Silking...
a modeling art form

By Ward VanDuzer and Tom Hampshire

Once, it was the only way to get a strong, lightweight covering for a model and also was one of the most beautiful ways to do it. There's still plenty of life in this method. Here are all the basics for sheer elegance.

Some time ago, at an Old Time Stunt contest, I found some young modelers admiring the silk and dope finish on my Old Timer. And did they have questions! We spent over an hour (off and on) going over the process. It was then that a friend of mine suggested that I write an article on how to cover an open frame airplane with silk.

Old goat that I am, I didn't realize that this might be a dying "art". We all silked our planes in the 40s, and 50s, (and 60s) because that was what you did! I suffered through *many* airplanes, before I knew what any covering should look like, let alone silk. It is a unique material, and is as applicable today as it was then, particularly with the popularity of the old time and nostalgia events. But why silk?

Today we cover the open bays of our models with high tech plastics, or silkspan and dope. They are light and easy. So, we save weight and time. But nothing, *nothing* is as strong as *silk* to cover an open framework model!

Before we get carried away let's review some of the characteristics of silk.

1. Strong!
2. Temperamental. (Not bad if you understand it)
   a. Pulls. Catches on everything!
   b. Stains. Ask your wife or girlfriend!
   c. Difficult to cut without pulling.
3. Hard to fill the weave. (Requires more dope).
4. Beautiful, transparent finishes. (Bad attribute if you are a poor builder)!
5. The classic finish for an Old Timer.

I must repeat here: nothing is as strong as silk for covering open bays (maybe nylon, but unavailable, and heavier than silk)! Case in point: three times I have made vertical landings with my *El Diablo*! On none of those occasions have I suffered any *major* wing damage. My bride even dropped the garage door on it on another occasion, with no *major* damage. (to her either)! Unbelievable, maybe, but this is what you gain from silk covering.

OK, let's get into the process, and we'll try to explain all the "mysteries". First, do not fear the process! This will inhibit any attempt at a trying something new. Remember your first foamy?

Initially you must decide how the model will be finished. Will it be color doped, or are you going to go for that beautiful, transparent, dyed silk finish? We will assume a transparent finish for now, and explain the variations as we proceed.

If you are going for the clear finish on that Old Time beauty, it goes without saying that your construction should be pretty. If you have a pet chipmunk that chews your lead-out holes for you, or your ribs don't mate up with your spars, forget the clear finish.

OK, prepare your model as you would for a silkspan finish, except that you are *not* allowed any rough areas where the cloth will catch and cause pulls. Sand the entire wing smooth with a l-o-n-g sanding block to level the surfaces of all ribs, spars, leading and trailing edges, and the tips. We need absolutely square corners on all surfaces. Any rounded edges will cause the wet silk to

PHOTOGRAPHY: WARD VANDUZER

Silk always connotes elegance and Ward VanDuzer proudly displays two elegant silk-covered ships, his *Stuntwagon* (L) and *Firecat* (R).

adhere around the radius and leave a ridge on the finished surface.

Apply at least three coats of nitrate dope on all wood surfaces, including the ribs and/or cap strips. We don't want the finish coats to be absorbed into the unfinished ribs and leave pinholes in the final finish! Block sand between coats with 400 Tri-M-Ite paper until absolutely silky s-m-o-o-t-h !

Here's where the debate begins, to cover with wet, or dry silk! I prefer the wet method, but we'll describe both, and you pick it!

Preparation

For either method, prepare your work area with these materials, a *sharp* pair of sewing shears, (the kitchen scissors won't cut it)! Borrow your wife's or girl's sewing shears, plus a *load* of sharp cutting blades. I use Uber Sciver scalpel knives. New, sharp X-Actos will be fine. Note, a *load*! Never attempt to cut silk with anything other than razor sharp blades, or you will cause pulls. Forget those industrial razor blades!

Next, you'll need water, an atomizer or spray bottle of some sort, and a small sponge if you're going to do it dry. You'll need a jar of thinned (50/50) nitrate dope, and a dope brush. This will be the "glue" you'll use to adhere the silk to the frame. I always have brushes that are used for nothing but clear dope. You don't want your last red airplane to show up under a transparent yellow silk job. And lastly, a tube of quick drying, *clear* cellulose cement. Sig-Ment works well. This will help to stick down the material in "emergencies"!

