The Art of Fiberglassing

By: George Miller

It seems to me that this is a dying art now that most R/C modelers are now just R/C fliers buying ARFs. But there are still a few who are still interested in building their own aircraft to have something that they made and created to have some real pride in flying.

But even most of them are not doing anything much more than epoxying cloth on their balsa and looking to some company who can supply them with fiberglass parts if possible.

I think the main reason for this is that most modelers have never tried fiberglass work because they fell it is very complicated. And this is not the case.

Reasons for working with fiberglass:

1. **It is lighter than your built-up fuselage.**
2. **It is stronger than your built up fuselage.**
3. **It is fuel proof and requires no sealing**
4. **It requires no elimination of wood grain.**

5. It is hollow and requires very few formers.
6. You can make more than one.

Ever spend a lot of time building that great aircraft and lose it because of a crash? Wouldn't it be nice to have all that work you put into building it sitting home in the form of a plugs so you could build another without having to build another fuselage, cowl, pants, etc?

Ever finish that wooden structure and find you have no room in it for the items you want to install, or there are formers in it that are in your way? Do you find yourself dinging that structure and having to fill and repair dings?

Do you have to carve two parts to the same shape? Then find room in them for the inside items?

Fiberglass Materials:

There are only two different products for fiberglassing I will talk about here: Epoxy and Isophthalic resins. Polyester resins have no place in model work.

Epoxy resin:

Used by most companies when making glass parts. It produces no fumes when working with it. It will produce a hard part. You can get it in various times of pot life forms. And because of this it is best for covering balsa or foam parts with 1/2 ounce cloth to add strength or eliminate wood grain. It will require using epoxy for gluing formers in place. And that is a heavy glue joint. It does not attack foam, but it does produce heavier fuselages and parts.

Isophelic resin:

This is my resin of choice for building parts. Yes it does produce fumes when working with it. You have to use it in a well-ventilated area. And when you add the hardener to it, your time is limited. Here are the reasons I use it:

1. **It produces a lighter item.**
2. **It produces a stronger item.**
3. **It sands easier.**
4. **It is a laminating resin**
5. **Your standard CA types of glue work well with it.**
6. **You can literally weld a former in place using**

"Ambroid" glue.

Products needed:

Isophelic or Epoxy resin
TAP PVA mold release
Acetone
Mixing cups and stiring sticks
Cheap small painting brushes
Various weights of cloth
Meguiar's mold release wax

These items can be purchased at your local "Tap Plastic" , boat repairing shops, or a shop that does fiberglasss work if you should have one close to you.

Fiberglass Cloth:

Fiberglass cloth comes in various weights and sizes. I generally use 3, 6, or 9 ounce cloth. The length and weight is determined by the size of the item I am building. An item is made using more than one layer of cloth because the layers of weave bonded to each other makes the item very rigid. If you have ever bought a fiberglass fuselage or part it will look like it is only one layer, but it isn't.

Determining the weights of cloth you will need goes according to the item you are making.

A standard 60 size fuselage will need a layer of 6 ounce and a layer of 3 ounce if the item has a lot of round curvature to it. If it is more square with large ares of flat, it will be best to use two layers of 6 ounce.

If your fuselage is more on the large scale in size, I would go to either two 6-ounce or even go to one 9-ounce and one 6-ounce.

If it is a cowl or wheel pants or some other item that will take a lot of abuse I will use two layers of 6-ounce.

And on a fuselage, I will add a addition strip of cloth in the wing saddle area or engine area if I feel it will be needed.

Making plugs and molds:

If you are building model aircraft, you are already making plugs. Just stop before you get to the primering and painting part and call it a plug instead of a fuselage, cowl, wheel pants, etc. If you

have the ability to carve foam, build up out of wood, or anything else, you have it. Just seal the foam with epoxy and cloth and if it is wood, just do your favorite way of eliminating the wood grain. Even just plain Monokote will work.

Do you need to make a mold from your plug and then glass in molds? NO. This is only necessary if you are planning on making a whole lot of thems. If you are only going to need one or maybe two, you can lay-up a part right off the plug. Now, this is not as easy as doing a lay-up from a mold, but it does take a fair amount of time to make molds. And with some aircraft that are very complicated in their shape, like some jets, you will be better off making a mold. But your basic military and sport type of aircraft are pretty simple in shape and easy to glass a fuselage or part right from your initial construction.

If you are deciding that you want to make a mold, the simplest way to do that is to locate a fiberglass manufacturing shop around you that has a "Chopper Gun". This is a gun that shoots resin and chopped up fiberglass rope at the same time. It is how tubs, sinks, pools, etc. are made. I have never found one of these shops that won't help you out if you prep the item so all they have to do is shoot it

when you bring it to them. The reason behind this is that you need a very thick lay-up when making a mold so the mold will hold it's shape. Doing it by hand with many layers of cloth is quite time consuming and requires another product called Gell Coat.

I am basically going to go into the procedure of working from plugs here. Anyone who wants to get into making a mold can contact me directly and I will get into it with them.

Let's get started:

We will deal with a fuselage that you want to make a fiberglass copy. This same procedure will work for any part you would want to make.

Find a way to support this fuselage with a wood dowl through the fuselage, clamped in a vise or some other way. Using a vise works well because you can rotate the fuselage to the side or inverted.

Give it a couple coats of the mold release wax, letting it dry between polishing with a terry cloth type of towel or rag. Then brush on a coat of PVA mold

release.

Determine the weight of cloth you will use. Cut out your pieces of cloth to the size you will need to go around the complete fuselage.

