THE ULTIMATE SURFACE FINISH FOR SCALE MODELS OF METAL SKINNED A/C

Technique for applying fiberglass cloth and epoxy resin: Note: this article is dated 1993, so addresses may have changed.

I can't claim to be the originator of the process that follows, what I have done is tried different styles from gifted modelers like Dan Parsons, Dave Platt and others who in turn have written articles for the various model magazines.

Back ground:

At first glance this technique may seem heavy. This is only true when you compare this finish to a "film" covered model, which is the lightest finish you can apply. A scale surface finish applied directly on top of bare balsa, takes a lot of grain filling to achieve a smooth surface and it adds weight. A list of some of the advantages are ....

a) The finish is equal to or lighter than finishes of the same calibre.
b) Unlike other finishes, this finish does not age. It won't sag with time, nor will the grain start to appear after a couple of years.
c) The finish acts very much like a stressed skin and adds significant strength to the model and goes a long way to reducing "hanger rash". Without the cloth the resin tends to show cracks and the finish is not as strong.
d) The finish is fast and very easy to apply.
e) While polyester resin gets protests from the family, this finish is family friendly. Use Z-POXY .... no smell.
F) The finish is easy to repair with CA. or use more glass/resin and the repair will be invisible if done with care.
g) The resin is fuel proof. Should the paint work become worn the resin coating is still there to act as a shield to protect the wood.

Materials:

0.6 OZ./SQ YD. fiberglass cloth, obtain by mail through
R/C CONSULTANTS
c/o DAN PARSONS
11809 FULMER DR.
N.E. ALBUQUERQUE
NEW MEXICO 87111

alternate
0.75 OZ./SQ YD. fiberglass cloth, obtain by mail, Tower Hobbies
SIG or K & B $ 6.00/SQ. YD.

Epoxy resin brand name Z-POXY Finishing resin
$ 13.00/12 fl.oz. (will cover two A/C)
PACER TECHNOLOGY
9420 SANTA ANITA AVE.
RANCHO CUCAMONGA,
CA 91730

Contact spray bond adhesive (3M), obtain at hardware store. Similar sprays will do.
$ 13.00/321g (will last for ever)

One ounce measuring cups, obtain by mail, Tower Hobbies
$ 3.00/pkg of 100

Acetone $ 9.00/L

Rubbing alcohol $ 1.00/450ml

Auto body glazing & spot putty $ 13.00/1.36kg

Latex gloves or use light kitchen gloves. Dust mask.

Artist's fan brush, spatula and Half inch wide good quality brush.

Procedure:

The area to be covered should be finished sanded, 240 grit is fine enough and all obvious dents and scars filled with autobody spot putty. The putty has the same or maybe even less hardness than the balsa, so should be easy to blend into the surrounding area. You do tend to use lots of sand paper due to clogging. I mount an old shoe shine brush inverted on my work table and clean the sand paper on it as needed.

How much of a part should be covered with cloth at one time depends on how you will ultimately hold the part while the resin is curing and the number of intersecting 90 degree edges. Generally you can cover both sides of a stab, fin or wing. If an overlapping panel is needed on these parts i.e. top and bottom surfaces, have the lap joint occur at the bottom side of the leading edge with the top panel over the previously applied bottom panel. Wing tips and stab tips can be lapped over in a similar fashion and because the cloth contours so well, separate pieces are not needed. This hides the joint area better and provides better strength in tension for the L/E. The fuselage can be covered from the bottom panel up. The top panel overlapping the bottom one by ¼“ to ½”. Perhaps the fuse can be covered with left and right panels overlapping along the centreline. Mask off final assembly gluing areas with tape before hand if desired. You do not need to cover every square inch of the model with cloth, areas such as fine T/Es or access panel edges, cowl edges can have resin only.

Prepare all of your materials and tools together. Put on your latex gloves and unroll the fiberglass cloth. Without the gloves, your fingerprints will snag the cloth and in no time flat you‘ll have a mess. Using scissors, cut out a piece of fiberglass to cover the part plus a 1/4 to 1/2 inch oversize on all edges. You can drape the cloth over the part if this helps. Pay attention to the grain direction of the cloth when doing long spans. Have the weave parallel to the longest edge.

