

GLASSING & PAINTING THE WOOD FUSELAGE & FIN (SEPT. 5, '09)

By Harley Michaelis

This entire document can be considered an extended tip, since few know how to do this fine finishing work. The attitude of the SGP droop snoot in level cruising flight is illustrated.

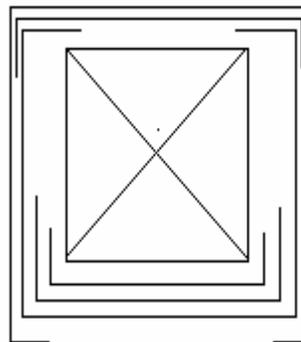
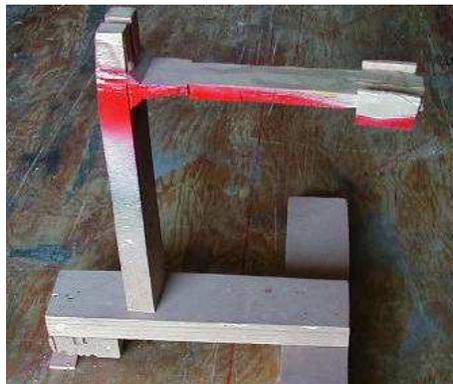


1.4-1.5 oz. plain weave glass cloth can be used overall, but using .5-.75 on the fin will keep it lighter & reduce nose weight needed to balance out. What follows assumes you've filled dings, cracks, contoured fillets & fine sanded overall.

OVERVIEW: Glassing-over involves attaching pre-cut cloth pieces overall with a light mist of 3M77 spray contact cement. Resin is then brushed on in stages & excess sopped up. As it soaks into the wood & cures, it creates a hard skin that adds essential overall torsional & impact strength. After overlaps & puckers are sanded out, low spots filled & the work sanded smooth, an overall thin coat of resin is brushed on. When cured, it's sanded smooth & a scratch filler applied. When cured, this is wet-sanded to a glass-like finish with progressively finer grits, ready for paint.

Don't even think about covering the fuse with film, etc. You'll learn nothing, miss the opportunity to create a work of art and get an easily dinged, flimsy structure that will soon look ratty. Film will not contribute to overall strength & beauty as is accomplished with glassing-over. After a season of flying, the glassed-over fuse can be refurbished to look like new by removing paint with acetone, etc, filling dings with Icing Putty, wet sanding and repainting.

As a handle & support when painting, prepare a pedestal to snugly jam fit between the fuse sides. Slot the protruding top to slip over the pushrod. Essential to fuse integrity is overlapping of cloth piece edges at the ply box corner locations after the fuse is shaped. This is illustrated in rectangular fashion on the right. The number of overlaps is largest up front on the bottom. The inside rectangle represents the skinny ply box.



A low viscosity epoxy, such as used for vacuum bagging wings, works well. One at a time, batches on the order of ½ oz. are mixed & applied. If mix ratios by volume are specified, this is easily done in a 1 oz. cup graduated in small increments.

You also need: a plastic card (credit card, etc.) Popsicle stick, etc. for stirring, 12" ruler, yardstick, sharp scissors, acetone, squeeze bottle for dispensing it, roll of toilet tissue, a fine bristle ¾" or 1" brush & a container to clean it in. A straight edge, Fiskar's cutting mat & a Dritz rotary cloth cutter (sewing accessory) are useful in cutting cloth & cleanly trimming edges to a taper.

You'll need #80-100-120 grit aluminum oxide sandpaper & in wet or dry, medium grit 220, 320 & finer 400-600, etc.

REINFORCING WRAP: in rough landings, the area behind the rear former is subject to splitting along the ply box corners. A wrap of thin nylon tape, light Kevlar, etc. is good prevention. With instant CA, tack it flat along the top first. Pull flat to tack at the bottom. Trim to avoid overlaps. Right: Ridges created are eliminated with staggered glass layers & filling/feathering with Icing Putty mentioned in the Fine Finishing file.



PRE-CUTTING GLASS CLOTH PIECES

An initial option to consider is applying reinforcement patches of Kevlar or a light CF cloth to extend from about the middle of the SS's to a bit over the spackle fillet where sides and fin meet. This will more firmly secure the fin in place, but require a harder nose in landing to let the fin break out. Brush this down first, and then proceed as follows:

FIN & DORSAL: Preferably from .5 or .75 oz. cloth, cut 2 pieces to cover from the fin top to the skid bottom & over the dorsal, with about 1" excess along the LE. Cloth can extend a little behind the TE, to later be sanded off. Lay one on the fin. Mark the location of the brass tube. Double fold there & snip to make a small hole. Repeat with the other one.

