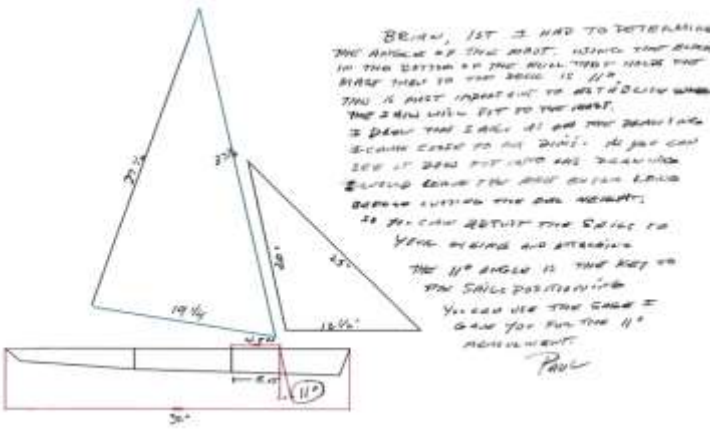
Scratch Building the PEP Jr. Sharpie by Brian Mau

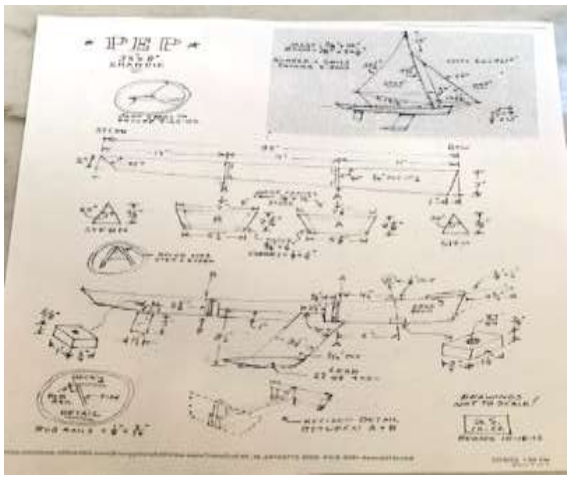
Original design by George Surgent Promoted by Rob Dutton

I've always liked the design of the Sharpie. It's simple to build, sails nicely and is graceful to watch. I built an 18' Sharpie when I was 16 and joyfully sailed it for many years until I discovered cars and girls. I wanted to recreate that experience with something I could handle without a trailer or slip fees. The PEP Jr. seemed to be that vessel. The idea of scratch building also appealed for a good winter/spring project. The build procedure below is the way I built the Sharpie. It may not be the "Best" way but it worked for me. I'm sure that most sailboat modelers can come up with a "Better" build sequence and a better finished boat. My suggestion is build it your way and enjoy the process; you won't be disappointed with her sailing characteristics. There is joy knowing that it was built by hand from plans! Building Instructions, Short version

1, Build hull
2, Build keel
3, Assemble servo controls
4, Attach Deck
5, Make Mast and spars
6, Make Mail and jib
7, Finish with paint, varnish or epoxy
8, Sail

Real Building Narrative;





How to start? Study the plan to determine what you know for sure and what features you'll have to develop. The hull dimensions are fairly straight forward and a good place to begin. Using the dimensions from the plan sheet, lay out the sides and bulkhead A & B on paper and cut them to size. Glue the templates to your wood. I like to leave about a 1/8" extra for final sanding to shape. For my Sharpie I used hollow door skin from Big Box store. The plans call for 1/16" plywood; I built mine for casual sailing rather than competitive sailing so I used 1/8". I used the same material for the bulkheads except I made them 1 piece instead of gluing 4 pieces together. The stem and stern posts were cut out of pine.