The purpose of this step is to tack (not bond) the cloth to the structure. On the area which is to receive fiberglass cloth, spray an extremely light coat or tack coat of contact adhesive. Try to deposit no more than two dots of adhesive per square inch. To achieve this, lay the part down on top of news paper or any spot you won’t mind getting over spray on, after shaking the can of adhesive vigorously, hold the can 12 to 18 inches above the part with the nozzle at 90 degrees to the area to be coated. Give one quick squirt of adhesive in a sweeping motion to cover the entire part. The adhesive should fall on the part like rain, rather than have the spray directed straight at the part, which tends to deposit far too much adhesive at one location. Those areas which won‘t receive cloth at this time should be masked off so no adhesive falls on them, otherwise the fiberglass cloth will be difficult to handle. Simply lay loose pieces of scrap paper as required for cover. If using a single large piece of cloth to wrap around a wing or large fuse, spray adhesive in limited areas such as one side. Use paper masks to protect the cloth. Lay down the cloth wrinkle free on the one side, spray the second side and continue with the rest of the cloth. Mentally plan how you will proceed and logic will dictate how to go.

The nozzle on the can of adhesive does not seem to clog, no need to invert the can to clear the nozzle, just wipe off any residue and as long as you can look down the opening, the spray should work fine next time around.

Drape the cloth onto the part, wrinkles invariably occur. Now comes the best part, which saves you tons of work later on. Lift the cloth at the edges and pull the cloth away from the part until you have reached the wrinkle. Using the fan brush, gently brush the cloth back down onto the surface of the part, being careful all the while to not snag the cloth or introduce more wrinkles. Keep working the cloth in this manner until a smooth surface is achieved all over. If a wrinkle can’t be avoided, trim out this area of cloth and apply a patch. It‘s less work and lap joint tend to disappear under the coats of resin.

The adhesive will provide enough tack so that the cloth remains in place, including concave sections and around to the other side of the part, assuming you sprayed that area as well.

The cloth should overhang the edges if the edges are any sharper than a 3/32" radius (ie. 90 deg. edge) the cloth won’t stay down because the cloth has sufficient memory to keep pulling back off of the corner. The edge will be cleaned up by trimming the excess cloth off, after the resin has cured. Do one side of a 90 deg. edge at a time, such as a T/E.

Mixing of the epoxy resin: You must use graduated mixing cups to prepare the epoxy, to ensure proper mixing ratios are adhered to. The one ounce plastic cups are ideal, because this is all the epoxy you can comfortably spread over the model during the pot life of the epoxy. In use, the epoxy resin is always thinned by 50 per cent (50%), in order to reduce it‘s viscosity. This makes the resin easy to spread and flow out onto the part. As an example, if we wanted to mix up one full ounce of resin, you squirt in 1/4 oz. of hardener, let this settle into the bottom of the cup, due to it’s viscosity and surface tension the “goo” takes time to level itself. Next add 1/4 oz. of resin and again let this settle down, add the last few drops to make the mix come up to the half oz. mark. I like to stir the epoxy together at this stage to ensure that a chemical reaction has started before I add the acetone thinner. To aid in pouring the acetone I first place some in a second one ounce cup then, squeezing the sides of the cup I contact the cup to the .040" wire I use as a stir stick which is still in the “goo” and let the acetone run down the wire. Do not deposit the entire half ounce of acetone in the mixture at this time leave some room in the cup so that the present slurry can be mixed without spillage. First it will go cloudy and then clear but with obvious gelatinous things floating about. Keep stirring and try to get the resin which stays on the side of the cup as well. Feed in the last of the acetone to make one ounce. Stir some more. It generally takes two to three minutes to get the slurry fully mixed and clear in appearance. Follow the same proportions of resin, hardener and acetone for smaller quantities as needed.

Using a good quality 1/2 inch wide brush spread the resin over the fiberglass cloth. The idea is to saturate the cloth and the wood, but not to put so much resin down as to make the surface look wet. If the surface is wet, air escaping from the wood and the weave of the cloth tend to blow pin holes into the resin, which are slightly more difficult to fill later on. When coming up to an edge of the part which is meant to be a sharply defined 90 deg. corner, drag resin from the area back from the edge in order to control the amount deposited. You don‘t want resin to accumulate underneath the over hanging cloth and cause a large glob to appear, which in turn has to be sanded back later. Let the resin cure overnight.

