

Edited by
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Bob's article first appeared in S.H.A.P. TALK, the bulletin of the Sailplane Homebuilders Association. These fine homebuilders would be happy to welcome you to their group and provide you with their newsletter upon payment of annual dues of \$12 for the U.S. and Canada (\$16 outside these countries). Mail your dues to the author of this fine article who serves as Secretary of this group of homebuilders whose special interest is sailplanes. Part I - Template Making and Line Generating Techniques appeared in the August, 1984 "Craftsman's Corner" of SPORT AVIATION. - Ed.-

WE BEGIN OUR mold-making by constructing a **MALE** mold, or "plug". This mold may be used for acrylic plastic canopies, or for lay-up of fiberglass materials. Thermoplastic acrylic sheet may be heated and "drape formed" over the male mold and fiberglass reinforced plastic can be "laid up" ply-by-ply to get desired strength and shape.

Production of several identical parts warrants the making of a **FEMALE** mold that may be constructed over the male mold. Parts can then be pressure blown into the female mold - or vacuum bagged - or "laid up" with polyester or epoxy resin.

When you have a good male mold, you may make the desired part from low cost materials and with the use of simple tools.

Part I of this article left us with our template/structure for a low drag fiberglass reinforced plastic nose cone. There are **NO** flat surfaces on low drag bodies - so get accustomed to working with compound curves in the hope of achieving some laminar flow.

Your visual "measurements" and delicate sense of touch will become your guides to obtaining smooth, flowing curves that are needed for minimum drag. Filling and sanding - filling and sanding - filling and - is the name of this game!

In addition to lots of patience and manual dexterity, you'll need some readily available mold materials and

MAKING MOLDS FOR

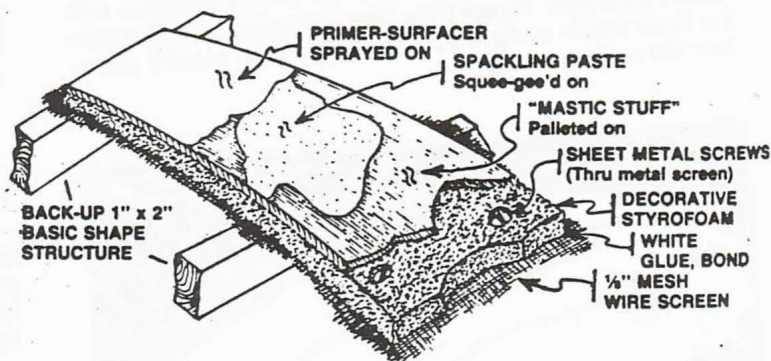
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A roll several feet long of $\frac{1}{8}$ " mesh "hardware cloth" from the chickenwire department of your hardware store. Do **not** try to use $\frac{1}{4}$ " mesh.

Blocks, or sheets, of quality Styrofoam from florist, crafts, hobby supply sources. 4" foam is best and it should be 12" or 24" wide by at least 36" long. Use a band saw to make mosaic-shaped blocks, mostly less than 1" thick and shaped into trapezoids, triangles, etc. The trick is to glue up the flat "foam tiles" so that they conform to curved surfaces. Make them overly thick so sanding will bring them down to the desired contour. Sanding styrofoam is so easy it's almost fun - BUT don't get carried away because filling and sanding the low spots gets weariesome!

A small, narrow SURFORM plane is needed for rough work. There is one that is flexible for curved surfaces. A block of foam makes a good "sanding" device - no sandpaper needed.

Get #8 or #10 sheet metal screws 1" and $1\frac{1}{2}$ " long. Pan heads, or stove heads, are preferable.



ASSEMBLY OF THE MOLD:

Now it is time to apply the $\frac{1}{8}$ " mesh hardware over the wooden back-up structure you have constructed. It should lie approximately $\frac{3}{4}$ " below the designed final mold surface. Use tacks and soft wire to fasten medium and small pieces of mesh to core structure. Be sure to fasten it solidly.

White glue is used for attaching the "mosaic" of foam onto the wire screen, leaving the template edges untouched.

Sheet metal screws are used for drawing the foam blocks into good contact with the screen while the white glue dries. Turn the screws deep enough so that screws won't interfere with the sanding operation to come.

The sketch shows all the materials which comprise the mold and its bracing, back-up structure, from sticks of wood through final sprayed-on primer, ready for the release wax and a coat of P.V.A. film release.

You'll need T-pins to hold the edges of foam blocks together while the white glue sets. Try to have a minimum gap. You'll use a lot of "white glue". Better buy large containers of it and refill a small squeeze bottle as needed.

Time now to approach the final contour surface for which you are striving. Buy, in 2-gallon plastic buckets.

corrugated carton cardboard in large segments.
hard (tempered) Masonite, $\frac{1}{8}$ " thick.
Furring strips 1" x 2" and 2" x 2" - select for straightness - these are for building the support frame structure - make it solid and strong to withstand sanding pressure.

