PEAK OF FLIGHT NEWSLETTER

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HOW TO REPAIR A HOLE IN YOUR FIBERGLASS ROCKET

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PEAK OF FLIGHT

How to Repair a Hole in Your Fiberglass Rocket

By Tony Smith

In this article, I am going to explain how I repair a hole in a fiberglass body tube or a composite nose cone. It is not very difficult, it just requires a little work. Let's say you launched your rocket and the recovery system did not deploy and the rocket was damaged when it hit the ground. As a result of this, you now have a hole in your rocket body tube or nose cone.

To repair this, I disassemble the rocket as much as possible. There are a couple of ways I have patched the holes in the past, which are explained below.

Method 1

The first method is taking tape and covering the hole on the outside of the rocket and fiberglassing inside the tube. This works fine. You just have to do a little more sanding to get the outside shape of the patched hole on the rocket tube.

Repairing the Hole

To do this simple method, first lightly sand the outside and inside of the rocket tube around the hole with 100 grit sandpaper. Then clean the area you just sanded with alcohol or degreaser/cleaner. Soap and water will also work. Next take some packing tape and wrap it around the rocket tube and over the hole. Then lay fiberglass and epoxy up on the inside of the rocket over the hole on the inside. Normally I like to use 3 layers of 4 oz glass for smaller rockets. If you are using carbon fiber, the same previous steps apply.

Once the epoxy has cured, remove the tape from the outside of the tube or nose cone. The hole should now be filled. Next you are going to have to do a little body work to get the tube or the shape of the nose cone to match the rest of the part.

Shaping the Part

First, take some alcohol and clean the outside of the hole and surrounding area. Now you are going to need a lightweight body filler. I like to use Evercoat glazing putty, but you can use any lightweight putty. Mix up a little putty and put a layer of it over the filled hole. When that has dried, take 100 grit sandpaper and begin to sand the puttied area. Try to match the shape of the body tube. Once you have the shape the way you like it, take some automotive primer and spray it over the filled hole. One layer of primer is fine for now. I like to use Duplicolor filler primer. You can spray it on thick and it does not run. It also sands easily.

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About this Newsletter

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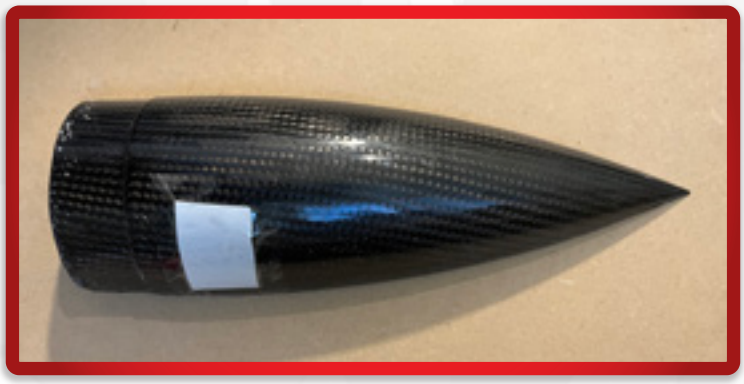
After the primer has dried, look at the filled hole and see if you have any divots or unevenness. If you do have unevenness, mix up a little more body filler and glaze it over the area that is uneven. Next sand the area with 220 grit sandpaper to your liking. Spray primer over the area again. Sand the area with 320 grit. The hole should be gone at this point and you are left with a nice primer color area on your part.



Paint the Repair

You are now ready to paint. Spray the area with the color you like. Spray two light coats and one heavier third coat. Wait 10 minutes between coats. If you paint really well, you do not have to do any more work to the area besides taking 1000 grit sandpaper and sanding the area and blending it in with the rest of the paint on the part.

After you sand the area and get it blended in, polish the area with an automotive polish of your liking. You are now done and the only way you should be able to tell that your rocket was damaged is from the inside of the part.

Repairing a Crack

Sometimes the damage can just be cracked paint. In order to fix this, you need to sand down the cracked area until the crack is gone. Once that is done, clean the area with alcohol. Next spray automotive primer over the area. If you see a small hint of the crack, sand the area again and primer the area again. If you still see the crack now, mix up a little putty and fill the crack. After the putty has dried, sand it with 220 grit sandpaper and spray on another coat of primer. The crack should be gone now. Next, sand the area with 320 grit sandpaper and refer to previous steps on painting. If the crack comes back after you paint the area or when you prime the area, the fiberglass or carbon fiber has been damaged and the structural integrity has been compromised.

