



Raingutter Regatta Tips and Tricks

There are many tips and tricks on how to build a fast raingutter regatta. Here are just a few to ensure you have a fun and fast race!

General information on Speed and Boat Design

Most Raingutter Regatta boat builders design their boats to plow THROUGH the water. The fastest boats described in this booklet move ON TOP of the water covering ten feet in a couple of seconds.

A boat that pushes water apart as it passes is said to "displace" water. It is a displacement boat" or a *hydroplow*. It takes much energy to move the water, creating waves in its wake. Such a boat cannot move faster than a water wave. This speed limit is called "hull speed". To reach hull speed, a hydroplow must not wobble in the water. It must be very *stable*.

One type of boat uses two pontoons to help make it very stable. It is called a catamaran. When forced to travel faster than waves, some boats rise to the surface. Many of these boats slap back down into the water. But a properly designed hull can rise up and *hydroplane* along the surface. Hydroplane boats hold all the speed records!

The hull of a BSA kit can be shaped into a catamaran or hydroplane.



* This is a picture of the standard BSA kit.

Standard BSA kit construction tips:

- Trim the hull to make it symmetrical.
- Lower the sail so that it touches the deck. Glue sail to deck.
- “Cup” sail modifications will be faster than the standard sail (Appendix B).
- Ensure the rudder is flat. A bent rudder will steer the boat into the raingutter.
- Wax the hull. Use paraffin or ski wax.
- Seal the boat in oil based, acrylic paint or polyurethane coating.
- Attach the metal keel $\frac{3}{4}$ to 1” further aft (toward the rear) than what the instruction recommend.
- Add bumpers to the boat to keep it from sticking to the sides of the raingutter (Appendix C).
- Heavier boats are slower, in general. Ensure deck-o-rations do not add excessive weight. Do not place too much weight toward the bow of the boat. The boats sail best with more of the weight toward the aft end of the boat.
- Catamaran (Appendix D) and Hydroplane (Appendix E) modifications can produce faster boat designs than the standard BSA kit boat.
- Attach accessories (such as people, animals, etc.) firmly to the boat using hot glue.
- Use an acrylic clear coat varnish or seal over decals and accessories. Use several layers to create a deep shine and hide the edges of the decals.
- Ensure the boat is waterproof! Paint all exposed areas of wood with acrylic or oil-based paint (acrylic is water resistant when dried).
- When racing, blow a thin stream of wind, rather than try to blow big puffs of air toward the boat.

Appendix A – Glossary

Aft – Toward the stern. Many seafaring terms are from Old English; this one means "back".

Beam – The width of a boat at its widest. From an Old English word for "tree".

Bow – The forward part of a boat or ship.

Catamaran – A sailboat with twin hulls and a deck or platform connecting the hulls. From Tamil, meaning "to tie tree or wood"; picture a log raft lashed together by rope.

Centerline – The line down the middle of a boat. It's used as a guide to make boats symmetrical.

Dry Dock – Area to set aside to modify or repair boats prior to the start of the event.

Harbor Master – Referee or the Official in Charge of the Regatta.

Hull – The body of a boat exclusive of deck structures. From an Old English word meaning "to conceal"; the crew is "hidden" from the water in the hull.

Hydroplane – A boat that skims the surface of the water. Greek: water+place or broad. The action is similar to a broad stone skipping across water.

Hydroplow – A boat that separates the water to pass through. Greek word for "water" with Old English word for "plow". The bow of the boat breaks the water like a farm plow breaks soil.

Keel – Extension of a boat, running the length of the bottom of its hull. Old English word for "throat, beak of a ship".

Port – The left side of a boat looking forward. Also called "larboard". From Latin "port" or "harbor". Long ago, it is said, certain major ports were approached so sailors saw them first from the left side of the ship. Eventually, that side was called the port side.

Port Authority – Pack leadership responsible for race rules and operation.

Starboard – The right side of a boat looking forward. Old English: steering oar + ship's side.

Stern – The rear end of a boat. Old English word meaning "to steer".

Appendix B – Cup Sail Modification

Make a sail that focuses the breath-force and reduces tipping and drifting. A small, cup-shaped sail placed low on the rear deck keeps the boat from tipping forward. Make it from the plastic sail that comes in the BSA kit. Breath cannot escape until it has delivered all of its power. The result is more stability, power and control.

