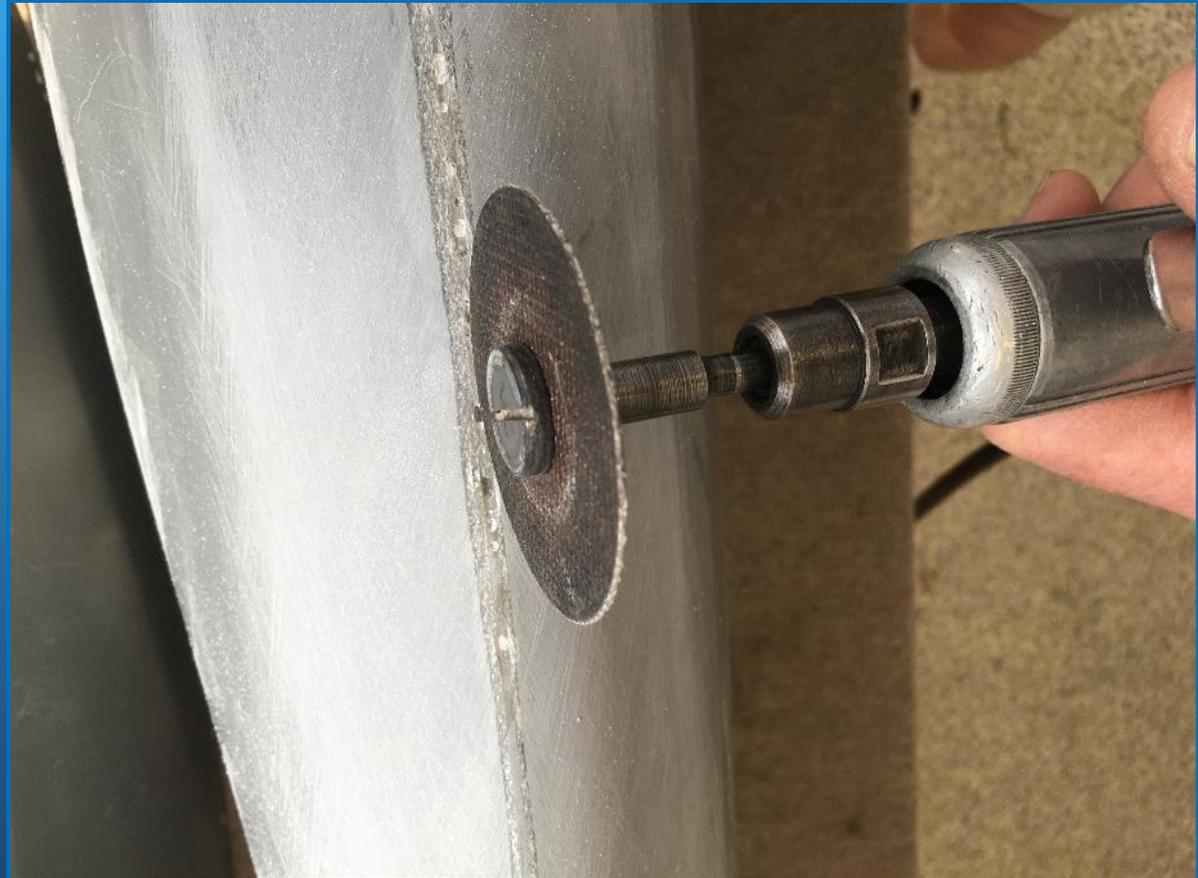


Picked voids have sharp edges the need to be dressed

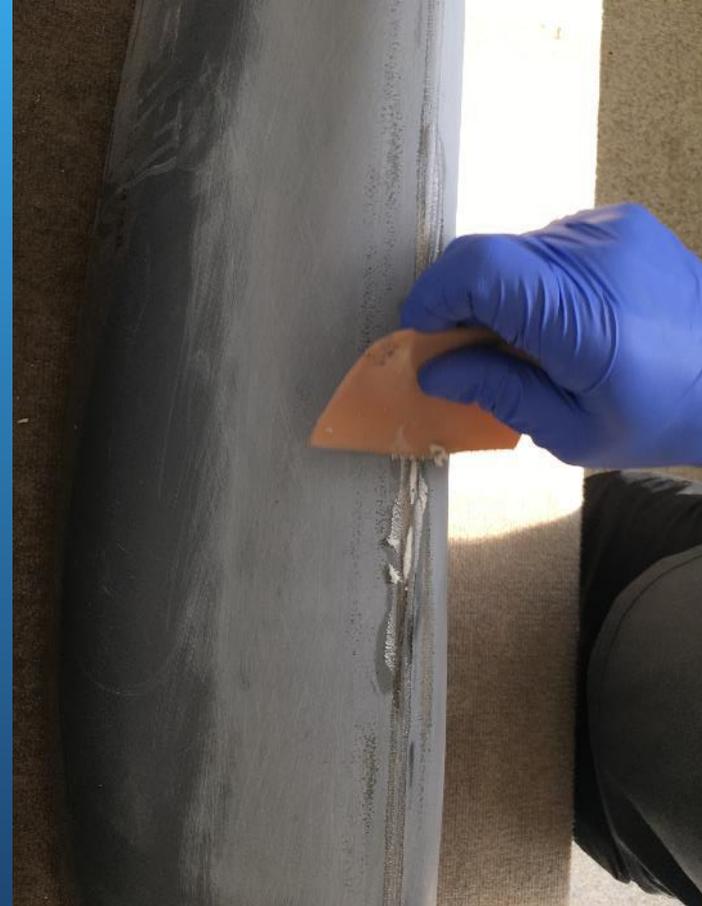
Bubble Busters Continued

Die Grinder
Or
Dremel Tool

GO EASY!!



Filling Seam Voids with Micro Putty



2nd Coat Wipe of Micro



Light Sand Ready to Prime

Pinhole Busters



- Common to have pinholes in composite parts
- Need to fill pinholes prior to painting as primer alone will not fill them (even high build primers)
- Use 'epoxy wipe' to fill pinholes
- Use Loehle Wonder-Fil to fill pinholes

Epoxy Wipe

- Sand and clean the surface (careful using compressed air that may contain water and oil)
- Wipe with 98% isopropyl or denatured alcohol
- Mix and wipe neat epoxy with rubber edge squeegee
- **!!DO NOT THIN WITH ALCOHOL!!**
- Let cure and sand
- Check for any remaining pinholes
- Repeat as needed
- Hint: only as much as needed

Loehle Wonder-Fil

- Suitable for fiberglass, carbon fiber or sanding scratches on wood
- Quick wipe on
- Wait 15 minutes
- Wipe off
- Disappears with the next sprayed coating layer