From a manila folder, cut a piece to overall fin & skid profile. Divide it horizontally at the brass tube location. Lightly spray one side of the fin, skid & dorsal. Let it dry. Lay the manila folder pieces above & below the brass tube. Position one of the glass pieces over the folder pieces. To press glass to the fin, progressively slip the folder pieces away from the brass tube. Glue residue on the fingers will snag the cloth. Smooth cloth with Monokote backing, etc. or brush it down. Don't try to wrap cloth around the skid.

With scissors, neatly trim the attached glass along its LE so ½" will be left to wrap around the fin. Along the dorsal, slit the glass to more easily wrap around it.

Lay the manila fin profile on the other side. Lightly spray the extending ½" of glass. Smooth it around the LE & dorsal. Lightly sand flat any little tags created in the process.

From 1.4 oz. cloth, cut two similarly shaped pieces to extend from the skid bottom to ½" above the inlays. Spray the .75 oz. cloth to attach one to one side. Then do the other side.

FUSELAGE: Three layers of glass on the bottom forward of the wing saddle are recommended. Elsewhere a maximum of two will do. Pieces can be first cut as rectangular strips to the maximum width needed. Then taper pieces wide enough to generally wrap 3/8" or so around at the rounded fuse corners where the 1/64" ply edges are visible.

With marking pen, every few inches dot the fuse center line & center of the glass pieces. As pieces are ready to attach, lightly spray the fuse where they go. Let it dry some. Roll or fold longer pieces to more easily handle. Stick down at one end & open it to work toward the other. Snip loose threads rather than trying to pull them out.

1. Cut a piece to fit the bottom from the saddle front to near the nose tip. The bare extreme tip itself will be coated with resin. Size the piece to wrap up around the bottom ply box corners & to go about halfway up the nose block. Attach.
2. Cut two layers to extend along the bottom from the dorsal area to near the nose tip. These can be cut in staggered sections rather than left as continuous long pieces. Attach to minimize avoid overlaps & gaps, but expect some to later have to be sanded out.
3. Cut a wide piece to fit around fuse top from the front of the turtle deck to the dorsal, sized to wrap around the bottom corners of the ply box about 3/8". Attach. Do not press cloth to the angled front of the turtle deck. Optionally, for extra ding resistance on top, cut & attach a 2nd such piece sized to extend around the top corners about 3/8". If needed to smooth over the reinforcing wrap, cut a couple of staggered pieces 4-5" long to attach in that area. This becomes a "gorilla" grip area for launching.
4. Cut right & left pieces to fit the fuse sides from the rear former area to near the nose tip. These irregular shaped pieces should be sized to cover the undersides of the saddle, wrap around the bottom of the ply box about 3/8" & up & around the closed compartment about 3/8". The pieces can extend up beyond the saddle edges & up beyond where the canopy sits, but are not to wrap around the horizontal parts. Attach. After resin is later applied & cured, the cloth can be sanded off flush at those edges & at the fin rear.
5. Cut a piece to go around the closed compartment to near the nose tip & down around the sides about 3/8". Attach. Do not press to the angled rear of the closed compartment. Optional: Cut & attach a 2nd piece to come down & around the ply box bottom corners.

Attaching the cloth pieces to SGP fuse/fin #7 with light mists of 3M77 added .9 oz. weight.

RESIN APPLICATION: Warm the resin. Mix a batch & thin it with a few drops of acetone so it brushes more easily & soaks in more readily. Work over newsprint, etc. to catch the drips. Without dawdling, spread the resin while it is thinnest, starting at the fin. Do not get it on the fin TE that is to later be concaved for knuckle hinging.

First brush resin on the side of the fin with no exposed LE overlap. Get it thoroughly wetted out. Working up & from TE to LE use a credit card, etc, to press resin through the cloth into the wood & cloth flat to the fin. Pick up excess epoxy with the card. Scrape it back into the cup. Roll fin, dorsal & skid with toilet tissue to look smooth & almost dry.