BSA Sail Template

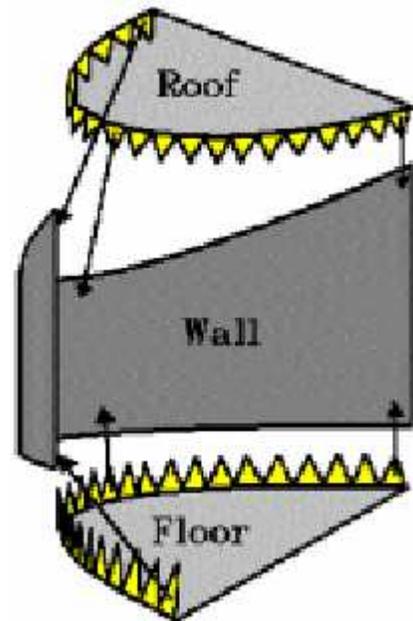
Three separate parts make up the sail (See below).

1. Wall - The back of the sail. "C" shaped when viewed from the top, it rises vertically.
2. Roof - The top part of the sail is flat, sloping down toward the bow.
3. Floor - The bottom of the sail is horizontal. It is hot glued or stapled to the deck.

Assembly

Glue the parts of the sail together with hot melt glue. Plastic model cement does not stick to the plastic.

1. Using the Sail Template (Appendix F), trace the outline of the wall, roof and floor on the sail material with a ballpoint pen.
2. Cut out the wall.
3. Cut a small shape from scrap. Glue it over the mast hole in the sail wall.
4. Cut the edges of the floor and roof that have no tabs first.
5. Cut an arc passing the scissors through the tips of the tabs.
6. Cut the left sides of the tab triangles then the right sides.
7. Remove any dangling triangles between tabs that are not completely cut off.
8. Test bend all tabs back. Then raise them to make right angles.
9. Beginning with the center tabs of the floor, apply small dots of hot glue. Immediately, firmly, press each tab to the center, bottom edge of the wall. Bonding is immediate - a second chance to line parts up is not likely.
10. Continue to put hot glue on the tabs next to those already bonded to the wall and press them firmly in place.
11. Carefully join the roof and wall piece in a similar fashion. Press each tab to the wall firmly. Bond only a few tabs at a time so the hot glue does not cool before it is pressed in place.



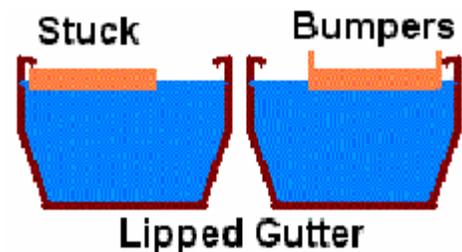
Appendix C – Bumpers

Add bumpers to keep the boat from rubbing and sticking to the gutter walls and overhanging lips. Bumpers can save the day when everyone else gets stuck! The two kinds of rain gutters require two kinds of bumpers. A third kind of bumper is needed to get a better start.

Problem: You are getting ready to deliver that last directed puff of air to the sail. Suddenly, you notice the little overhang along the top edge of the gutter has your hull pinched under it. You blow hard, but the boat only spins a bit hinged between the lip and the water. Your boat has just been “Shipwrecked!” Lip bumpers keep the boat off the lip-edge of the raingutter wall. To keep from getting stuck under it, the bumpers must be tall enough to clear the lip of the raingutter.

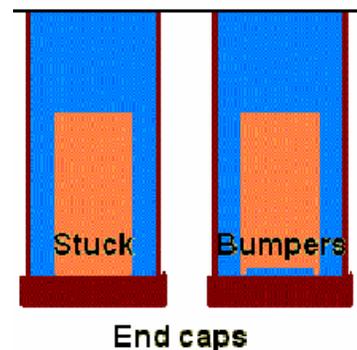
Construction

- A good size for lip bumpers is one inch tall and one-half inch wide. Bumpers should be thin and springy if possible.
- Cut bumpers out of wood, plastic or other waterproof (or water-proof) materials.
- Round the corners of your bumper so sharp edges don't catch.
- Glue the bumper to the edge of the hull as far forward as possible. If your bow comes to a point (like an unaltered BSA kit hull), attach bumper pairs to the bow, beam and stern.
- Whenever possible, build the bumpers into the hull.



A Better Start

Problem: "Blow!" – the race begins, but your boat just doesn't pop off the starting line. Something is holding it back momentarily. Surely, this slows it down. Adhesive contact can be a problem at the starting line! The boats are required to start backed up against the raingutter end cap. When the stern is flat, it contacts the end cap over its entire width and height. When wet, this contact can be quite forceful, preventing a clean get away. Avoiding contact is the key to defeating adhesive forces. To do this, make little bumpers that jut out to the rear, holding your boat away from the end cap at least 1/8-inch. Better yet, cut a long notch in the back of your hull so only the outside edges of the stern touch.