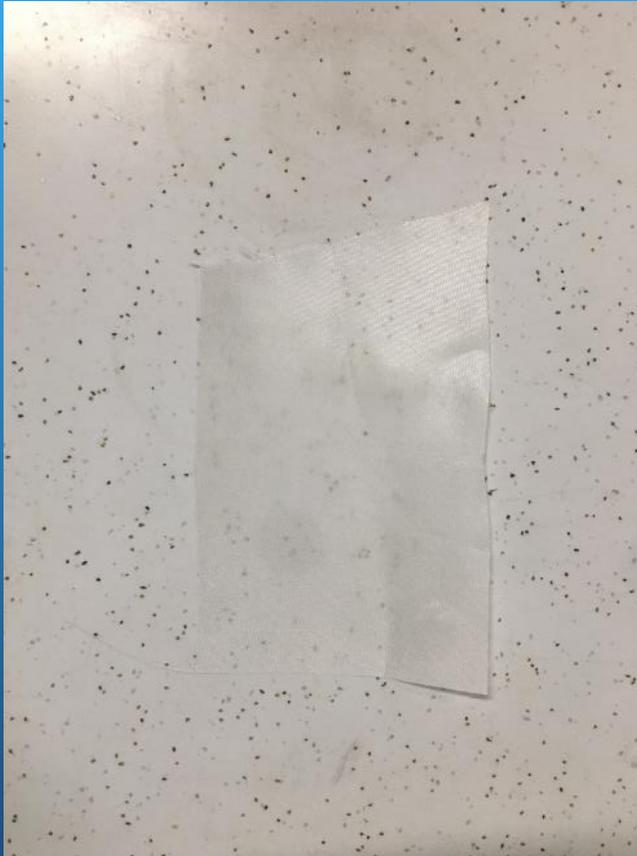
Composite Tips



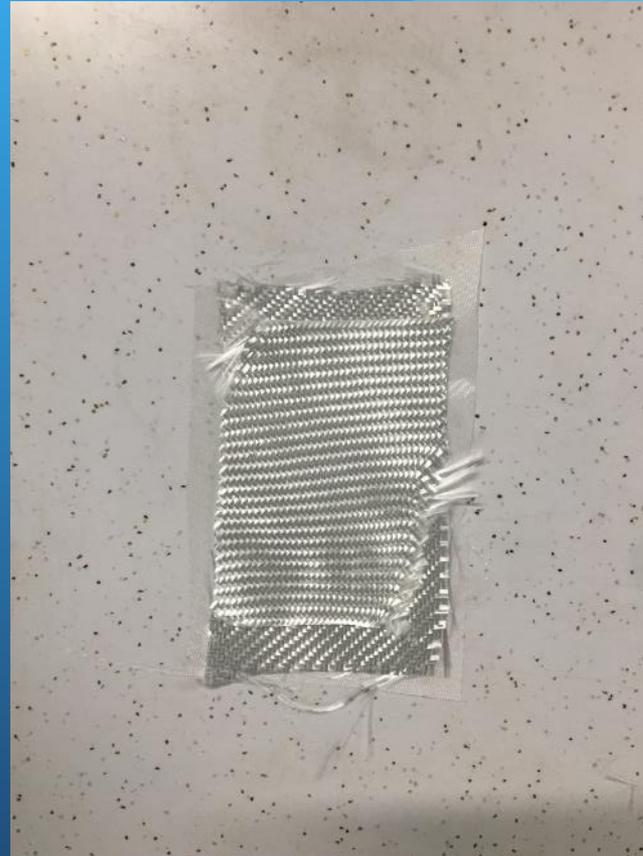
Fillet Fabrication

- Needed:
 - Mold released surface (glass or Formica)
 - Peel ply
 - 7725 glass fabric (Rutan fabric)
 - Resin
- Peel ply against flat surface
- Three plies of cloth wetted out with resin
- Peel ply on top

Fillet Fabrication Cont.