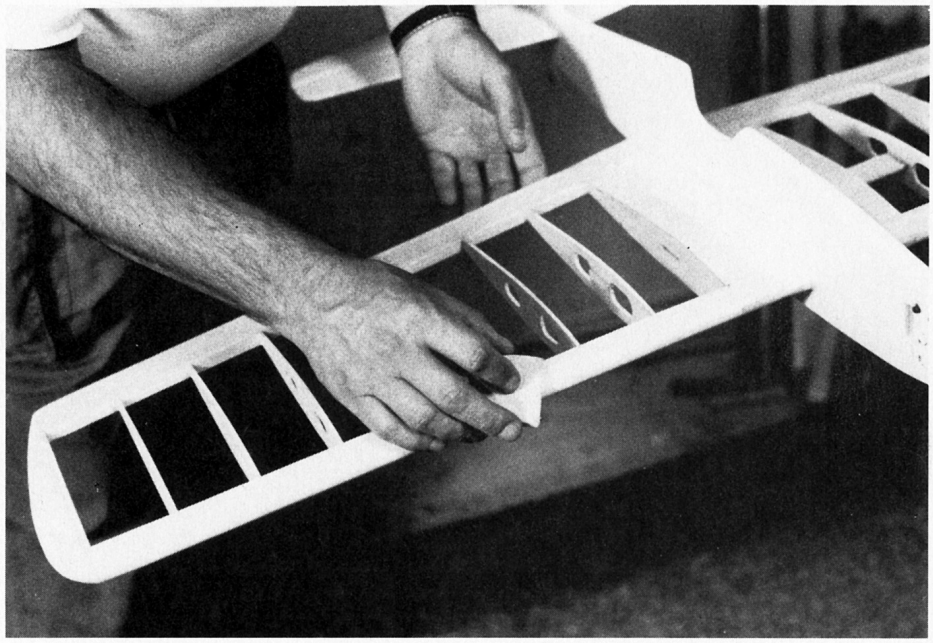
When you remove the silk from the package, it will have some sharp folds and wrinkles in it. These will come out when you wet and stretch, but, make your life simpler by removing them now with an ordinary steam iron. We have to discuss "warp and weave". This relates to the stiffness of the fibers, and the direction that they run. Grab the sheet of cloth by two opposite (not diagonal), corners and pull gently, then pull from two other corners at ninety degrees from the first two. You will feel that one side will stretch more than the other. You want the "stiff"', or stronger side to run parallel to the wing spar. Do it wrong and you'll have large "dips" between the ribs. This is an undesirable aerodynamic condition. So, run the stiff side from root to tip.

Always examine the material you are about to use for flaws! Look for pulls, little bunches of thread, and "stripes". Stripes are just that, a change in the way the material was woven that can cause a lighter or darker colored "stripe" in the silk. These will show up on a clear finished surface. Place the "stripe" on the bottom, paint over it, or save it for patches. Patches? But *do* work around it if you're doing a clear finish! Now that you have a clear, flawless, piece of material, cut it 2 to 3 inches larger all around the wing panel with your super sharp shears.

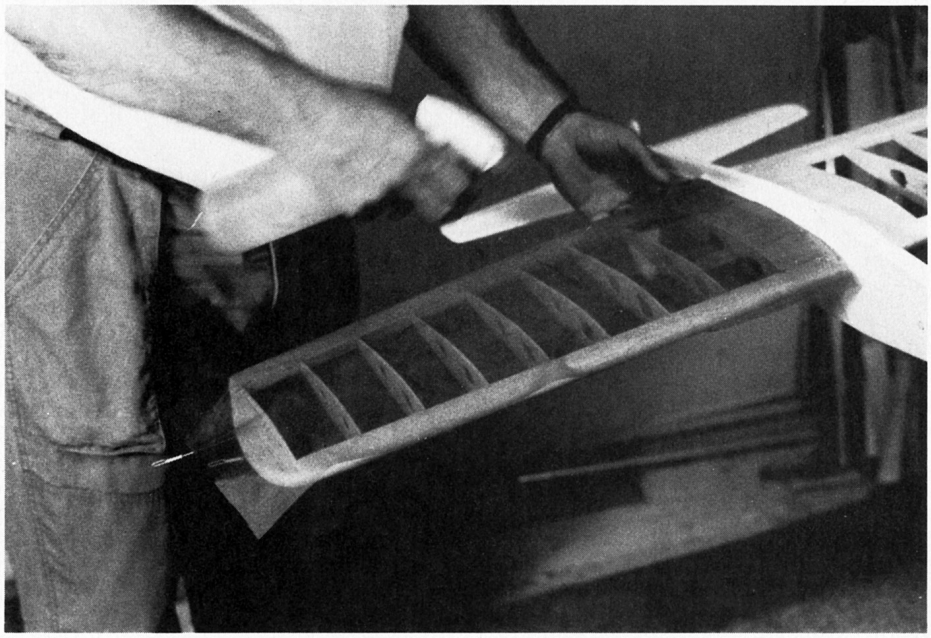
Decision time: wet or dry! Dry is easier, and more manageable. Wet seems to get the tightest job. We don't want a soft, spongy wing surface do we?