This fuselage will require sanding when finished to make it smooth for painting. So you want your last coat of glass to be your lightest cloth so the weave is the finest for sanding. And if you are going to add some strips in some areas, they should go on first.

Add hardener to the amount of resin you feel you will need to coat the fuselage in a plastic cup. Then brush a coat of resin on the fuselage making sure you have a nice even coat that is not too thick, and make sure you have no runs by using the brush and mopping off any extra resin. The thinner the better. It just needs a nice coat, not a thick one. Now clean that brush with acetone and sit back and let this resin cure. And put that plastic cup with the resin you didn't use outside because when it goes off it will really put out the fumes.

This resin is a bond coat type of resin. It will still be very tacky when it is cured. You will be able to tell when it is cured by looking at the extra resin in

that cup. It will be hard but tacky. This is a good thing.

Placing the cloth on your plug takes some practice and experience, but it really isn't that difficult. You want to lay it on as even and smooth as you can, starting with those strips I was talking about if you are going to do that. Or just start out with your heaviest cloth first.

You will notice that the cloth will go around corners and curves very well. You will also notice that it sticks to the resin and stays in place. You can use the scissors and cut the cloth where you need to, but do not leave much in the line of overlap in those areas.

Once you have the cloth on and trimmed like you want, it is time to put another coat of resin on, let it cure, put on another layer of cloth, and another coat of resin.

Now look at your finished project. If this is your first time doing this and you have a pretty rough finish on it with lots of overlap areas and what not, you can let it cure and give it another coat of resin to help fill the grain of the cloth for your sanding.

Either way, after your final coat of resin has cured, you have to brush on a coat of the PVA mold release. This is a liquid wax and will seal the resins from the air which will make the resin totally cure for sanding.

Sanding

Give it a few days to completely cure, even placing it out in the sun during the day.

Hose off the PVA with water and it is time to sand.

First, I use one of these four sided rough files and go over the overlap areas and bad spots if you have them. I clean up all the edges with this tool.

Use a pretty rough sandpaper or you will be there forever. Like about 60 grit. You will be able to tell what grit is best for you by how it is sanding. Once you have it sanded smooth, you can use a finer grit for the finish. Yes, this does take a little time, but the end product will be worth it. I would now give it a few more days of curing.

Now I haven't run into this in a very long time, but

will mention it here. If when all done with the sanding you feel you have sanded through the resin and cloth too much, you can put on another coat of resin, let it cure, another coat of PVA, and give it another fine sanding. But remember that primer will fill a lot. Strength is all you are concerned about here.

Parting and Seaming

OK, you have your finished glass fuselage on the plug. It is time to get it off the plug.

According to the shape of your fuselage or part will determine how to get it off the plug. I generally like to cut it through the wing saddle or the bottom. Remember this fuse will flex some, and sometimes you can just cut it on the bottom and flex it off.

I mark where I will cut the glass with a felt pen and use a Zona saw to cut through the glass. Do not worry about cutting into the plug. You can always repair those areas. I then use water and thin metal shims to get the water into the areas to release the PVA.

Once it is off the plug, give it a good washing inside

to make sure you have all the PVA off the inside of the fuselage.

Rough up the areas where you are going to do any seaming with rough sandpaper.

Use masking tap and tape the parts together.

Brush on a coat of resin the width of your seaming cloth, (about a inch wide) let it cure, put on your seaming cloth and another coat of resin.

You now have a fiberglass fuselage.

Summary

These instructions make this sound like a very long tedious project. But that is not the case. Just look at the size of the instruction manual for building a built up fuselage.

I have tried to cover everything here. You will find with your first time that it just flows from one step to another. And you will sure like your finished project.

Here are some tips:

1: Be sure and sand the inside of the fuselage before gluing to it.

2: When using CA, use the thin stuff and fill gaps with baking soda and more CA.

You will never get a good glue joint with thick CA. It has no capillary ability.

3: Remember "Ambroid" glue? It is a acetone base glue. It will melt right into the glass fuselage. Put glue on both parts, rub in place and remove. Let the glue dry and then re-glue it in place. You may crash this airplane, but that former will still be there. Great for nose gear, engine, and such.

4: Use a zona saw for cuting out hatches and such. They have a very fine blade. Just pencil on the fuselage, start with the edge of the saw and work from there.

5: On hatches and things like that, I like to glue a strip of balsa about a 1/4" or so low in the fuselage and then glue a strip of 1/64" ply up to the hatch line, making a trough for the balsa strip I glue on the hatch to fit into.

I hope this is some help to you.

Feel free to contact me if you have any questions:

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The Following are Photos of some of my Glass projects.

1. This plug is ready to glass with the wax and PVA applied.
2. The glassing in finished. One layer of 6 oz and one of 3 oz cloth.
3. The fuselage is finished. Sanded, seamed, and the canopy hatch cut out.
4. A wood plug . Silkspan, doped, primer, and waiting a coat of paint to finish.

These were built using molds because as you can see, we built quite a few of them

This is probably fiberglass and modeling taken to the extreme here but nothing has changed as far a procedure.

1. A cowl plug turned on a lathe and a canopy plug.
2. All the plugs, molds and some glass parts for making this aircraft.
3. Notice all the room this glass cowl gives plus the ease of getting air for cooling.
4. The construction complete. Ready for covering and finish.

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This F-4 Phantom requires making a mold for glassing. The recessed areas for the missles, and behind the intakes would be very difficult to sand and shape. And there would also be the problem of getting it off the plug. It takes a lot more time to make molds, but on some aircraft it is the only way to go.