Removable Bumpers

Transparency film or other springy plastics can be glued with rubber cement (contact cement) to the hull after it is finished. Because the glue can be separated from the plastic and wooden hull, bumpers can be removed with no trace when desired. But make sure to allow the glue to fully dry before testing!

Appendix D – Catamaran Design

A catamaran resists side-to-side tipping. This added stability helps it out pace traditional BSA kit boats. Two pontoons guide it straight without needing a rudder. It does not hydroplane but has recorded times less than 5 seconds.

Why is this design fast?

Reasons why this catamaran design is fast:

1. The separated pontoons distribute the buoyancy of the boat across the width of the boat.
2. Curved up pontoon tips keep water under the pontoons.
3. A small sail on the back of the deck reduces forward tipping.
4. Air cannot pass through a sail made from a rigid material.

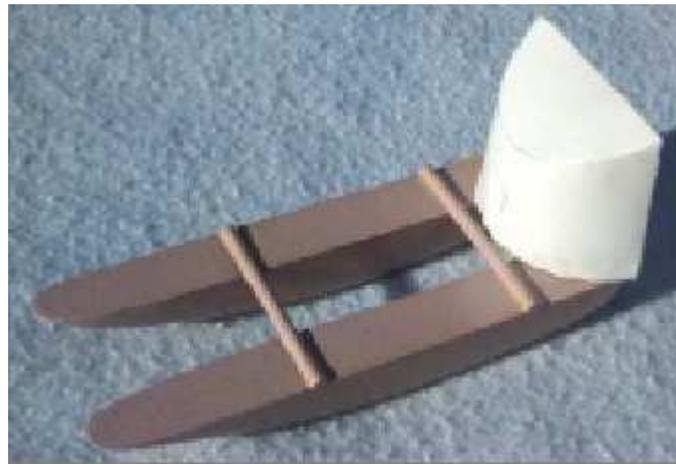
Construction:

Refer to the catamaran template in Appendix G for the following steps.

1. Trim the hull to make it symmetric.
2. Cut the hull down the centerline (middle).

The two parts are now pontoons. The cut edges are the tops of the pontoons.

3. Cut two rods from the sail dowel for pontoon spanners. Make them as long as the maximum beam (boat width) allowed. 2-1/2 inches is a good beam. A typical raingutter is about 4-inches wide.
4. Cut a notch 1-1/2 inches from the aft end on top of each pontoon.



Catamaran Made From BSA Kit

5. Fit one spanner into the slots to bridge the pontoons across the aft. Fit the other spanner into the halves of the mast hole.
6. Glue them in place. Quickly place the drying or cooling boat upside-down on a lined piece of paper. Place one pontoon next to one line and see that the other pontoon lines up with a line near its edge. Adjust as needed before the glue dries. Pontoons set this way won't toe-in or out.
7. Cut up the plastic to make a cup sail.
8. The catamaran hull should be narrow enough for the sail to fit across it. Anchor the back edges of the sail to the end of each pontoon and the bottom of the sail to the rear rod across the pontoons. Apply hot glue to the wood and press the plastic onto it. Staples may be used to fasten the sail instead.
9. Make bumpers.
10. Don't use the keel or rudder. If required, glue them in front of, or inside the sail flat on the floor.

Appendix E – Hydroplane Design

Hydroplanes are the fastest type of raingutter regatta boats.

Why is this design fast?

If a breath-powered boat's bow comes to a point like most boats, it may never be able to hydroplane. A hydroplane is different!

It is fast because:

1. A flat hull distributes the weight of the boat across the width of the boat.
2. A flat hull turned up in front rides up to the surface of the water.
3. A sail on the back of the deck reduces forward tipping.
4. Air is caught and forced to exit backward via a pocket in the sail.
5. A boat tipped upward in the front about $\frac{1}{4}$ inch prevents water from breaking over the bow. That can stop a light boat.

Construction:

These steps turn a BSA kit hull into a hydroplane.