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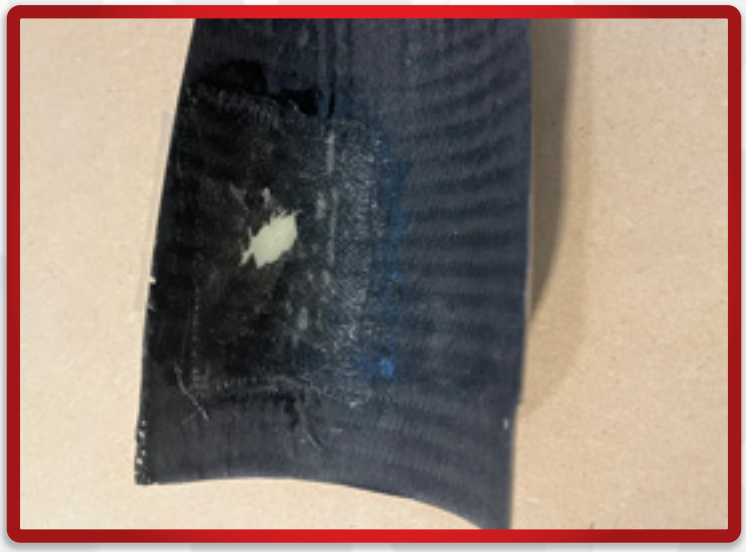

All is not lost. The easy fix is to apply some thin CA glue on the inside over the damaged area. The damaged area on the inside should look like a white area, a different color than the rest of the inside part. Next repeat the sanding, priming and painting. If the crack comes back now, you are going to have to get a little bit more aggressive.

Take 100 grit sandpaper and sand inside over the damaged area. Clean that area with alcohol. Mix up some epoxy and brush on a layer of it over the damaged area on the inside of the part. Now take a swatch of 4 oz fiberglass or carbon fiber and place it over the damaged area. Stipple the area with a brush to wet out the fiberglass or carbon fiber. If you are worried about weight, take some peel ply and place it over the glassed area and stipple the area with the brush. After the epoxy has dried, remove the peel ply. The area should now be stiff. Sand the outside of the part until the crack is gone and repeat the above steps. You should not have a crack anymore and the structural integrity of the part should be good again.

I do not like to do the quick fix of just using CA glue unless it is an emergency and the part is needed immediately. If it is, I will do a quick fix and when the part comes back in, I use one of the more aggressive methods listed above to do a more permanent repair.

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Method 2

The second way to repair a hole is to make a quick mold and use that mold over the hole to get the perfect match of the shape of the rocket tube. I prefer this method. If you can find a tube the same diameter of your rocket tube and you want to use it as a plug, you first have to make sure the surface is smooth.

Making the Mold

If the hole in your rocket tube is about 1 inch in diameter, sand about a 5 inch square on the rocket mold. If the surface is painted already on your mold, take 1000 grit sandpaper and sand the surface and repeat with 1500 grit. Next polish the surface you just sanded with an automotive polish. I like to use Griots complete compound, as It gives a very shiny surface. After you have polished the plug, wax it with 3 coats of mold release wax. I like Partall or TR high temp or TR 108.

If you are using TR high temp wax and you are making a mold, after the mold is made, apply a coat of TR-301 fiberglass mold sealer and glaze. This seals the mold of any small pores. If you get small pores in the mold, your part will stick to the mold when removing it and it can ruin your mold.

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When you wax the mold, make sure you do not let the wax completely dry. Wipe on the wax and wipe off the wax. If for some reason you let the wax dry, re-wax the molds. Wait at least 12 hours between coats. You wipe the wax on and wipe it off immediately if you are going to use PVA/polyvinyl alcohol also as your release agent. If you are not going to use PVA, follow the instructions on the wax container.

I like to use wax and PVA. It is tried and true and I do not have to worry as much about the part sticking to the mold. There is nothing wrong with just using wax, however I have just used wax in the past and I have had some parts sticking in the mold.

Now take 4 oz fiberglass and cut several swatches of 5 inch diameter patches. I like to use 6 layers, but 6 is not really needed. I use six to make the mold very rigid. Now take your waxed mold and apply PVA on the section of the tube you just prepared. You can use a foam brush to apply the PVA or you can spray it on with a paint gun and compressor.

If you want to spray the PVA on and do not want all the expense of a paint gun and compressor, I recommend you go and buy yourself a Preval spray system. You can order them online or you can buy them at Home Depot. The Preval system works really well for spraying PVA. You just have to water down the PVA a little bit to spray nicely through it.

If you use the Preval system, use 2 lightly sprayed coats of PVA and one heavier 3rd coat. Once the PVA has dried, mix up a small batch of epoxy. Follow the instructions that are printed on the bottle of epoxy that you are using. I like to use System 1000 from Fiber Glast. It is a laminating epoxy and has very good UV protection. It also flows well and wets out the cloth extremely well. Any good epoxy will work for making your mold, even cheap epoxy.