Dry method

Lay the silk over the top surface of one of the wing panels first, and try to get the weave running straight, and perpendicular to the spars, ribs, etc. Take a small sponge



First step in the silk process is the application of 2-3 coats of nitrate dope to all surfaces—including the rib edges. That is sanded with #320 paper on a expanded bead (Styrofoam is one brand) block **(above)**. Either application method, wet or dry, at respective points will need an atomizer **(below)** to mist water on the silk.



dipped in water and apply it to the *extreme* outside edges of the silk at the wing center sheeting, the leading edge, and the trailing edge. The water will adhere the material to the surface. Try to keep the water at least 1½ to 2 inches from the open bay portion of the wing as the water will "wick" toward the open bays and *will* cause stains. Clear dope will not hide these stains. Color will.

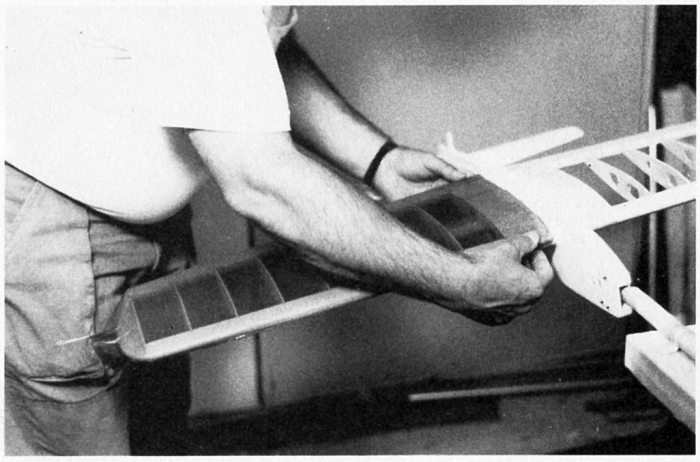
Starting at the wing root, stretch and pull out the silk, trying to maintain the weave *straight*. Get it as taut as possible ... both directions! If the water dries, dampen the edges again to maintain the holding property. Now, brush clear nitrate around the edges only, to stick the silk down. Use enough dope to bleed through the cloth and soften (melt) the nitrate on the wood frame. This causes a permanent chemical bond.

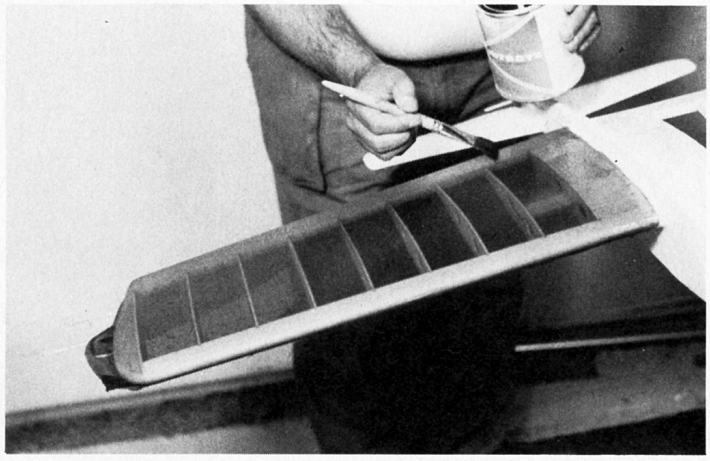
Do the sheeted center section first. Rub the dope in with your fingers to help it dry quicker. Then do about 4 or 5 inches of the leading edge. Rub it in. Now, do about 4 or 5 inches of the trailing edge. Stretch the silk taught, and rub in the dope. It will dry quickly.

As you are stretching you may discover some wrinkles. Re-dope (thoroughly) the area to be stretched again, lift the material as it loosens, and re-stretch. Do not pull too hard to lift the stuck down material. You will cause pulls in the silk. Use more dope until it loosens, then lift, stretch, and re-dope.