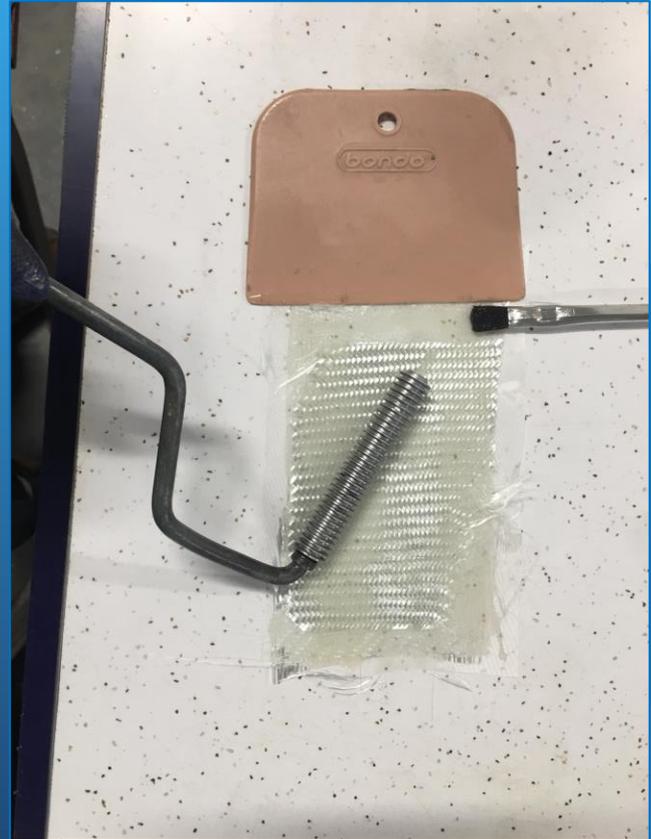


Peel Ply

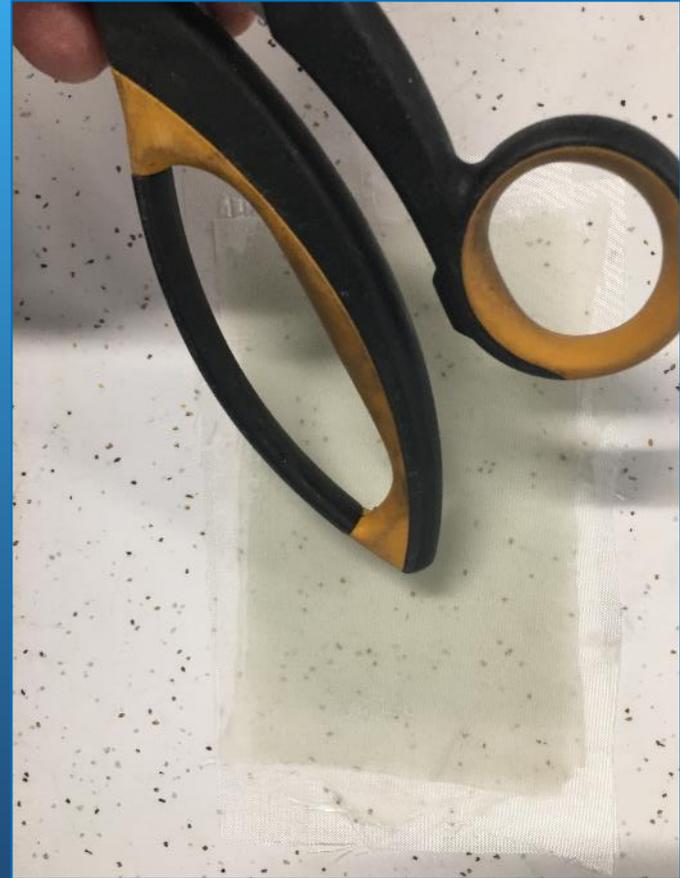
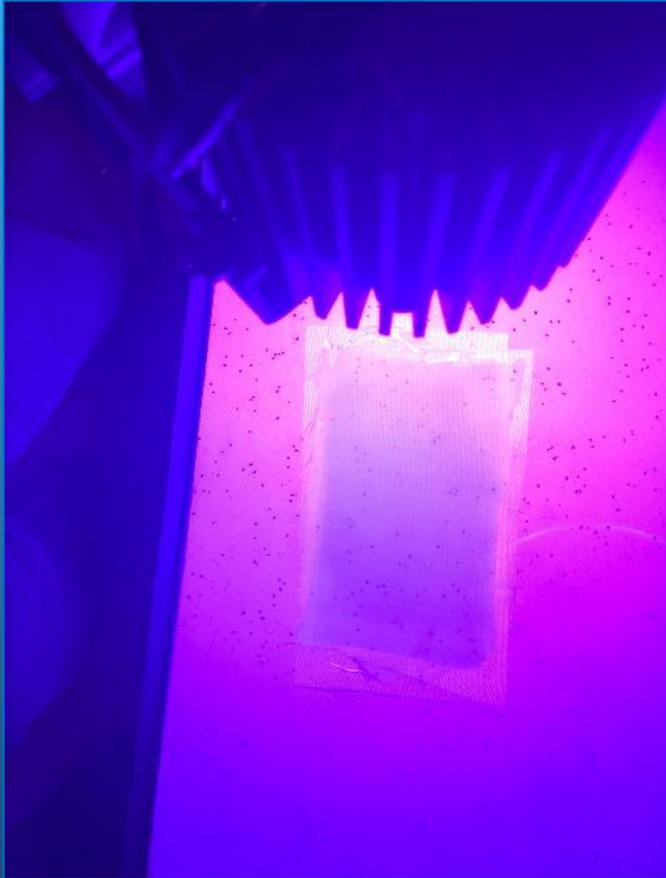


7725 Fabric

Fillet Fabrication Cont.



Fillet Fabrication Cont.



Fillet Fabrication Cont.



Teflon Tape



3 Plies OverTape

Fillet Fabrication Cont.



Flange



Set on Fillet

Fillet Fabrication Cont.



Bonded Flange



Fillet Inserted

No No's

- Rags (read bond breaker)
 - Cloth rags are not used no matter how often they are washed or washed with
 - Preferred are the Scott Blue Shop or the Multi-Ply, Reinforced Nylon Fiber Utility Towel
- Fabric Handling - not handle with bare hands
- Shop heating - I do not recommend kerosene heat as it puts contaminants in the air and so on the surface of your work
- Diluents in resin - some have used alcohols to thin out epoxy resin - DON'T! Keep your resins at temperatures in the 80's or 90's. Use a heat box if you have to (wooden box with light bulb & thermostat).
- Open Fabric storage - keep your fabric in a bag to be free of dust and moisture: preserves sizing
- Open Resin storage - epoxies last a long time when stored cool & dry