Repeat on the other side, working inward from the LE overlaps, so they're not disturbed. Brush any remaining epoxy forward of the fin. Work it well into the cloth. Roll with toilet tissue to remove excess. Clean brush in acetone or rubbing alcohol to keep it usable.

When ready, mix another batch. Work progressively forward, wetting all out well. Insert the pedestal to continue or stop anytime, let the work cure to handle & later continue. The fuse will look terrible. Expect some puckers. Let the resin thoroughly cure, so it will sand down in a white powder.

SANDING BLOCK: From 3/8" balsa make one about 1-1/2" x 3" with rounded edges. Cut up a sheet of #80 aluminum oxide sandpaper into 9 equal pieces. They'll quickly fill as you sand to flatten bumps & feather overlaps. Sand along the fuselage, not in swirls.



Left area shows the cloth brushed on with resin & block sanded dry with #80 grit. On the right the resin has not yet been sanded. All the shine is to be removed so the next coat will stick.

The white-ish stuff is Icing Putty (See Fine Finishing file) used to fill depressions & pits where puckers were cut out.

With finer grit 100-120 papers, reduce scratches made with #80 paper. Sand off excess cloth flush to the edges at the saddle, canopy seat & fin. Trim cloth at the angled edges of the turtle deck & closed compartment. Smooth cloth by the tip of the nose block.

Puckers can be sanded out or cut out. Pits & low spots created need to be filled & sanded. Quick curing, easy sanding ICING putty works particularly well. Fill tiny depressions with CA. Don't apply accelerator. Pick up excess with edge of toilet tissue to wick excess away & level it. Wipe the fuse clean.

FINAL RESIN COAT: This fills weave & deeper scratches. A little of the mix, thinned with acetone, goes a long way. Working in oblique light, start at the tail end. Brush on a thin, overall coat to just fill the weave. Anything more means lots of sanding later. Brush no further than to the rear of the saddle for best control. Over soft cloth, etc. weight the nose down to extend the fin horizontally off the work bench. Clean the brush.

Let this rear section cure well so it can be held. To coat the remainder, start at the nose & work back. Thinly coat the angled areas, saddle & edges where the canopy sits.

This final coat must cure thoroughly to most easily sand off in a white powder. A warm environment helps, but direct hot sun can cause bubbles that break & make craters. When cured, start at the extreme nose tip with loose #220 wet or dry paper used wet. Just smooth out the resin without cutting into the wood.

Then work rearward with the sanding block to remove all shine & smooth irregularities. You can start with #80 grit. Go to finer ones, say down to 120, to reduce scratches made. At the fin, see if you can scrape down irregularities with single edged razor blades. Keep the fin well supported as you work on it. Careful & thorough work from the dorsal rearward will result in nicest finished appearance.

SCRATCH FILLER MIX: Final prep for painting involves wet-sanding down an easy-sanding scratch filler. One can be made by mixing baby talcum powder with MINWAX water-based Polycrylic Protective Finish in Clear Satin or Semi-Gloss. Dip 3/4 oz or so into a cup. Mix in talc to whipped cream consistency. Brush on a thin coat overall.

Let thoroughly dry. Start with #220. Go to progressively finer grits to get a glass-like surface. A light coat of quick drying glossy white paint will show how you've done. Acetone removes it. Fuss to your heart's content with finer grits. Open the drive pin slot, rudder cable holes & the slot for the nose tooth. Punch the center hole in the tow block.



Close inspection of this pic taken after the final resin coat was applied shows many things.

With no 5/16" balsa available, this fin was made from a light 3"x 3/4" piece on hand, cut in half on edge with the bandsaw, sanded down to 5/16" & then spliced. The dorsal is a separate 2 pc. item, sanded to airfoil shape with the fin. The skid is the light 3 layer item detailed in Const. File 4. Before filleting, the ply doubler over CF laminate was sanded down at its edges & merged with 1/16" balsa behind it. The balsa & the SS it's on, were tapered down to fin width at the tail end.

Filleting was done with light spackle, left to cure well, then sanded smooth to give the fin & skid an integral appearance with the fuselage.

When the final coat is well cured, it's sanded to remove all shine & coated with a scratch filler that is wet-sanded glass smooth ready for painting. Not seen, the fin TE was concaved with a 5/16" round file for rudder knuckle hinging.

Use of light spackle to fillet in the fin allows fin to break out in a hard enough nose first landing to prevent serious fuse damage. See end of document about getting the fin back in to look nice again.