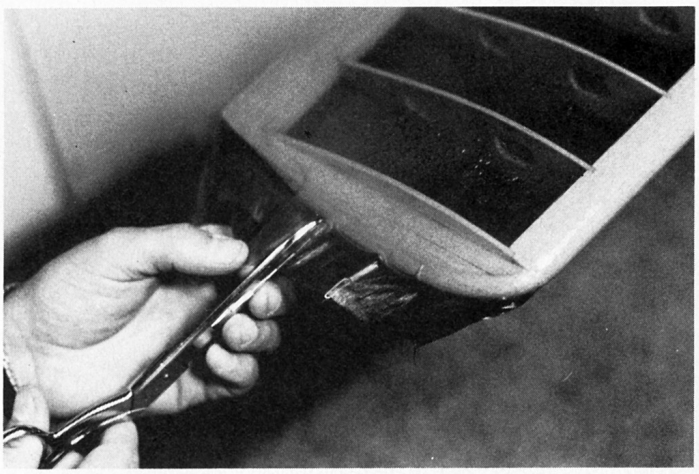
Wing tips are key, but not difficult. One of the real beauties of silk over silkspan is its ability to cover compound curves without wrinkles! Stretch the silk *around*, and *under* the tip. Use lots of dope, or the clear cellulose cement, to saturate the silk 2 inches at a time around the edge of the tip. Use your finger to rub the dope, or cement, into the wood. On most Old Timers you only have a ⅛th inch thick wing tip to adhere to, so be sure it's stuck before you release the cloth! Remember, later coats of dope applied after the silk is trimmed *can* loosen what has

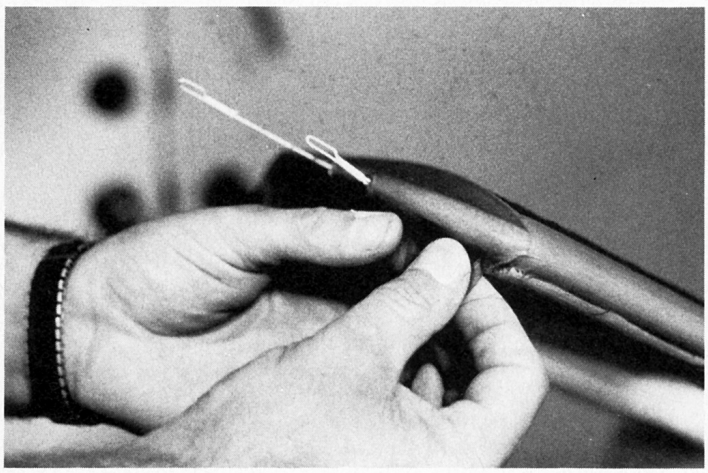
Silking: a modeling art form





First "rib-wise", then "spar-wise", Tom Hampshire uses his educated thumbs **(above left)** to stretch the silk taut. Whichever method used, the silk should be kept wet. The text details the differences. That done, the edges are thoroughly doped **(above right)**, pulling out any wrinkles at this point. A one-inch brush works well for this. Using scissors or blade—whatever it is, make it *sharp*—cut the silk **(below left)** so it will wrap around the leadouts on the inboard wing tip. Now, pull and stretch the silk around the wing tip. Silk works *much* better in this area than silkspan, or plastics **(below right)**. Dope down the covering.





already been put down. If it should, you'll have to resort to pins to re-attach what came loose. Work about 2 inches at a time around the tip until complete.

Be sure that you have some dope on the excess cloth all the way around the wing. The dope will make the excess silk "crispy" at the edge when it dries, and "duck soup" to trim off with your knife. When trimming off the excess silk, lay your super sharp knife on the edge at an angle so that when you slide it (gently) to cut along the edge, it leaves about 1/16th to an 1/8th of an inch of material to fold around to the other side of the wing. Be careful at the wing tip. Leave as much material stuck to that 1/8th of an inch as possible! Now, dope the edges only, and rub the excess silk down, and around the edge. You should have a complete, no wrinkle, tight covering at this point. Beautiful!

Don't wet the silk over the open bays yet! Do the bottom side of the same panel, move to the top side of the other wing, then the bottom Trim the excess off the bottom piece flush with the edges. When you're finished trimming the top, silk will be wrapped around the bottom, covering the edges completely, but the bottom will not wrap around to the top panel. If you do this, you'll show a dark line where the silk overlaps. When all surfaces are covered, mist all of the silk with your atomizer. If you mist only one surface at a time the shrinking of the cloth will cause mega-warps.