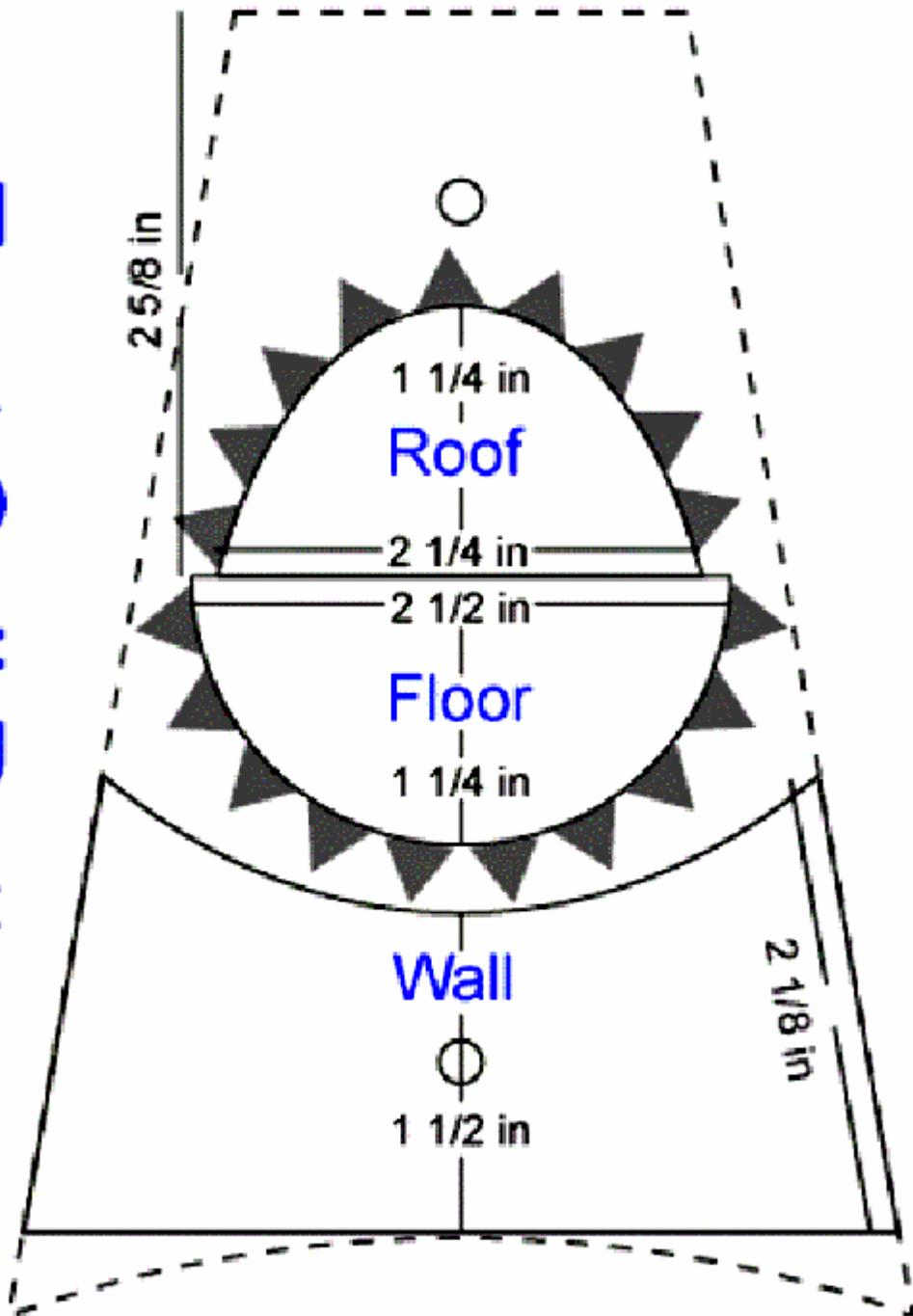
1. Trim the hull to make it symmetrical.
2. Cut out Template in Appendix H and trace the pattern on both sides of the boat.
3. Cut the boat following the lines drawn:
 - Start $\frac{1}{8}$ inch under the deck and cut aft, parallel to the deck for 1- $\frac{1}{2}$ inches.
 - Cut up from the bottom to remove this piece.
 - Cut from the middle of the hull at a glancing angle toward the bow on the bottom.
 - Increase the slant until the cut joins the thin bow deck.
4. Sand the bottom flat across its width. The sloping part should be very smooth. A few coats of sanding sealer (sand between coats) will increase smoothness. Wood putty can be used to fill in any gouges.
5. Cut up the plastic to make a cup sail.
6. Glue the sail as far back on the hull deck as you can while keeping the overall length under the maximum.
7. Make bumpers.
8. Blow low and straight.
9. Don't use the rudder or keel. If required, convert the keel to a rudder by cutting a slot in the bottom of the hull about 1- $\frac{1}{2}$ inches from the stern. Sink the keel into the hull so that most of the keel is hidden. The rudder can be glued to the floor of the sail if required.
10. Practice blowing the boat. Some skill is required to keep the hydroplane sailing straight.



