

The 1994
YMCA Camp Fuller
Advanced Sailing
Textbook

As a member of the YMCA Camp Fuller sailing and racing school, you are in training to be the best. Through your hard work and training you will learn more about sailing than you thought possible. We expect you to try hard to pass the class. Attitude is everything. And remember, never *ever* leave your wingman.

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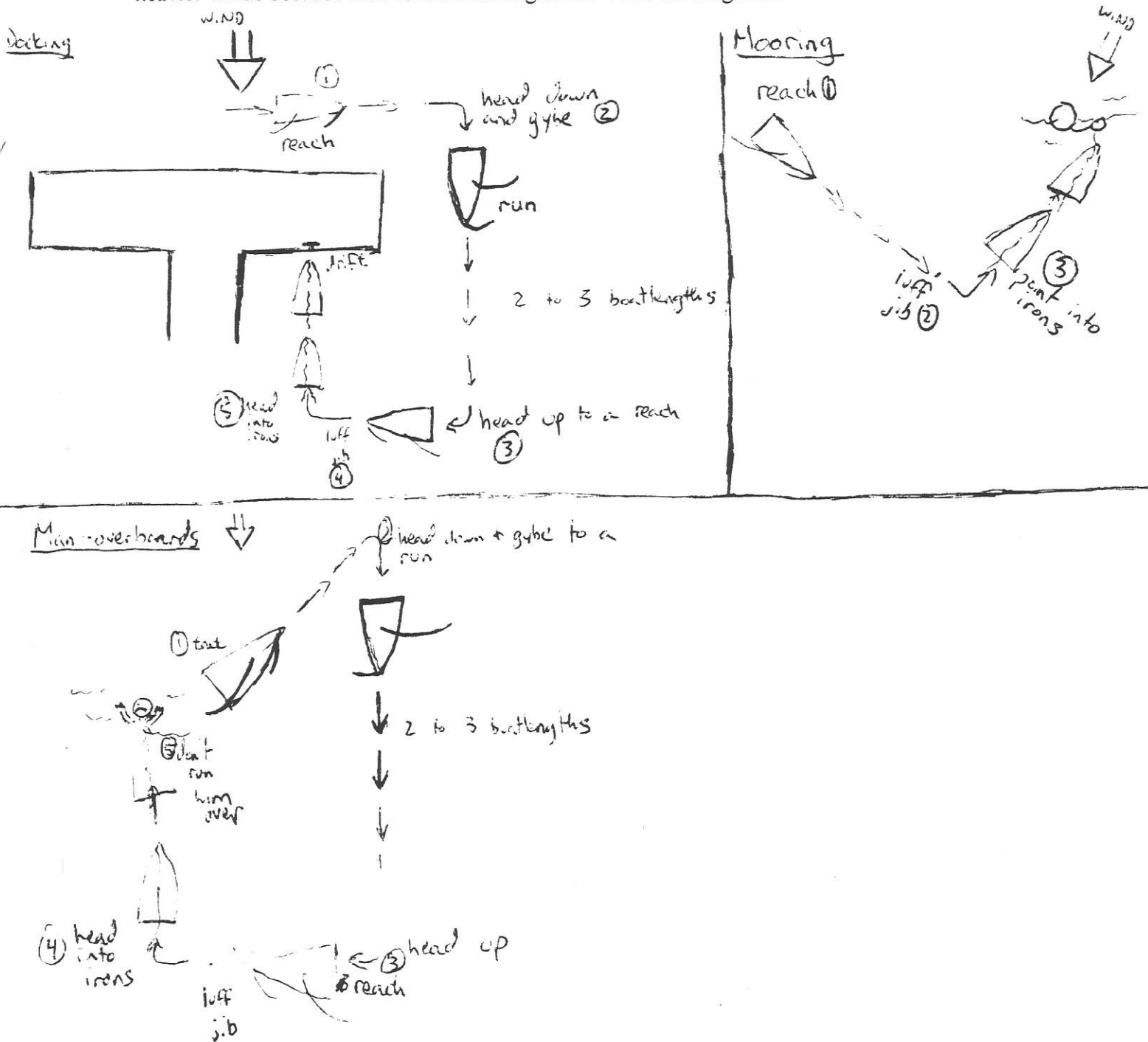
Advanced Sailing Requirements

- 1) Ability to confidently solo a sailboat in winds up to fifteen knots.
- 2) Competence in the realm of sailboat racing.
- 3) Knowledge of basic sail theory.
- 4) Ability to safely correct an emergency situation.
- 5) Knowledge of Point Judith Pond.
- 6) Ability to make perfect moorings, dockings, and man-overboards.
- 7) Knowledge of advanced parts of the boat.
- 8) Mastery of all Beginner and Intermediate requirements.