Using an X-acto knife trim off all of the excess cloth. Clean off any obvious burrs with 120 grit sandpaper. Try not to cut through the weave of the cloth if cleaning up any spots on the surface of the part. Wipe the surface clean with an acetone dampened rag. Cover remaining areas with cloth and one coat of resin, trim sharp edges as before.
2nd coat: Prepare another mix of epoxy, as before but this time reduce the quantity to one half that used for the first coat. The resin is not soaking into the wood or the cloth and therefore less is required. Flow out the resin in two or three strokes, any more strokes than this seems to upset the resins ability to blend the brush strokes together. The second coat generally is sufficient to fill the weave and should look wet but not overly thick in appearance. A thick coat just means you have to sand it off later, so try for a good balance, you can always add a third coat, which is less work in the long run. Let cure overnight.

Key to this process, is to reduce your work load to a minimum while achieving a superior surface finish, the foregoing should have laid down a wrinkle free, hard, relatively even surface (the smooth part comes after sanding). So don’t create work for yourself by starting to sand using too fine a grit of sandpaper.
Begin with 120 grit, backed by a sanding block and tear down the excess resin lying on the surface. This stage creates lots of dust, so wear a dust mask and use a rag to wipe the part clean to observe your progress. If the part is completely sealed with no risk of water damage to open wood structure, you can wet sand, which will eliminate the dust. During the sanding process the shiny surface of the resin is roughened and becomes matt (no shine). Use the 120 sandpaper only long enough to achieve 60% leveling of the surface (matt in appearance), 40% of the surface will be shiny in the valleys of the still yet to be smooth surface. Change the grit to 180 and proceed to finish smoothing the surface (100% matt), be careful not to cut through the cloth. Reduce the thickness of the resin until you can just see the shadow of the weave in the cloth. You want to eliminate as much weight as you can. Next quickly improve the surface with 240 grit sandpaper, your sanding out the scratches left by the coarser grit sandpaper. Its unwise to use 240 grit sandpaper to remove lots of resin, as this grit is too fine and is slow going, return to 180 grit for the area that needs it, then finish with 240.

Wash down the surface with a damp cloth, dry it and look for imperfections. If the surface shows lots of weave, you should have bypassed these areas during the sanding process, you can apply a third coat of resin locally or if only a few spots look bad, fill these with autobody spot putty and wet sand with 240.
Prime the surface with your favorite primer, I use a lacquer based grey automotive metal primer, once this cures overnight I wet sand the part with 320 sandpaper. Inspect carefully with the light at a tangent to the surface and see if any area needs additional attention. If no surface detail is being added the part is now ready for the final color coat. Should you choose to apply surface detail, sand most of the primer away, it was only needed to detect the quality of the sanded surface. Add 3D panel lines, and raised rivets to your hearts content. Apply a final light primer coat, let harden overnight, inspect for quality, light sand with 320 or 400, watch those panel line edges. Add flush rivets or wait until after the color coat.

A few additional pointers would not be amiss at this time.
I tend to fiberglass cover the individual parts of the aircraft, such as FIN, STAB. ELEVATOR ETC... before I join them permanently to the fuselage. This gives you easy access during the sanding stages and reduces the chances of damage to the structure, you know…, like when you forget that the fuse is three or four feet long while you‘re sanding the stab and you smash it into the side of the workbench. Mask off the gluing areas or glass over the entire part, the decision is yours. One advantage of having the parts pre-finished, is that while producing fillets between the stab and the fuse, the surface is much more resistant to sanding and less or no under cutting of the two mating surfaces occurs.

To clean your valuable brush immaculately every time, wash in acetone in order to remove as much epoxy as possible, then let the brush soak in rubbing alcohol for two hours or overnight. The alcohol leaches out any remaining resins at the neck of the brush and returns the brush to an as new condition. Unlike acetone, the alcohol evaporates slowly, so an open jar can be used while soaking the brush. Cap the jar afterwards.
Do not under any circumstance reuse the one ounce mixing cups for the next batch of resin. Throw them out, you don’t want contamination of a new batch and risk not having the resin cure.

You can now look forward to a contest finish that does not cause pain to achieve. It will take a week or two of evenings though.

Happy modelling Paul Monforton 14 Jan. 1993