

Making the Cub Cowling

Stan Douglas

This technique of using Hydrocal to form the plug for molding fiberglass parts came from a video of Terry Luckenbach where he demonstrates making a fuselage for a “Pretty Mantis”. The video may be found here <http://home.paonline.com/hayman/video.htm> along with “Vacuum Bagging Made Easy” by Phil Barnes. I recommend both of these videos. They contain lots of information about construction methods as well as general shop techniques.

So I needed to replace my Cub cowling as the ABS one was falling apart. I ordered a new one.



Above is the old and new cowls along with the engine part. The first step was to prep the ABS cowl by installing a former in the open end for support, pic 1a. Then I sprayed the plastic cowl and engine with Minwax Polyurethane and prepared a parting plate to install at the center of the cowling running from the front to the back. I also made a mylar mirror of the parting plate that I glued to the parting plate with 3M Super 77 spray adhesive.



Next I prepared the dam for pouring the Hydrocal. I first built a platform to support the parting plate and bottom of the cowl off of the work bench.



Here you can see the parting plate installed. I used clay to make a seal all around the edges where the cowl and the plate met. The plate was tacked to the cowl at the back at the former and the front where the hole for the engine will eventually be located (where blemishes wouldn't matter, with CA).



I have built up the walls around the top half of the cowl and sealed all the corners with clay as well as the rear around the former. Not shown is the engine piece which I simply built walls around and sealed with clay. To make the clay easier to work with I used my heat gun to warm it.



Hydrocal poured into both molds. The Hydrocal is similar to Plaster of Paris, but does not set up as fast and will withstand heat of molten metal. You can find it at pottery shops where they fire glass in kilns for around \$15 for a 30 lb bag. You mix it to a thick consistency where it will pour still pour, not too thick though. The big advantage over gel coat and fiber glass is the cost. If you make a mistake you can through the plug away and do another one. It's great for prototyping fuselages and generally does not damage the plug. When the Hydrocal does finally go off, it's fast and there's no further working with it. It gets hot to the touch.



I have removed the foam dam and support and flipped the whole thing over so the bottom half is now up, but the plug is still in the Hydrocal. I'll pull the plug out of the mold and let the whole thing cure for a day or so.



The completed cowl half and the engine mold. The engine mold is a worry because it's so little and has a lot of relatively complex curves. After curing I sanded the inside and edges of the mold lightly with a fine paper. I also had a couple of places where there were bubbles in the Hydrocal that I filled with epoxy and micro ballons. I cure the Hydrocal and also the fiberglass parts in the kitchen oven set to 190 degrees. Some day I need to build a hot box; another future project.

I didn't take pictures of making the second half of the mold, but basically I prepped the first half by coating the Hydrocal with three (3) layers of epoxy. You do this by applying epoxy liberally to the surface of the Hydrocal. It absorbs the epoxy quite readily. Then you take a soft rag and wipe any excess epoxy from the mold and let the epoxy cure between each of the 3 applications. I treated the part of the mold where the parting plate was to create a surface to serve for a parting plate for the second cowling half. Also lightly sand between each cured coat.

To make the second half I re-inserted the ABS cowl in the 1st plug and built foam walls around the 1st mold and plug so I could pour Hydrocal over the exposed second half of the cowl. I also drilled four (4) 1/8" holes in the 1st mold and inserted 1/8" pins in each just long enough to stick up about 1/8". These are to serve as guide pins when the molds are complete. They are just visible in the left mold in Pic 8. To make sure they wouldn't stick to the Hydrocal, I coated them with Vaseline prior to pouring the second half.



The molds completed with 3 coats of epoxy and lightly sanded with wet or dry paper. They are then given 3 coats each of wax and lightly sprayed with PVA release.



Here is the glass cowl in the mold after applying several layers of glass and epoxy. The mold halves were taped together and clay applied to the seam on the inside of the mold. I also gave it final coat of PVA.



The completed parts after removal from the molds. I was afraid the engine would be a through away piece, but after carefully working around the edges it popped right out. There was some suction formed and I think in the future I'll drill small holes where the cylinder heads are and plug them with clay. Then when it comes time to remove the part I can blow compressed air into the hole.

Here's the final cowling after painting and ready to install on the cub.



This is the third cowling I have made with Hydrocal. I have molds for a Spitfire and for Balsa USA's North Star. The neat thing is that the original plugs are undamaged. I also have a Q500 fuselage that I designed, but I was impatient and removed the sides of the second half and before the Hydrocal cured completely and wound up with a slight curve where I set it down on a uneven surface.

Stan Douglas