If you can get all of this down, and we think that you are ready for the Skippers program, then you will pass out of Advanced. It'll take a lot of work, but that will only make the rewards that much tastier. Good luck.

I. Moorings, Dockings, and Man-overboards:

As advanced sailors, you will be sailing without an instructor. Therefore, we should expect you all to capably perform moorings, dockings, and man-overboards without accidents or collisions. All three of the procedures follow the same basic theory that we will call the L-Stop. Always start on a reach about two boatlengths downwind. Just before the windward shroud is aligned with your target, luff your jib. Then, immediately when the shroud and the target are lined up, point your boat into irons and steer up towards the target. Remember, lighter winds require more room to stop than heavier winds because there is less breaking force. Note the diagrams.



II. Point Judith Pond

If you eventually pass out of the advanced program, you will enter the skippers class calibre. Skippers sail all over the pond, so in order to be included in their ranks, you must be aware of the pond in detail. Know it, learn it, love it, be it.

III. Rules of the Road

Avoid the following vessels:

- 1) Large commercial vessels and barges
- 2) Large sailing vessels with large drafts
- 3) Waterskiers, divers, and other recreational boaters.

It is difficult for these vessels to alter course, (especially in the channel.) As small boat sailors, you are much more maneuverable, and you are expected to get out of the way.

IV. Capsizing Procedure

- 1) Capsize.
- 2) Count heads.
- 3) Place a lifejacket under the top of the mast. (You don't need to tie it on)
- 4) Uncleat the main and the jib sheets.
- 5) Head boat into irons.
- 6) Stand or sit on the daggerboard to right the boat. (Please don't break the daggerboards)
- 7) Get back in the boat and sail away.

Dry Capsizing Procedure: But why bother getting wet when you can avoid the hassle by simply climbing over the windward side, and positioning yourself on the daggerboard. When performed correctly, this can right the boat while narrowly escaping a trip to the drink. What a savings!

V. Emergency Procedure

The Galilee 15 sailboats are old, and (here's the understatement of the year) very well broken in. Since parts may (will) break, you, as advanced sailors, are expected to jury-rig when needed. It is most important that you remember the wise words of Douglas Adams, "**Don't panic!**" Some emergency situations you should be prepared for are:

- 1) Windward shroud breaks
- 2) Daggerboard breaks
- 3) Mast breaks
- 4) Boom falls off
- 5) Rudder falls off and sinks
- 6) Hole in the hull
- 7) Leeward shroud breaks
- 8) Sails rip

VI: Sailing Theory

The following concepts explain how your boat sails. These theories will aid your racing and give you an extra boost when you finally take physics in high school.

A. Bending the flow

Sails extract energy by bending the flow of the wind as it moves by in what is known as an airfoil. As the boat moves through the water, similar forces push in almost the opposite direction in what is known as a hydrofoil. Its pretty neat that these forces which oppose each other almost perfectly are governed by the same principles.

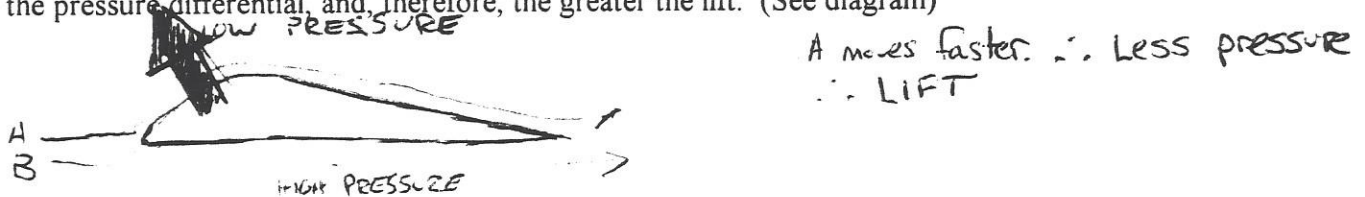
B. Airfoils vs. Hydrofoils

A sailboat's foils pull in nearly opposite directions. the airfoils pull to leeward, and the hydrofoils pull to windward. Neither would help the boat do anything useful alone, but together they allow the boats to sail forwards high into the wind.