The tricky part of forming the hull is installing the stem and stern pieces to the sides of the hull. I chose to secure the post to one side of the hull with epoxy being careful to align perfectly as best as I could. Drilling the stitch-n-glue holes was accomplished after I taped the bow and stern together and taped the bulkheads in place. This started to look like a hull and everything seemed to fit. I joined the bow and stern together by drilling 1/8" holes about ½" apart. Then I epoxied the bow and stern securing the sides in place with copper wire. Just reminder to wax the wire or it will become a permanent part of your hull.

The bulkheads were epoxied in place utilizing pins to hold them in place. Carefully check the location of the bulkheads, for and aft, top to bottom. This will assure a true hull shape.

Instead of continuing with the hull, I chose to build the Keel and Keel bulb. Basically my method of doing any project is to get the hardest, most complex and most challenging work done first. The keel build represented that challenge for me.

Paul Kolbe cut the keel out of 1/8" aluminum which I'm thankful for. Designing the keel bulb proved to be a challenge. Not having a CAD program or a Centroid calculation formula proved to be a disadvantage in designing the shape of the keel bulb. Laying it out free hand just didn't look right. I found a 16 x 6 wooden propeller that had a blade shape close to what I thought it should look like and might work. Using the middle section of the blade, I transferred the leading edge shape of the propeller on to a length of 2 x 8 x 5/4 pine, and cut it out. I tapered (draft angle) the bottom edge so it could be removed from the plaster mold. The keel bulb is designed at 22 oz of lead. I'm sure that there are many scientific formulas for determining the weight per volume for lead casting. Unfortunately I didn't have any. Using ¼" foam board I formed the board into the shape of the bulb added a bottom. I left the sides about 1" higher than the pattern. Placing the foam template on a scale added the lead shot until it reached the 22 oz mark. I cut the foam board to the level of the shot and transferred that height to the wood pattern and cut to that level. Now I had a complete pattern. The screws on the pattern were used to hold down the pattern during the plaster molding build. The bulb molding process is pretty straight forward.

I used a plastic tray and coated the pattern and tray with wax. After mixing the plaster and securing the pattern so it wouldn't float carefully poured the plaster into the mold. The plaster was left in

the mold for 2 days to fully harden. After the mold was removed for the tray it was left to dry for about 10 days. No one wants to pour molten lead into a damp mold. It could explode due to the expansion of steam because the mold was not fully dry! The keel fin had 2 holes drilled near the top for future securing to the keel trunk. Four, ¼" holes were drilled near the bottom of the keel fin so that when the bulb was cast the holes will fill with lead and provide a secure holding of the keel fin to the bulb. The

answer to your observations is YES, the gas can in the background is empty

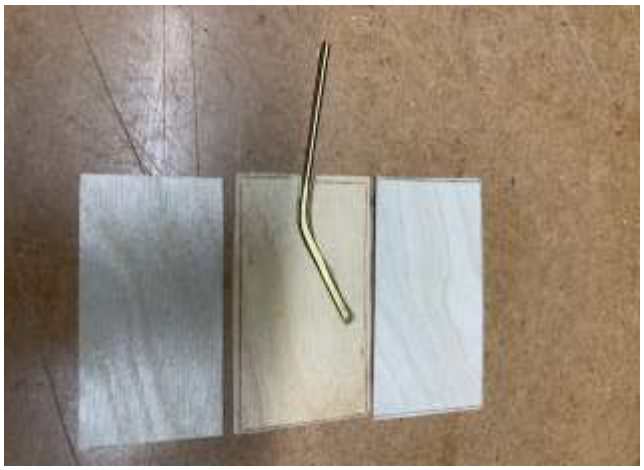
Now that the hard part is finished, we'll proceed with the build.

The hull bottom was cut oversize and sanded to fit the sides of the hull. Utilizing the stitch and glue method it was attached to the sides with 30 minute thickened epoxy. The Centerboard trunk and keel support were cut out of 1/8" Plywood. This was pretty straight forward and easy. I used 2 pieces of plywood for the sides and the third piece to fit the keel. This took some time to "get it right" but the resulting fit was tight and secure. After the initial epoxy had set I used PC-11to form the fillets along all the internal seams. I used ¼-20 nylon bolts to secure the keel to the hull. This allows the removal of the keel if needed.