Now brush a layer of epoxy on your tube mold then lay one of the swatches of 4 oz fiberglass on the epoxy. Take your brush and stipple the epoxy and cloth. You want the

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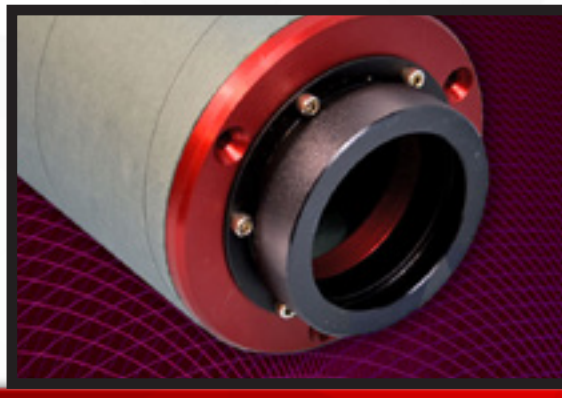

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epoxy to come up through the glass. Lay on another layer of fiberglass. Stipple the area more with the brush. Lay another swath of 4 oz glass over the area. You might have to brush on a little more epoxy on the area. Keep repeating until all the cloth is layed down. Once the epoxy has dried, remove your new fiberglass mold of the part from the plug. Now wax the surface of the new fiberglass mold with 3 layers of mold release wax. Again, wait 12 hours between coats.

Repairing the Hole

Now place the fiberglass mold over the hole on your rocket and check for fit. It should be a perfect fit. Next tape the mold over the hole. Cut some swatches of fiberglass a little bigger than the hole. Mix up some epoxy and brush it on the inside of the rocket where the hole is. Lay one of the swatches of fiberglass over the hole on the inside of the rocket and use your brush to force the epoxy up through

the glass. Place another swatch of fiberglass over the epoxied area. Again, force the epoxy up through the fiberglass. You might have to brush on a little more epoxy if the fiberglass is not wetting out enough. Lay on enough glass to build a good thick layer, normally about 4 layers of 4 oz fiberglass.

Next cut some peel ply to cover the epoxied area and place it over the area. If you do not have any peel ply, do not worry about it - the peel ply is only to soak up some of the excess epoxy. If you are worried about weight and do not have any peel ply, take some paper towels and pat out the excess epoxy. Once the epoxy has dried, remove the peel ply and mold from the outside of the rocket where the hole was.

Next, spray on a coat of primer. You should see the filled hole and all the imperfections. Mix up a little spotting glazing putty and apply a thin film of it over the hole area. Next, take 100 grit sandpaper and sand the area. Do not

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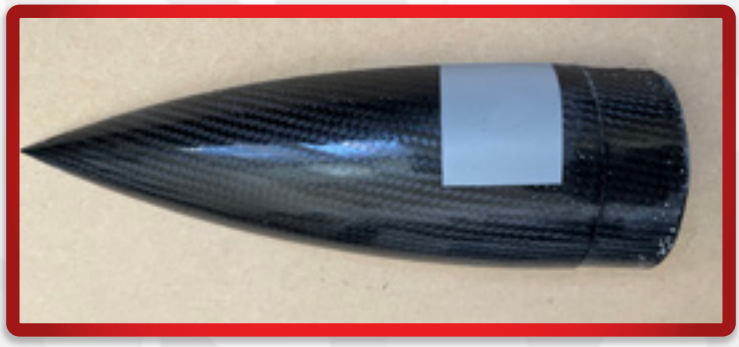

change the shape unless you have to, to match the shape of the rest of the rocket.

If you have followed the steps, you should not have to do a lot of sanding. Spray on another layer of automotive primer. After it has dried, sand the area with 220 grit sandpaper. Spray on a little heavier coat of primer. After it has dried, sand the area with 320 grit sandpaper. You are now ready to paint the part. The painting is the same as mentioned above.

These are a couple of ways I repair holes and cracks in damaged composite parts. There are many ways of doing repairs and it depends on how in-depth you would like to go, from simple and a little more work to just repairing the part correctly from the beginning.

A Note About Composites

Some people do not like to do any composite work due to thinking it can be too complex and expensive, but with just a few things that are not expensive at all, you can make and repair some amazing rockets.

You can get all your composite supplies at any composite online store or your local hobby shop. When working with epoxy, wear gloves as much as possible and when working with carbon fiber wear a mask as well. When you are painting, wear a respirator style of mask and work in a well ventilated area. If you would like to learn how to make composite parts for your rockets such as nose cones, please read my previous article on this subject in *Peak of Flight* Newsletter #581: https://www.apogeerockets.com/education/downloads/Newsletter581.pdf. If you like building composite parts, I would suggest you buy a 3D printer to print your plugs or molds.

I hope this article will help you out in your future repairs of your rockets.

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