OK, here comes Panic City. The material *will loosen and get baggy when misted!* Be patient. It *will* shrink tight as it dries! This is why I prefer the *wet* method. Wet silk can be more difficult to handle, but this loosening effect (when wet) will be used to stretch a much tighter, and stronger, covering. Proceed.

Wet method

All of the techniques we used with the dry method are pretty much the same with the wet method, except we'll thoroughly spray the entire piece we're going to use *before* we dope it down. This will eliminate the "wicking water stain" problem, and allow you to stretch the cloth tighter.

We get rid of the water stain problem by wetting the whole piece, right? Well, the wet method has another, different problem. If you're going for a clear finish, do *not* get any dope on the wet silk over the open bays. It *will* blush, and/or drip through the silk and be visible forever! Thinning with some retarder may minimize the blushing. If you're going to use colored dope as a final finish, no problem.

OK, smooth a piece of dry material over the top of the wing and spray the entire panel with water from an atomizer, or an abandoned spray cleaner bottle. Using the water to adhere the silk to the frame, stretch and smooth the cloth from the wing root out to the tip. (See photo of Tom's educated thumbs). Start doping at the root section rubbing the dope through the silk. Now, 4–5 inches of the leading edge, then 4–5 inches of the trailing edge. Rub it in, smoothing and stretching all along toward the wing tip.

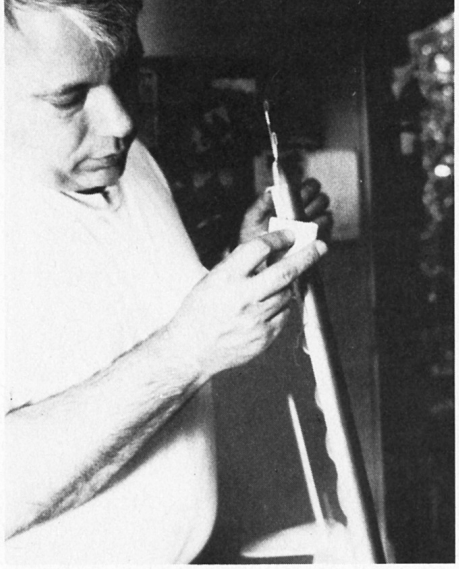
You may need to re-mist the silk during this process, but you already know how to do that. Keep on until you get to the wing tip. Do the tip the same as explained in the dry method, but be careful not to over stretch the tips as you could cause them to be pulled too tightly in one direction and warp.

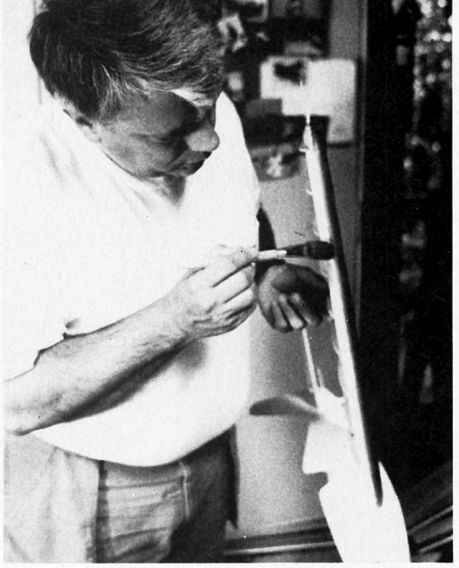
Trim the material from the edges, and wrap a little excess around to the bottom side. Check for warps now, as you can use the shrink, stretch, pull of the silk on the opposite panel to remove, or minimize, most warps at this point. Do the other side. Then, the other wing. (Twenty bucks says the second wing comes out better!)

Finishing

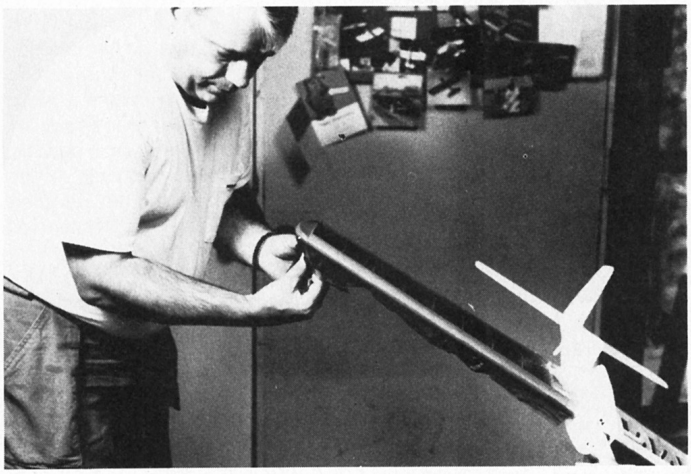
With any finishing method, don't be too quick to sand the edges smooth yet. You do not want to sand raw silk. Wait until you have 4-5 coats of clear dope on the entire wing before smoothing the edges. If you're going for a clear finish, the scarring of the silk caused by the sandpaper on undoped (or thinly doped) material will follow you for the life of your masterpiece!