Setting the mast step in the right place is important. The step itself is an easy structure to make, just follow the plan. For me the tricky part of the installation was the correct placement and alignment of the mast in the step. The mast step had to be installed before the deck was in place. The mast rake angle was calculated based on the dimensions of the mast step and mast hole on the deck. Simple geometry calculations indicated the rake angle was 11 degrees. Thanks to Paul Kolbe and his AutoCAD it was easy. The mast hole, in the step, was drilled at an 11degree angle. To assure proper alignment of the mast I stretched an elastic line for the bow to the stern and slid the "stubby" mast under the line. Once I was sure of the correct angle and side to side alignment the mast step was glued in place. Take your time to get it right and she'll sail like a dream. The photos below show how easy it was to get it right.

Everything Lines up now, it's OK to proceed.

The next portion of the build was the placement of the rudder servo and the sail servo. Before the rudder servo could be placed the rudder and rudder block had to be made. I used 3 pieces of lite plywood to make the rudder. The middle piece was cut to size then carved out to fit the rudder shaft. Then the 3 pieces were epoxied together and clamped to cure.



I decided to place the rudder and sail servo within the beamiest part of the hull. Several locations of the servos were tried using ¼" foam board. I use foam board for several reasons: 1st it's easy to work with, it's inexpensive compared to wood so trial fittings are easy to make and once the placement of the servos is finalized it can be used as a template for the wood servo plate. A Futaba S3004 servo for the sail control and Futaba FP-S 148 was used for the rudder. I had these on hand but you may decide to install different servos, after all it's your Sharpie. The sail control servo (SCS) was placed on the port side of the Keel strong back. This placement allowed for a longer sail arm controlling both the Jib and the mainsail. The rudder servo was also placed on the port side behind the SCS.

Considering that each builder has options for the type, size and placement of their servos each servo board will be at the builder's own design. The sail control Servo could have been a sail drum, a double sail arm, one side for the main and the other for the jib. I chose to use a single arm.

Finished Layout

Dry Fit Layout

Preliminary test layout

The actual sail control arm was cut out of an aluminum sheet. I wanted to be able to remove the servos for service or replacement so the servo tray was attached to the Keel strongback with 4 brass screws. After establishing the placement of the servos, receiver and battery; the wood servo tray was cut out using the foam board as a template. Foam board, for me, is so much easier than a paper or cardboard template.

Now that the internal components are in place it's time to install the deck. Again, I used foam board to generate the template for the deck, hatch locations, mast location, deck beam for stabilizing the bowsprit, and sheet guides. Before the deck can be installed the gunnels must be added. After cutting the pine strips to size I soaked them in boiling water for 30 minutes. I used a length of PVC pipe to hold the strips and hot water. I changed the water every 5 minutes. Using the foam pattern for the deck; nails were placed on a plywood sheet in the shape of the deck. The gunnels were removed from the pipe and placed in the nail form. The gunnels were removed after 24 hours and fitted to the hull with epoxy and brass nails. Real working Sharpie builders would not have used brass, but it's my boat and I'll dress her up just a little.

With the gunnels in place and the servo controls in place it was time to install the deck. Utilizing my foam template I established the bowsprit deck support beam. It took a little fitting to get the fitting angles correct as the angle is 2 directional the fore-n-aft angle and the angle of the hull. I took some time to get it fitting correctly in both directions and epoxied it in place. This is a good time to run a straightedge along the entire hull assuring there were no high spots. High spots can create a water leak path; not what I wanted. Any high spots were sanded down with a 1'x3"x 15" sanding block along the length of the hull.

I wanted the deck to look like it was planked so I drew planks on the deck with a straight edge and a number 2 pencil. The hatch cover, steering hatch and mast plate were treated with the same technique. After the finish was dry it looked "realistic".