Following are a series of pictures taken of various areas after the scratch filler had been applied and progressively wet sanded down to #600 grit.



Note the 1/8" balsa doubler at the left is leveled to the 1/16" ply external doubler.



This shows a spiral reinforcing wrap of nylon tape over the full tripler of 1/16" balsa between 1/8" balsa doublers.



This shows F2, the deep rails and the saddle capped with 1/64" ply strips. The HS tubing covered end of the pushrod tube has been secured to F2 with a drop of instant CA glue and then coated with a fillet of silicone sealer so it is firmly attached there.



This shows front of the saddle caps and the interior portion of the towhook blocking. 1/2" triangular stock on either side secures it to the SS's & the 1/16" ply plate across the bottom of the fuselage. To keep spray paint off the pushrod it was covered with a straws. Masking tape goes against the fuse interior walls before painting so good glue joints can be made when installing the main bolt holddown unit.



Note how the nose block, sides, closed compartment & fuse bottom all merge together for nice appearance. Icing putty fills beyond where sides end. Hole is where 1/8" dowel goes through to secure the nose tooth.

PAINTING: Paint overspray inside prevents proper bond of servo rails & the main bolt holddown unit. Apply masking tape where these go. Tightly insert the pedestal.

I got good results using, the slower drying Rustoleum White Clean Metal Primer & Gloss Protective Enamel. It covered well with one coat & a little touch up. A spray handle with trigger is recommended to prevent "spitting" blobs that accumulate on the nozzle & finger. Read mfg.'s instructions. Clean & tack fuse. Warm can. Shake well. Keep the can moving. Cooler temps are OK if work & paint are warm, but take indoors to cure. Wear protective glasses to avoid spray settling on yours. Follow instructions regarding cure time before applying trim colors.

A friend recommended B-I-N, a white, pigmented spray can primer saying paints stick well to it. Drying time is 30 minutes. I found it at Home Depot and will use it on my next fuselage. Let the Rustoleum primer dry a few minutes until the shine is gone. Spray top coat. Touch up any thin areas. Allow to cure a couple of days before handling. If it's hot out avoid direct sun that may cause bubbles. If summer & if you have an enclosed garage, set the work inside on top of the car & leave it overnight in the warm environment.



The pic shows the Rustoleum Gloss Protective Enamel before any waxing, polishing or buffing. It takes many days to cure to maximum hardness. **SADDLE AREAS:** to avoid wing & saddle paint rubbing, apply a heavier clear tape, such as book tape, on the saddle.

WEIGHTS: Building #7, I had an excellent selection of wood in the recommended densities. Without any built-in nose lead, weights were as follows:

- 10.9 oz. shaped, with no stab pushrod or fin.**
- 12.5 oz. ready to glass with fin, pushrod, BK, widened saddle capped with 1/64" ply.**
- 13.4 oz. with glass attached overall with 3M77.**
- 14.3 oz. after first resin coat, dry sanded smooth with #80 grit.**
- 14.6 oz. after second resin coat dry sanded with #100 grit.**
- 14.7 oz. with Minwax Polycrylic/talc mix wet sanded with 220/320/400/600 grits.**
- 15.8 oz. with Rustoleum primer and paint.**
- 16.2 oz. with painted canopy fitted with the sliding latch.**

Radio gear, stabs, rudder, cables, towhook, nose tooth, main bolt holddown, bolts, etc. will add about 10 oz. If not originally put in before attaching the nose block, lead shot can be poured into the drilled out area of the nose & secured with epoxy, polyester resin or hot liquid paraffin.

Use of the ply doubler over CF laminate by the fin is instrumental in preventing breakage of the fuselage in the area by the dorsal. In a hard enough dork, particularly a hard, nose first landing, the fin can break out from between the slab sides. This is an intentional, further provision to prevent fuse breakage in the small cross section area.

Should the fin dislodge, consider it a blessing in disguise. The fix is much easier than repairing a broken fuselage, although that is possible with new ply doublers, new CF laminate & exterior layers of glass cloth.

For easiest access, snip the rudder cables & disconnect the pushrod up front. Chip away the broken spackle. Glue the fin back & fillet with new spackle. Apply some new glass, prime again & paint. Install new cables. You'll slightly move the CG rearward which may require adjusting the stab neutral.