C. Bernoulli's Discovery

In the early 1700's Daniel Bernoulli discovered that changing the velocity of air or water flow results in consequent changes in pressure. A faster flow results in a lower pressure.

Bernoulli's theorem led to the principle of the venturi effect and to the development of the curved foil. The shape of the curve forces the fluid to move faster over the top of the foil, resulting in a lower pressure zone above the foil. Now there is a pressure differential which results in a force that pulls the foil upwards. We call this pull, "lift." The faster the fluid flows over the foil, the greater the pressure differential, and, therefore, the greater the lift. (See diagram)

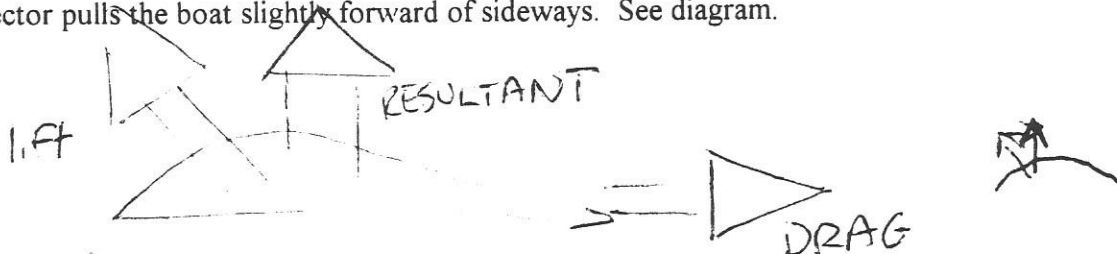


This same principle accounts for many interesting events. Airplanes fly because the shape of the wing bends the flow of the air resulting in lower pressure above the wing, and thus lift. Frisbee's fly for the same reasons as well.

If you want to experience lift, but you don't have a Frisbee, or, for that matter, an airplane handy, try this. Next time that you are in a car, roll down your window, and put your hand out. (Watch out for objects which can rip your arm off.) Now curve your hand, and feel how it is pulled up. This is lift.

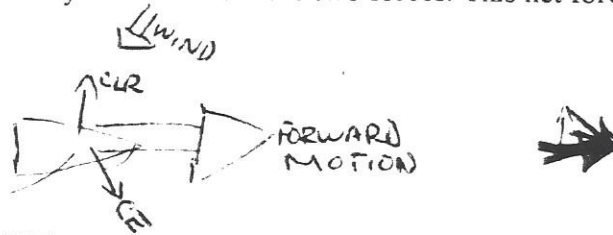
Bear in mind that the foil is still being pushed through a fluid. Due to a certain unavoidable amount of turbulence and friction, the foil is still being pulled backwards by drag. Drag is your enemy. Always try to reduce drag. When you are trying to sail close-hauled, but your sails are luffing, lift will not be produced. and your foils will only encounter drag. This is why you are always trying to adjust sail trim. Airplanes stall when insufficient lift is produced. Your jib pinches when you head too high. These events are analogous.

Back to sailing. When we add the lift and drag vectors, we get a resultant. This resultant vector pulls the boat slightly forward of sideways. See diagram.



Now, as the boat is pushed sideways (laterally) through the water, the hydrofoils of the daggerboard, rudder, and the submerged parts of the hull begin to act. As before, the flow is moving faster over one side of the foil. (Now the windward side of the boat) Therefore, less pressure is being exerted here, and this pressure differential pulls the boat to windward.

Now the airfoils and hydrofoils get busy and really start to work. Once both are in effect, a net force is encountered by the boat from the two forces. This net force pushes the boat forwards. See diagram.



D. Center of Effort (CE):

The Center of Effort is the point at which all of the airfoils forces are thought to be concentrated. This point pulls slightly forward of the leeward beam.

