

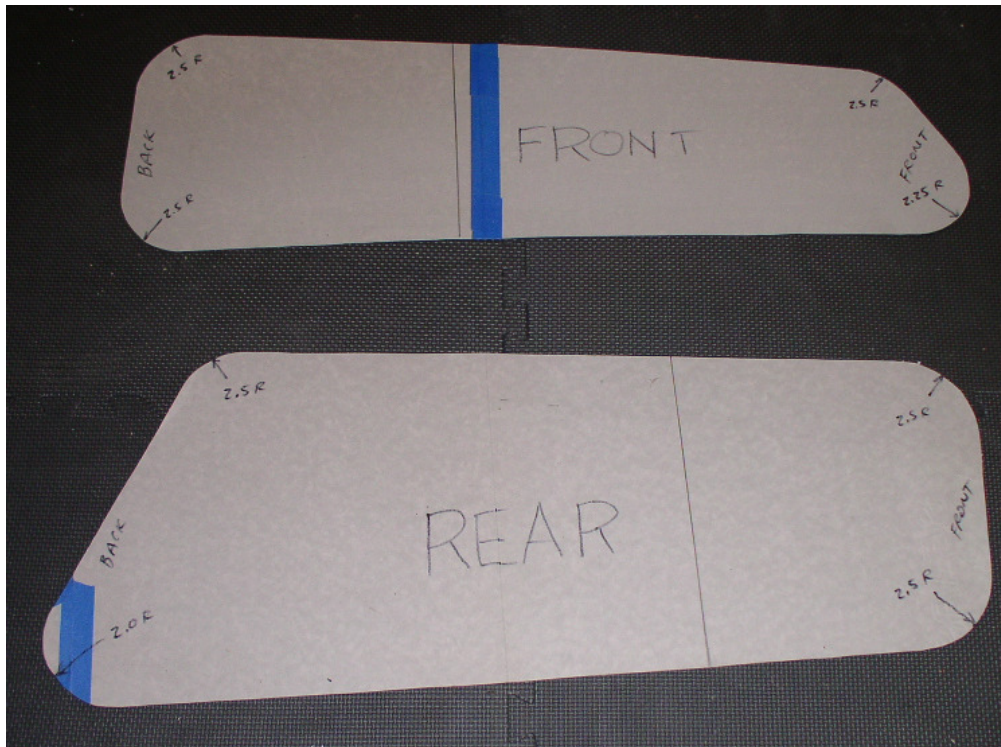
Window Project

The second largest project that I wanted to tackle this year was to replace the leaky windows. The largest project was to re-paint the deck. According to everything that I've read, replacing the sealant around the aluminum window frames to stop the windows from leaking is a difficult job to do properly. Some of the guys on the Catalina 22 forum have reported that even after installing the kit from Catalina Direct, their windows continued to leak. Instead of replacing the gasket and sealant, I decided to replace the windows completely with Plexiglas that is basically "glued" to the outside of the cabin. I realize that this goes against everything the "purists" would do but it's my solution and I'm sticking to it.

The entire project was accomplished in 16 easy steps.

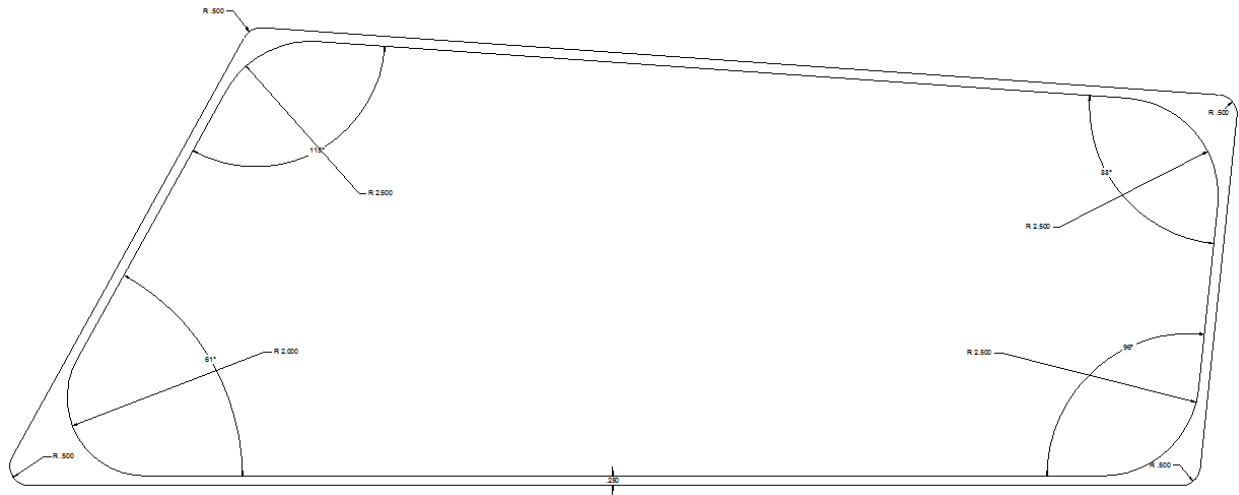
1. Make cardboard patterns of the window frames.
2. Create full scale drawings of the cardboard patterns.
3. Print and verify the drawn shapes match the patterns
4. Modify the window shape (enlarge by .250" and reduce the corner radii to .500")
5. Order Plexiglas.
6. Print the modified drawings.
7. Transfer the images to a poster board and cut out the shapes as new patterns.
8. Remove the old windows and frames.
9. Remove all traces of caulking/sealer.
10. Verify the window size by placing the poster board patterns over the window openings.
11. Have the Plexiglas windows cut to size by a laser cutter.
12. Mask the window openings to prevent adhesive from getting all over everything.
13. Apply the window adhesive to the boat.
14. Press the Plexiglas windows onto the window openings.
15. Let the adhesive cure.
16. Remove all tape and clean off the excess adhesive.