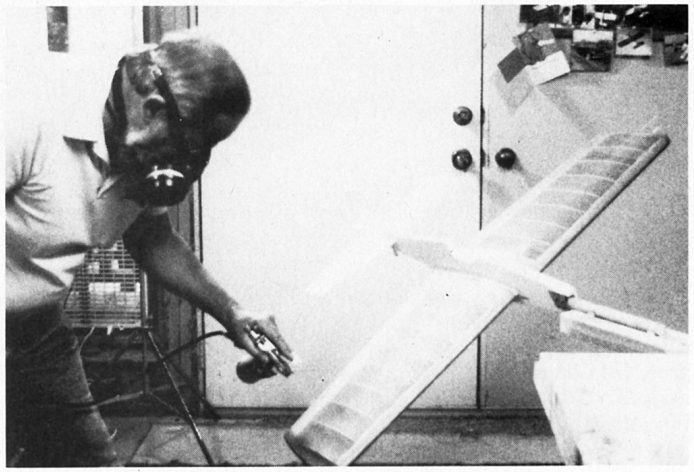
There is not much difference at this point between the clear finish, and the pigmented color finish so here we go.





Wrap the material around the edges. Then, with a razor knife, trim off the excess material **(above left)**. The idea is not to have the edges showing. When the dope is dry, sand the edges smooth **(above center)** in preparation for the application of silk on the other side. Now dope down the "fuzzies", all around the edges **(above right)**. Flip the work, and start covering the top of the same wing. Covering the top of the wing **(below left)**, is pretty much a repeat of the same process as the bottom. When the entire model has been covered, start shooting with heavy dope **(below right)**. After 3-4 coats, start sanding the edges smooth.





We *should* be spraying the dope for the best finish possible. It is almost impossible to get a "pure" clear finish by brushing. The overlapped brush strokes will always show. Larry Scarinzi used to use "S"-shaped brush strokes for this reason. If you don't have spray equipment, and can't find another modeler to help you shoot your art form, try calling a local body shop for aid. Most of these artisans will be glad to help, with a little stroking, and/or some refreshment! Should even this fail, I have used spray cans to apply the first four or five (sealing) coats of clear. But, do be careful, this stuff is always very thin, and runny!

Put the lid on the nitrate can, and open the SIG Supercoat Clear. If you're not using SIG dope, be sure to use a "shrinking" dope for the first 4 or 5 coats. This will help tighten the silk even more. *Never* use a shrinking dope on curved fillets, or over cellulose glues on wing/fuse/stab joints. I've never had any problems with Supercoat over square wing and fuse joints when joined with CyA's or epoxy. If you insist on using "good ol' Ambroid", keep the fillet areas clear of glue! Many old time models were built with no fillets at all, particularly if the wood is to receive a clear finish also. (A very light way to finish Old Timers).

If you are going to use curved filets, use *only* epoxy based materials. *Never* use spackle, or the white fillers, for fillets! Even non-shrinking dope will not stick to these materials. Use micro balloons and epoxy, or Epoxolite type materials. Micro balloons may be added to SIG Epoxolite to make it even lighter and *more* sandable.

Let's get some dope on this thing. Mask off your round fillets now!

The first four or five coats should be sprayed as thick, and "dry" as possible. 30 to 40% thinner in your dope should do it. Don't forget the plasticizer. (I have never used this until recently, but everyone else does. My *El Diablo* is over twenty years old and no cracks—except where it got kicked ... and the garage door dropped on it ... and where I forgot the other half of the wingover....

If this thick dope mixture won't spray, turn up the pressure. Keep the gun just far enough away from the surface so the paint does not go on wet and shiny for the first few coats. This is done to prevent the dope from bleeding completely through the silk, and creating "runs" inside the wing. We are trying to seal most of the pores in the material before we start the "wet" coats.

After three or four coats, stop and let it all dry. In a day or two, (the longer, the better, always) you can use some 600 or 1000 grit paper to *lightly* sand off the fuzz. Apply two or three more dry coats of this thick mixture, and sand again—the fuzz only! Any cutting of the silk will cause you a severe case of the uglies!