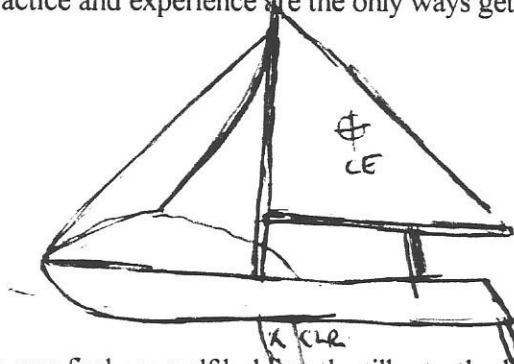
E. Center of Lateral Resistance (CLR):

The Center of Lateral Resistance is the point at which all of the hydrofoil forces are thought to be concentrated. This pulls towards the windward beam.

F. Weatherhelm:

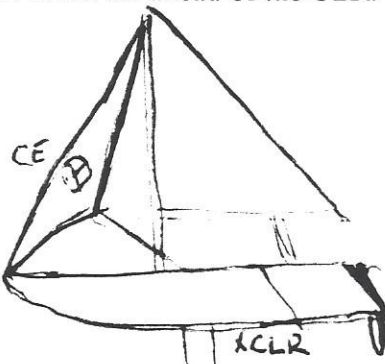
This is when you find yourself holding the tiller towards the windward side when holding a straight course. The boat is trying to head up into irons, because the CE is too far aft the CLR. Remember that a little weatherhelm is not such a bad thing. You only need to worry when your holding the tiller so far back that the rudder's hydrofoil stops producing lift, and only produces drag.

To correct this, you can move either the CE or the CLR by trimming your sails differently, moving your weight, repositioning the daggerboards, etc. Use your common sense, this is different in every boat and practice and experience are the only ways get to better at it. Check out the diagram below.



G. Leehelm:

This is when you find yourself holding the tiller to the leeward side of the boat in order to sail a straight course. It often happens in light winds. The boat is heading itself down all by itself. The reason for this is that the CE is too far ahead of the CLR. Use your head to correct it.



VII. Racing to Win

Sailboat racing is a fun and exciting sport with fierce competition and daring maneuvers. Mastering the sailboat and the rules of racing are the only ways to achieve excellence in the Camp Fuller Racing School. Here are some necessary items that you must learn.

A. Rules of Racing: The following set of rules deal with the rights that you and other boats have during racing. You must understand and memorize all of these in order to successfully race. With the intense competition at the starting line and in close legs of a race, knowing your rights can make the difference between a first place and a second place.

1. Starboard o'er Port
2. Tack o'er Reach o'er Run
3. Tack o'er Tacking and Gybing
4. Buoy Room
5. Sea Room
6. Barging
7. Clear Ahead o'er Clear Astern
8. 1 Minute Rule
9. Leeward o'er Windward
10. Mast Abeam

B. Protest Procedure

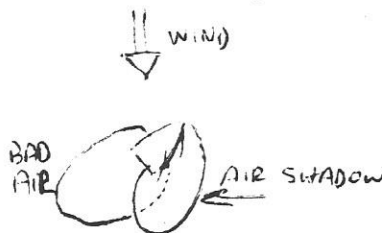
If you feel that someone has violated the rules to the degree that they have caused you to alter course, then you must know how to handle the situation. Here's how:

1. First protest the boat by yelling, "**PROTEST!!!**," and usually their sail number.
2. Find a witness, and remember who it was. (If you are a witness, then yell, "**WITNESS!!!!**")
3. The boat being protested has the option of doing a 720 before the end of the leg that the incident occurred on.
4. If they fail to do a 720 by the end of the leg, then tell the committee boat at the end of the race. If you do not do this your protest will not stand. A meeting will follow at the end of the racing day to hear all of the protests.
5. Know the rules, and don't start yelling things when you aren't sure what you are talking about.
6. Do not waste time with a protest unless you or anybody else altered course.

REMEMBER: NO COLLISIONS!