The first step in this process was to make some patterns that matched the exact size and shape of the outer aluminum window frames. I did this by placing sheets of cardboard against the frames to make an impression of each window. It was just easier to measure a flat surface than to measure the frames themselves. Once the impressions were made, I cut them out as shown below.



After taking accurate measurements, I created full scale drawings of each window on a CAD system named Solidedge. I printed the drawing at full scale and placed the cardboard patterns on top of the print to compare shape and size. They matched exactly.

Since I did not know what was behind the aluminum frames or how much surface area I had to work with to glue the Plexiglas to, I decided to enlarge the window size by .250" all the way around. This would allow just a bit more overlap around the outside of the window opening. I adjusted the drawing accordingly. Another modification that I made to the window shape was to reduce the radii on each corner giving the windows a more modern look. The image below shows the difference between the old aluminum window frame (inner shape) and the new Plexiglas window (outer shape).



Next, I ordered 2 sheets of Plexiglas from InterstatePlastics.com. It was their Gray Polycarbonate sheet #7130 product. The dimensions of each sheet measured 24" wide x 48" long x .236" thick. Total cost including shipping was \$148.00.

Now that I had the technical details worked out, it was time to start working on the boat. Removing the old windows was easier than I thought. I simply removed the screws holding each inside window trim to the outside window frame and the inside trim popped right out. Now, the only thing holding the outside frame on was some really nasty sticky gray caulking type gunk. After prying on each corner of the window for about 5 minutes each, I was able to get the windows to release. What was left behind was just some of the gray gunk that seemed to be getting all over everything.



Cleanup of the gunk was really easy; I used a small brush to apply some paint thinner to it. The paint thinner worked a little magic and the gunk came right off leaving behind a clean but somewhat jagged window opening.



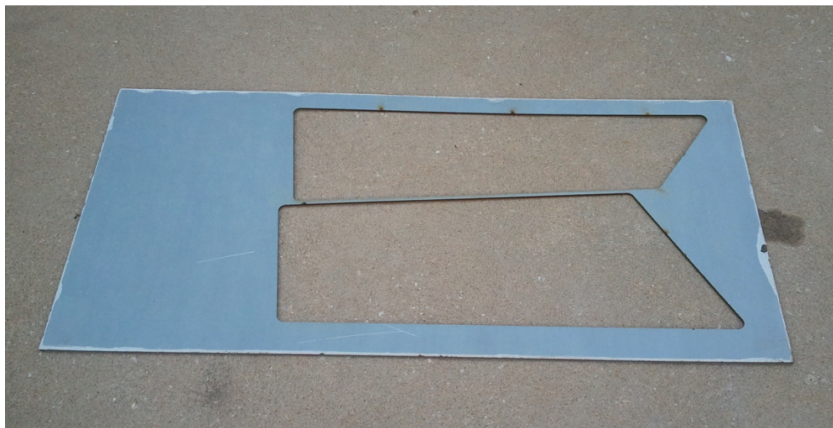
Before I did any cutting on the Plexiglas sheets, I wanted to make sure the drawing of the windows was exactly the right size. I printed the new windows and transferred the images to some poster board that I had lying around. Next I cut the shapes out and placed them over the window openings. They fit exactly like I was hoping they would.



Now that I knew the windows would fit properly, I proceeded to have the Plexiglas cut. One of the really nice things about working at an engineering facility is that I have access to some really cool equipment. In one of the labs, we have two laser cutters that I could use to cut the windows.



The process here was to convert the drawing that I created to a DXF format and import the DXF file into one of the computers that controls the laser cutter. After making a few adjustments on the laser cutter for the type of material and thickness, the laser did its thing. It only took about 10 minutes to cut out all four of the windows.



When a laser slices through Plexiglas, I assumed that it would leave behind a really smooth edge. This is not true. Because Plexiglas is heat sensitive, the laser actually melts its way through the material as opposed to cutting through it. This left behind a somewhat rough and blackened edge all the way around the perimeter of the windows. I simply used some 120 grit sandpaper to cleanup the edges.