- Solvent wiping / cleaning - many like to clean with acetone or MEK; these are potential bond breakers. I recommend isopropyl alcohol as it does not have any recycled adds due to the medical requirements. Try to get 92%.
- Additives (fumed silica aka cabosil, micro-balloons, flox) - cabosil at less than 2% for thixing and balloons or flox as required. Cabosil has no strength. Additives are introduced after resin & hardener is thoroughly mixed

Source List

- Teflon Tape: CS Hyde Company, 1” wide Skived PTFE Part# 15-2A, 2” wide Skived PTFE Part# 15-2A (found it on Amazon recently)
- Airtech Flashbreaker Tape - Airtech (www.airtechonline.com) or Freeman Supply (www.freemansupply.com)
- Scissors: Kretzer Finny 74525 10.0” - Sewn Products Equipment Co., PO Box 357, Jefferson, GA 30549. www.sewnproducts.com
- Wheel Cutters: Olfa Rotary Cutter sold at many fabric stores
- Fiberglass Rollers: E S Manufacturing, St Petersburg, FL (www.esmfg.com)
- Tongue Depressors: non-sterile - any local medical supply
- Resins: Aircraft Spruce or Composites One
- Fabric, resins and vacuum bag supplies: Composite Envision (www.compositeenvisions.com)
- Loehle Coatings: <https://loehlecoatings.com>, ph: 850-482-4141