C. Upwind Leg

1. When you see or feel a gust coming, head up a touch instead of letting out your sail. This will decrease the distance travelled and will not decrease your speed.
2. Keep your boat flat. (A slight heel is fine, but you'd like to keep the daggerboard submerged)
3. When positioning yourself in relation to other boats make sure that you are not in the windshadow or their bad air. This will result in a dramatic loss in your boat speed. Note the diagram:



D. Downwind Leg

1. Daggerboard up.
2. Boom down.
3. Do not pass side to side because the forward boat can head you up and cause you to catch bad air
4. Proper sail trim! (Always important)
5. Gybing from broad reach to broad reach may be faster than simply sailing on a run. Broad Reaches are faster because the sails are still acting as foils, and the drag is pushing in more or less the same direction that the boat is sailing. On a run, only drag pushes the boat.
6. If you do decide to sail on a run, remember to bring the sails wing-on-wing. Have a crew member hold the jib out to keep the sail full, and remember to keep the boat on a slight windward heel.
7. If a boat is stupid enough to pass you on the windward side, head them off the favored course. (Leeward o'er Windward). When you go to head down, do it quickly and unexpectedly.

E. Finishing

1. Round the leeward mark tight.
2. Good tacks. (Try not to let the jib luff, at all. Backwind it to increase the speed of the tack.)
3. Once again, keep the boat mostly flat.

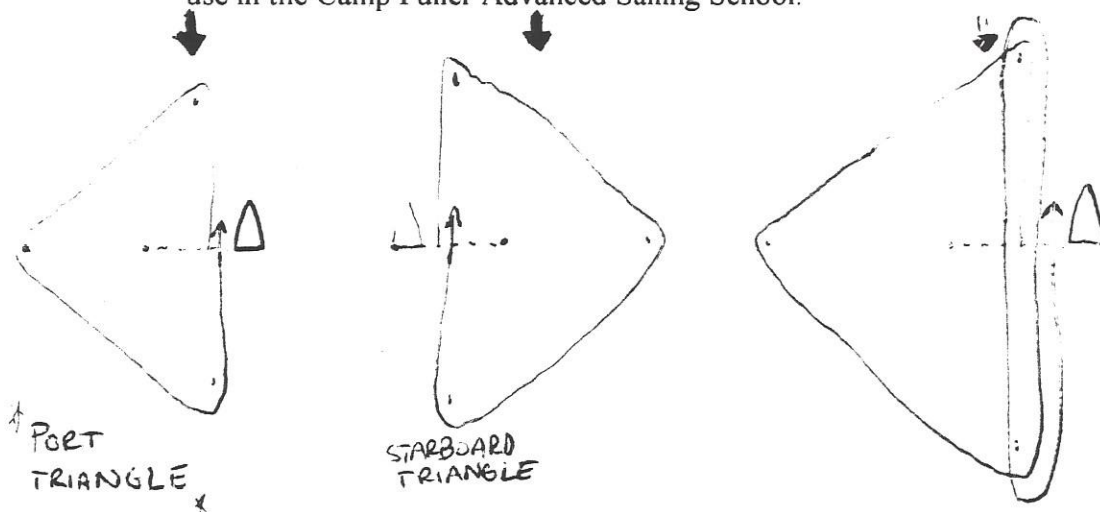
F. Rigging

In heavy air you want your sails to form a thin flat airfoil. To achieve this, they must be tight. Crank the halyards, downhaul and the outhaul as tight as possible. Set the fairleads further aft, in order to tighten the jib.

In light air you want your sails to form pockets. You want the airfoil to be bubbled. Loosen your outhaul and downhaul. You also want to set the fairleads as forward as possible. **DO NOT** trim sails too tightly.

G. Courses

There are several types of race courses. Here are some of the different race courses that we use in the Camp Fuller Advanced Sailing School.



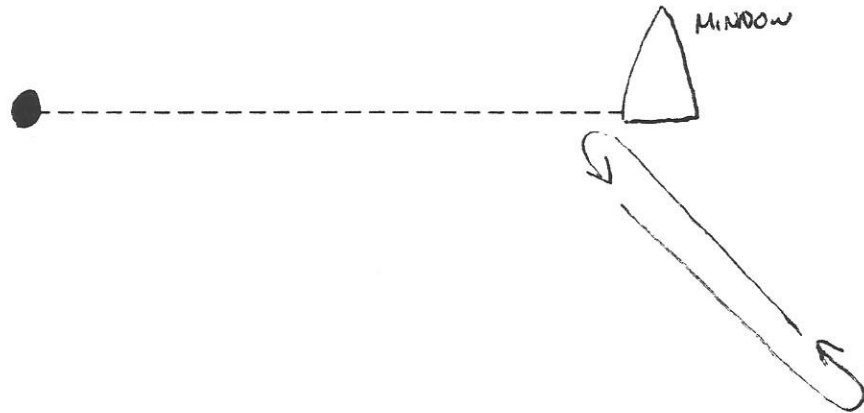
H. Starting

Unlike a footrace, a sailing race begins with everybody jockeying for the favored positions on the starting line. The race start is done in a sequence of whistle blows, as follows.