The next step was to mask off the perimeter of each window to prevent the adhesive from getting all over everything. To do this, I placed the Plexiglas windows against the side of the cabin and traced around them with a pencil. Seeing the window outline on the side of the cabin allowed me to make minor adjustments to their location so they would be centered over the openings. Once they were located properly, I placed painters tape around the outside perimeter of each window.



Once of the things that I noticed while tracing around the Plexiglas was that it didn't lay flat against the side of the cabin. There was a slight bow to the side of the cabin. The Plexiglas was rigid enough that I was concerned about it staying flush against the cabin while the adhesive solidified. The solution for this was simple; I just placed each end of the window on a workmate and placed a weight in the center to create a bow. I let this sit overnight and in the morning, the windows were bowed enough to match the side of the cabin.



Now came the fun part – gluing the windows in place. At first I thought that I should drill some holes through the Plexiglas and screw it to the side of the cabin with a sealer behind the window. This is what Catalina started doing on their boats but before long, the Plexiglas developed cracks at the screw holes. To solve the problem, they simply quit using screws and just let the adhesive hold the windows in place. The adhesive that I decided to use is sold by Catalina Direct. They claim that it's the same adhesive that is used on high rise buildings to adhere huge glass panes to the outside of the structures. It's also the same adhesive that Catalina uses on their new boats. I figured that if it is good enough for a skyscraper then it should be okay to use on my tiny little boat.

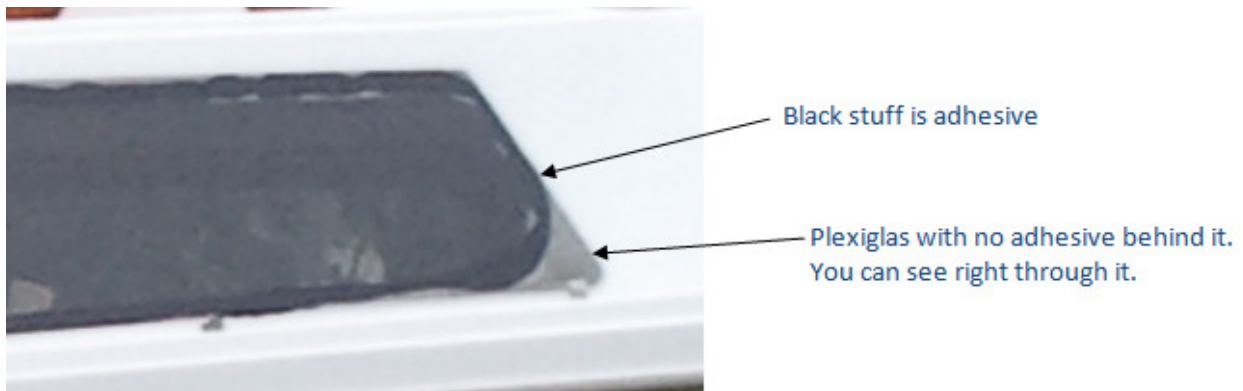
I purchased some cheap-ass suction cups from Harbor Freight that I attached to the inside of the window. Then I planned to run bungee cords to them on the inside of the boat to help pull the glass against the boat. I applied the adhesive to the outside perimeter of the window opening and pushed the glass against it. Then I used a piece of duct tape to hold it until I got inside to attach the bungee cords. The suction cups only held for about 5 minutes and when the suction cups popped off, the glass started sliding down, getting black adhesive all over everything. Fortunately, I masked everything off and it didn't get on the boat or the center part of the windows. I slid the windows back up and then used duct tape to hold the windows in place. How did the world ever survive without duct tape? I also cut a few pieces of wood and wedged them against the bottom of the windows to help keep them firmly against the side of the boat.



After letting the adhesive cure for three days, I removed the tape and protective covering over the Plexiglas.



The windows looked great except for one issue. I had an ID-10-T moment when I applied the adhesive. I didn't think about how transparent the Plexiglas was and how well you could see the adhesive through it from the outside. It was very easy to see where the adhesive was spread between the cabin top and the Plexiglas. Unfortunately, there were areas, particularly in the corners, where the adhesive did not flow into. I should have spread the adhesive all the way out to the edge of the Plexiglas. If the black adhesive was spread all the way to the edges of the Plexiglas, it would have "framed" the window better.



Even though the look of the window did not have the exact effect that I hoped for (because of the adhesive), I think the end result is fine. It's time to launch and sail right now so if it bothers me too much, maybe I'll remove the windows and re-apply the adhesive in the fall. Also, the primary reason for replacing the windows was to eliminate the leaks that were driving me crazy. On the day that I removed the tape and protective coverings over the Plexiglas, a major thunderstorm came through producing 50

mph winds and hail. The next day, when I checked the inside of the cabin for leaks, it was totally dry. Success!