When the pores are sealed, you can move on to a 50/50 dope/thinner mix. You can switch to Lite-Coat (non-shrinking) now if you wish. This will build up your gloss. Spray. Dry. Sand. Spray. Dry. Sand ... until you're happy with the effect. I happen to like the satin sheen of silk when you can still see the weave of the material (but all the pinholes are sealed). This is how the finish was applied to my Nat's "Spirit of '52" winning *StuntWagon*. This is a lighter finishing method, of course, because less dope is applied to the model.

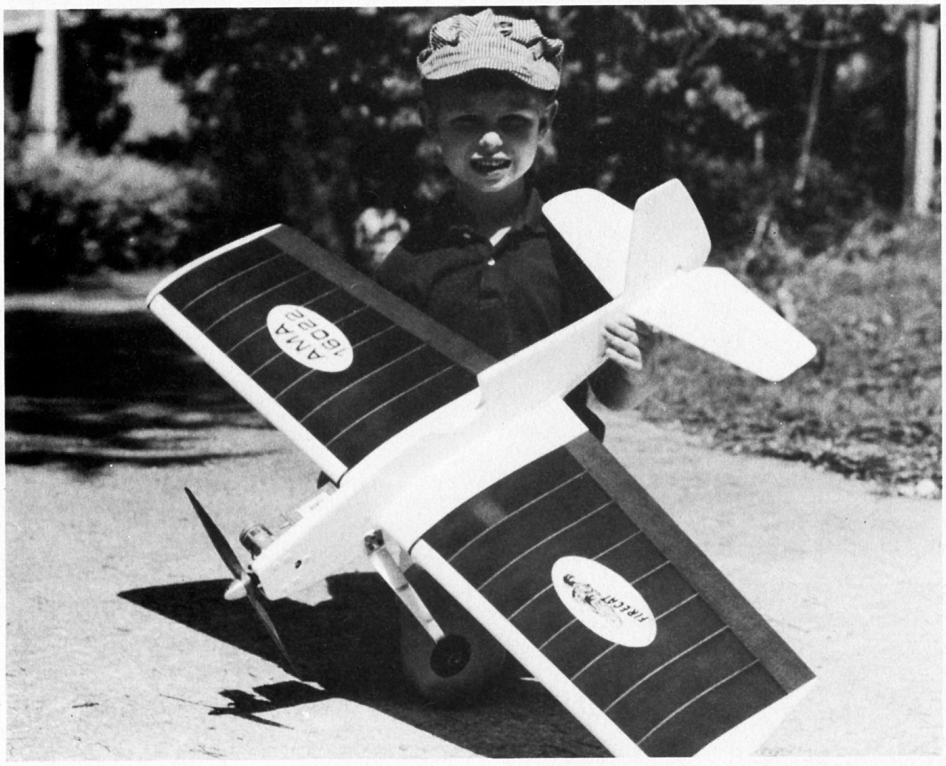
If you want your masterpiece to look like that high gloss "20 pointer", keep on doping and sanding. Somewhere along the way, (again, once the pinholes are sealed) you have to make the decision to apply your color, if you are going to use color for trim or finish. When to do it is up to you, depending on the effect you like. Don't forget, you are still going to have to apply more thinned (60-40) clear to seal the color and add the final gloss! (More weight).

From here on it's pretty routine. If you like that silky satin finish, you're done. Ain't it pretty? If you prefer the polished look, sand, rub and buff to your heart's content. *But*, be careful not to cut through the silk.

Neat stuff

Here are some neat tricks to play with. Mix Rit dye with thinner and add it to the clear dope for a transparent, but colored finish on white silk and bare wood surfaces. Small amounts of pigmented dope added to

Silking: a modeling art form



To help his dad illustrate the beauty of a silk covering, young Mitchell VanDuzer lets the sun shine through the wing, showing the elegant translucence of the doped finish.

clear will have nearly the same effect. This was done on many "oldies" (in the Northeast at least) and looks great on the wood surfaces. Reinhardt's *1951 Winner*, and Scarinzi's *Gay Devil* were done in this fashion. But, (always "but's") be careful, as the thickness of the dyed dope governs the depth of color. Uneven spraying, sanding or buffing will cause variations in the final color.