- 3 minutes - 3 long whistles
- 2 minutes - 2 long whistles
- 1 minute, 30 seconds - 1 long whistle, three short whistles
- 1 minute - 1 long whistle
- 30 seconds - 3 short whistles
- 20 seconds - 2 short whistles
- 10 seconds - 1 short whistle
- 5, 4, 3, 2, 1 - one short whistle for each second

Within this sequence, you and your crew must set up to cross the line at zero seconds, which gets one long whistle. Here are two different ways of achieving this. Experience and practice will tell you which of these, (or neither of these) two starts that works best for you.

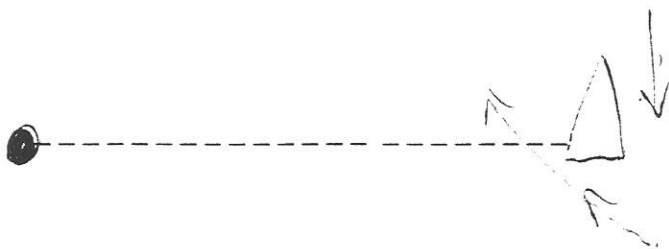
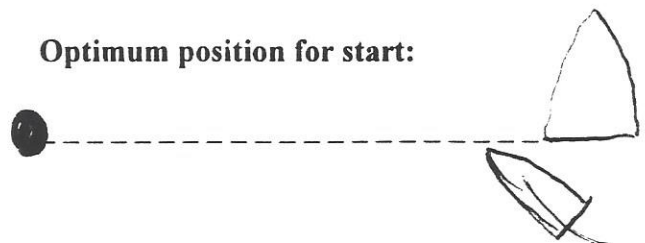
Vanderbilt Start - Figure how much time it takes to get from the bottom of the loop to the starting line. For example, if it takes 20 seconds then plan to be at the bottom at the 20 second whistle. Remember to give yourself at least 2 or 3 seconds for your tacks and gybes. We highly endorse the Vanderbilt Start.



Dip Start -

Be careful. You don't want to be called for barging when you head up. We discourage this starting technique, but if you can pull it off, then rock on!

Optimum position for start:



I. Favored Side of the Course

The race course may not be set up perfectly in its relationship to the wind. Therefore, there may be a favored side of the course. To find which side is favored, head up to the line in irons. Whichever side the bow turns towards is the UNfavored side.

On a very shifty day, the favored side may change from start to star,, even perhaps changing from whistle to whistle. On a day like this, it is important to start in the middle of the line and after the start jockey for a good position on the course.