Before I glued the deck in place, I used blue painter's tape to protect the gunnels in case of any seepage for the gluing process. A stubby mast was installed and the epoxy was painted on the hull and bulkheads. Lots of 1" tape was used to secure the deck in place, lots of tape was used and resulted in the hull looking like a blue fish. Another 24 hours and the tape was removed. An ounce of prevention is worth a pound of cure. To check if there were nay voids I put a flashlight in the hatch, turned off the lights in the shop and held the boat up and rotated it, hoping not to see any slivers of light; I did not. That was good news.

The main hatch's sides were glued in place after shaping to meet the deck profile. 1 layer of painters tape was applied to the sides and the main hatch was built around that. With the main hatch glued and cured the painters tape was removed. This provided a secure watertight fit for the main hatch. The fairleads were made out of ¼-20 nylon bolts with a hole drilled thru the middle. The deck was tapped to accept the fairleads and the bots cut 1/16 longer than the deck. Remember to smooth the edges of the bolts so the sheets move freely through the fairlead.

The Bowsprit was made to plan and epoxied and screwed in place. I found a broken chain and used that to secure the bowsprit to the hull at the waterline. The mast, jib club and sprit were made to the plan and finished.

Sail making for me has always been a challenge. It's not difficult to make sails out of plastic tablecloth film but they never seem to fill out properly in the wind. I wanted to see how this Sharpie sailed, so I went ahead and cut the sails. Cloth sails will be a winter project. I taped together paper to make the pattern and establish the size of the sails and the hem lines.

The plastic was cut to the hem line folded over and taped in place with "Blenderm" medical tape. Blenderm is available at any pharmacy retailer. I like this because it is flexible and easy to work with. One piece of advice is to cut the tape longer than needed so it lays flat when applied. When the tape is pulled off the roll it will be in tension and if applied to the sail material it will bunch up the material. Preferably let the tape relax before applying it to the sail material. It doesn't take long for the tape to relax, 1 minute, but it seems like a long time when your holding the tape over the material this was discovered the "hard way" the photo below shows the right and wrong application. Remember to put in a luff line before taping the sails hem. The sail works ok but it's not pretty and certainly not competitive. Both sails were made with the same technique.

The main sail was lashed to the mast. Wax paper was placed around the mast to prevent any of the lashing to stick to the mast when the knots were sealed. In order to provide adequate spacing and rotation of the main sail a 5/32" or 0.155" carbon rod was taped to the mast. Using thread on a needle the sail was pierced at 2" intervals. Make sure that you include the luff line in the piercing; otherwise the lashing might pull thru the sail and leave a loose attachment. The sail was secured to the mast with square knots and the knot was secured with CA. Once the CA was cured the thread tails were cut off, the carbon rod and wax paper were removed.

The attachment of the jib was a bit of trial and error as the pivot point of the jib boom is not clearly defined. With the mast in place and the jib boom attached to the jib it was relatively easy to set the pivot point to assure that the jib boom would be free of the mast when tacking. I drilled the hole in the boom and secured it to the bowsprit with some elastic thread. I thought some flexibility in that mounting provided better jib control. I don't know if it does but she sails fine.

The attachment point was 4 7/8” from the front of the jib boom. The mainsail sprit was attached to the clew and by trial the mast attachment point was determined to be 9 3/4” from the tack of the main sail.

Trial run and maiden voyage seemed to indicate that there were things that needed to be refined. This turned out not to be the case; her first sail was in 8-10 mph wind and she liked it. She tacked without any issues and ran with the wind without any indication of submarining and looked graceful doing it. There is a combination of pleasure and pride seeing her on the water knowing that I made her and she really sails well.

Granted scratch building isn’t for everyone but the satisfaction of a completed vessel is very rewarding. The big question is would I do it again? The answer is yes.