You may also use the Rit to dye uncolored material, or to deepen the color on previously dyed silk. I used to believe that once you wet the silk (as with a dye solution), it would shrink up and that would be the end of the shrinking process; i.e., it would not shrink on the model when you needed it to. I am told that this is positively not the case. So, go ahead and follow the dye instructions to dye the material. Let it dry. Iron it. Then proceed as normal. But, I would test a piece first!

Back in the 50s, silk scarves were cheaper than modeling silk, although a little smaller. We had all manner of birds, polka dots, checkers, and paisleys on our Combat ships. Have fun!

Silk can be used to cover wood surfaces too, for added strength. Model boaters covered their hulls with silk. Scale model enthusiasts use silk to get "that cloth look" on cloth covered subjects, and cloth covered panels. I silked the sheeted stab and elevators on my *Stuntwagon* so that the clear orange finish on those parts matched the clear orange wing.

Get creative! This is neat stuff!

The teapot!

No article on silking would be complete without mention of ... *the teapot*! You say you've finished that open frame beauty, and it is warped! Fear not travelers.

All silk finishes pull and twist the surfaces, except (maybe) a "D" tube wing, but then your flaps will warp like crazy. It cannot be avoided, but it can be fixed. Except for the tips, steam can be used to bring any panel back into correct alignment. (Most old time wing tips will benefit from the use of additional sheet balsa gussets to reinforce them, and help alleviate this problem).

Remember, these designs were not intended to have ten to fifteen year life spans, and the silk (unless plasticized) will continue to shrink over the first few years. Hence, the warps will have to be removed continually over the first year or two.

OK, tomorrow is going to be your maiden voyage. Go to the kitchen and fill the tea kettle. While you wait for the steam to come up, start sighting your wing from the trailing edge. Does the line of the trailing edge evenly split the distance between the top and bottom of the wing at the high point, all the way from root to tip? The front quarter of the wing, from the leading edge to the spar, rarely picks up a warp, and twists can be taken out by making the trailing edge straight and parallel with the high points of the wing.

Identify the worst warp in either panel. If the airplane has fixed flaps, ignore these for now, and concentrate on getting the wing panel itself straight. Now, hold the panel in the steam for a minute or two, first one side, then the other, allowing it to absorb both heat and moisture. Pull it from the steam and grab the fuselage between the wing and the tail. Put the prop nut in your belly, (all retread, old time flyers have bellies, don't they?) and grab the trailing edge of the tip with the other hand. Lay your forearm against the high point of the wing, and twist the wing between your hands and forearm so as to remove the warp, going about half as far to the other side of neutral as the original warp was. You should feel the spongy panel move in your hands as you apply pressure.

If it feels as stiff as it did dry, steam it some more. Hold it in this position, until it cools. Wipe off the condensation, and see where it has settled.

If it moved to beyond neutral in the direction opposite to the warp, it is probably close enough to right to be left overnight. Don't try to get it absolutely correct in the first session; overcompensate some. Now do the other panel, and lastly, take out any small warps in the flaps, or tail surfaces.

It will take two or three attempts to arrive at dead neutral. Don't cheat by thinking that some warps will compensate for others. It *may* work in level flight, but rolling and yawing are guaranteed in the maneuvers! And don't cheat by thinking that small warps are OK. Close enough ain't! If it sounds like we've tried to cut corners and found it a waste of time, believe it!

The next day before leaving for the field, run the entire ship through the process again. You'll probably find that most of the warps you removed last night, have returned, but to a lesser degree. Three or four trips through the process are usually necessary to get a truly straight wing. Afterward, the wing will have to be steamed every now and then, until it finally settles in.

Sure, trim tabs are easier. But every tab I have ever used seemed to scream out, "Yeh, Yeh, my owner built a crooked wing"!

If all this seems to be a pain, consider how it will feel the first time some youngster, or retread old timer, sees the sunlight shine through your creation and says, "Whazzat? Howjaduit?" It takes time and work, but nothing, not the shiniest RTF made, beats this kind of satisfaction. I know. That's how this all started, remember?

Finally!

Clear dope does *not* filter ultra violet rays from the sun. The dye in your colored silk *will* fade (over time) when exposed to the sun. You can tell it's fading when the top of your wing is a different color than the bottom! So, when you see me out at the field, and my Old Timer is covered with a blanket, please don't laugh!

Silk Sources

Sig Manufacturing
401-7 South Front St.
Montezuma, Ia. 50171
+1 641-623-5154
www.sigmfg.com
mail@sigmfg.com

Larry Davidson
66 Casa Mia Circle
Moneta, Virginia 24121-5307
(540) 721-4563
SamChamps@jetbroadband.com