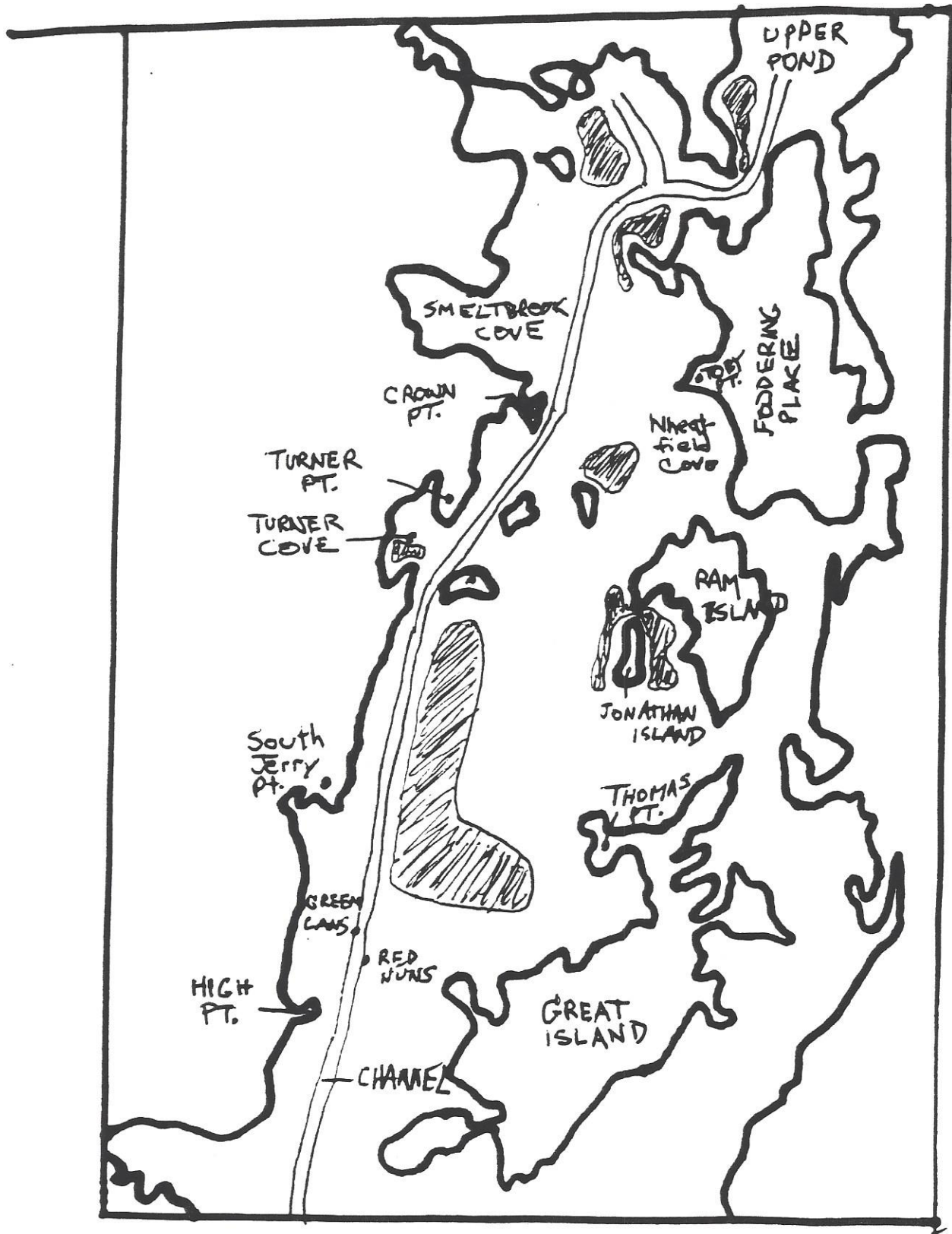
VIII. Parts of the Boat

- 1) Transom -
- 2) Mast Tang -
- 3) Cunningham -
- 4) Grommet -
- 5) Tell Tales -
- 6) Clevis Pin -
- 7) Jury rig -
- 8) Roach -
- 9) Fairlead -
- 10) Gunwale -
- 11) Cotterpin -
- 12) Boot Top -
- 13) Boomvang -
- 14) Yaw Angle -
- 15) Lay Line -
- 16) Pinching -
- 17) Planing -
- 18) Lifted -
- 19) Headed -
- 20) Pintel -
- 21) Gudgeons -

We didn't supply the definitions, because we'd rather you hunt them down for yourselves. Less work for us, and, more importantly, you will remember them better after putting more effort into finding them. Don't be afraid to ask your friendly advanced sailing instructors for help with the definitions.

Thats it boyz and girlz. There is a lot of material to soak up to pass this class, but you will appreciate it more because of that. Study hard and you'll be psyched to enter the skipper's class. Maybe you could one day have a plack on the wall!

Pt. Judith Pond



Bibliography:

1. Thomas, Diane Stine. Seamanship & Small Boat Handling. (61st edition) New York: Hearst Marine Books, 1994.

A great book. I highly recommend reading this or:

2. Rousmanierre, John. The Annapolis Book of Seamanship.

A Camp Fuller tradition for years.

3. Kahn, Brian, and Rosenburg, Matthew. The 1993 YMCA Camp Fuller Advanced Sailing Booklet. Wakefield: Camp Fuller Press, 1993.

These donkeys had a lot to say that we felt was still worthwhile. Though their spelling and grammar errors were atrocious, we used their stuff anyway. We left out their crappy jokes.