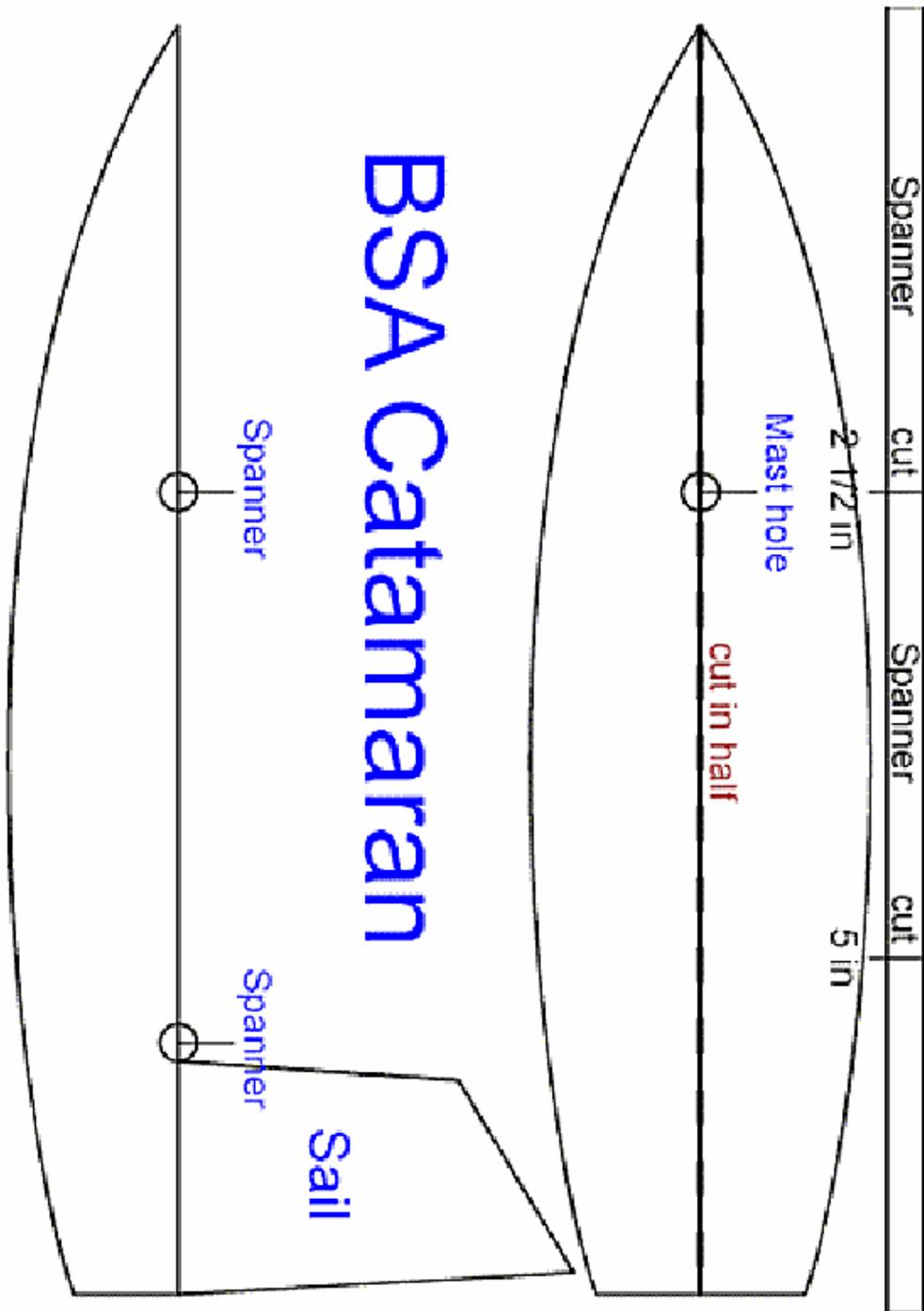
Hydroplane made from BSA kit

Appendix F – Cup Sail Template

Fast Sail Pattern



Appendix G – Catamaran Template



Appendix H – Hydroplane Template