LAMINATING/FORMING QUALITY AIRCRAFT PARTS

PART II - MOLD CONSTRUCTION

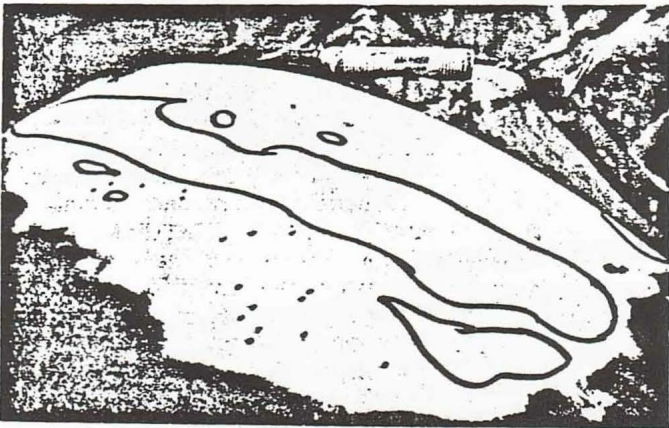
a quantity of a relatively new mastic wall-covering material that comes in whipped cream consistency. It clings, does not sag at normal temperatures, is water based and easy to handle. It dries to a sandable surface and can be worked with SURFORM PLANE. Thick applications need 12 hours for drying. It shrinks somewhat on drying - so allow for this. A 2" wide putty knife, or a kitchen spatula, is good for application. Be prepared to put on second and third coats to build up low spots. Two trade names for this nice material are: "SCULPTURE KOTE" and "RUFF STUFF". It costs about \$10.00 to \$12.00 per 2-gallon pail.

The best sanding disc grit is OPEN - 20 or 40 grit. When using electric sander - use caution - don't disturb template edges, or accuracy will be lost. Use a light touch and good illumination. Protect your eyes and lungs with safety equipment and ventilation. A good trick for hand sanding is to wrap abrasive paper around a **used** kitchen sponge. New sponges are too soft.

Splines are important tools. Thin wooden strips work well. Use a movable shop light to find low spots, or unevenness, in the surface. Place spline so that light shows under it to find low places. Move spline and light in all directions. Use your hands to detect irregularities.

Check left and right symmetry with hand-held templates.

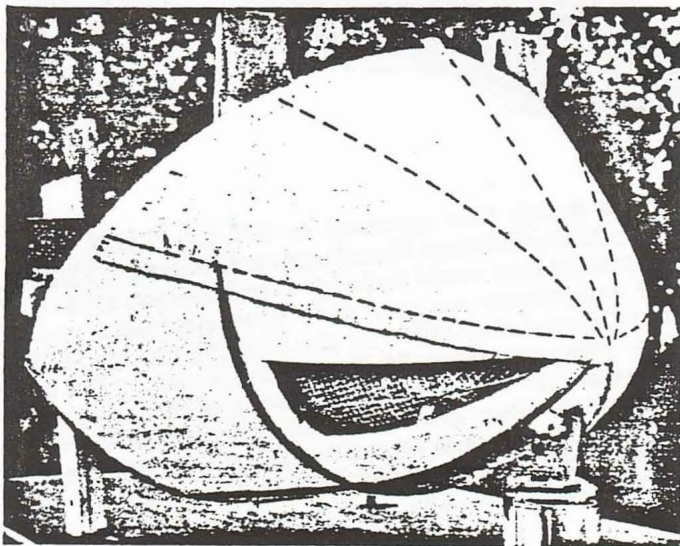
For final shaping, purchase a 2-pound tub of vinyl spackling paste (SYNKOLOIDS is excellent). This stuff is smooth and easy to apply and dries quickly with minimum shrinkage. Thin layers work best. Use a medium soft rubber squeegee. Remember that this surface will create the final inside surface of your mold, so be careful not to mar the soft material.



Lines drawn indicate enclosed low areas needing "build-up" and spots indicating high areas to be sanded.

From an auto paint store, buy a can of PRIMER-SURFACER for spray gun use and spray on 3 or 4 medium coats for a good, smooth protective coating. Don't attempt to use "BONDO" as it is too hard for our soft materials.

Sand between coats of primer with 180-220 grit paper. For plastic canopy work go to a 360 grit abrasive for final smoothing. Optics of drape formed acrylic are directly determined by the smoothness of the mold surface.



Completed upper surface of nose cone mold for Bob's sailplane.

DuPont's 100 series "Multi-purpose Acrylic Lacquer Primer-Surfacer" has worked well.

Be aware that some resins, thinners, solvents, etc., may penetrate the mold release barrier and attack the primer-surfacer. It pays to experiment with your materials on a sample part in order to learn of possible problems. No need to sacrifice all that work of mold making!

Use lots of genuine mold release wax (four coats) plus a carefully sponged-on polyvinyl alcohol (PVA) film. This should furnish a good barrier and assure release of the fiberglass reinforced plastic. Remember that a pin-hole leak will allow the stickiest glue known - catalyzed resin - to penetrate to the mold's surface and cause a problem when you try to get the part out of the mold.

Reference: See **SPORT AVIATION**, Feb. '82, for article on shaping and finishing A/C surfaces.

Our thanks to Bob, the *Sailplane Homebuilders* and their publication, *S.H.A.P. TALK* for this fine article. -Ed.-

The EAA member submitting materials published in this feature are awarded the "Craftsman's Corner" Award. The award includes a special, limited edition hat and recognition by EAA Headquarters and fellow members.

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