Cal Sailing Club
Senior Sailor Study Guide

Chapter 1: Introduction

THE CSC SENIOR RATING

If you're reading this guide, you are probably an aspiring senior or at least curious about the process. So what exactly does it mean to be a senior at Cal Sailing? Achieving your senior rating at CSC is more than just passing some tests and gaining a collection of privileges. It means being a leader and role model for other club members, committing to a continuous journey of learning and honing your sailing skills, taking ownership of the club in a new way, and most importantly: being responsible for anything that could go wrong while sailing, without the help of a Day Leader.

GOALS OF THIS GUIDE

This guide is designed to provide aspiring seniors with a transparent pathway for achieving the senior rating. It includes a chronology of the steps needed to become a senior, a guide to some advanced sailing skills including the maneuvers needed for the practical test, tips on getting out of difficult situations on the water, and advice from testers on what they expect from a successful candidate. The goal is to pull together some of the valuable resources our club has to offer and organize them into one document, so that the process of becoming a senior can be more transparent and accessible for club members.

DINGHY SENIOR VS. FULL SENIOR

There are two types of senior rating at CSC: the "Dinghy Senior" and the "Full Senior" or "Keelboat Senior." You will need to take a Senior Dinghy test in either case, so it is recommended to focus on dinghy skills first to pass that test before going on to Senior Keelboat. The club focuses it's attention building dinghy skills because this builds a good foundation for sailing any boat any time any where. Whether to get the Senior Dinghy rating depends on your interests. If the Senior Dinghy privileges are useful to you, by all means go for it. If you can pass one Senior Dinghy test, you can pass two. This then requires a third test to become keelboat rated. The next step, keelboat, is much harder and will take quite some time. If your only interest is keelboats, then getting the Senior Dinghy rating would not be as useful.

This guide is primarily written to help skippers achieve the Senior Dinghy rating, but much of the content and resources are applicable to both dinghies and keelboats. Another guide, focusing on keelboat ratings, is available here on the Club website.

PRIVILEGES

Dinghy seniors get a key to the clubhouse and have access to the entire dinghy fleet outside of club operating hours (within the dinghy senior area, refer to the Club Operating Rules for a map of each area), they can fly the gennaker on dinghies, they can give junior tests. There are always boats in the club fleet that need a special sign off even with a Senior Dinghy rating.

Keelboat seniors have the same privileges as dinghy seniors, but are able to use the keelboat fleet, with similar sign off limitation stated for dinghies.

Chapter 2: Steps to Become a Dinghy Senior

Step #1: Sail, sail, sail!

There is nothing better to prepare you for your senior tests than getting out on the water. As one senior put it: "Go out and sail and have fun. Don't worry about specific things you need to learn. Sail as many days a week as you can, in challenging conditions as often as possible. If you have enough fun, you'll stumble your way into senior."

Achieving the senior rating requires a significant investment of time and dedication to honing your skills, so be prepared to put in hundreds of hours on the water before you are ready to test.

Here are some tips on building your sailing skills:

- Take opportunities to sail with highly skilled sailors at the club, especially in challenging conditions (after you become a senior, too!) as often as possible. Reach out to individuals to request private lessons (especially those on the rating committee, as they will want to sail with you before they test you), and go on cruises as often as you can. You will find that our seniors are generous with their time if you demonstrate a serious commitment to both your progress as a sailor and to the club.

- Attend races. The club offers races on Sunday mornings and Thursday nights, and this is a great way to learn from more practiced sailors and practice quick maneuvers in a high-pressure environment.

- Buddy up with other folks (perhaps from your senior study group - more on this later) who are also working on their senior, and go out together to practice the senior skills. You can motivate and support each other as you practice and learn.

- Single-hand in challenging conditions as often as possible. This is something you can do as frequently as you want, since you don't have to schedule with anyone else, and you can learn things you won't learn with crew. When you're single-handing in high winds, especially on the trapeze, things will go wrong and you will be on your own to fix them. Over time, these experiences will build your confidence, resilience, and problem-solving skills. Single-hand trapezing also provides a quick feedback loop where you quickly see your mistakes and can correct them, which will help you to internalize a sense of the boat mechanics.

- Practice rudderless in the JY. Get comfortable with the JY early on, as you will very likely have to take your test in it, and it's much more difficult to sail rudderless than the Quest or the Venture.

Each time you go out, whether it's alone or with others, take some time to reflect on the experience afterwards. What went well and what didn't? How could you have done things differently? If you're not sure, talk to other sailors and get their opinions — this is an essential component of the learning process. But note that not many Seniors really understand boat dynamics in detail, so some of the information you get may be incorrect. There are a few Seniors in the Club who really understand this, so seek them out.

Step #2: Do a senior project

As you're building your sailing skills, you can get started on your senior project. This should be a project that enriches the club in some meaningful way and consists of at least ten hours of volunteer work (most will entail considerably more.)

Straightforward senior projects include things like organizing fast tracks, boat repair clinics, study groups, or advanced dinghy

workshops. Other senior projects have included things like building infrastructure for the club, construction, massive repair projects, youth rides, and special workshops. If you choose to do a senior project that is "outside the box", expect that it will take some time to get approved.

Once you've come up with a project idea, you'll need to find a sponsor (an Excomm member) who likes your idea and wants to support you on it. The next step is to submit a project proposal to Excomm which outlines your project idea. Excomm may give you feedback on your proposal or ask you to revise it and resubmit before they vote on it. Once they've approved it, you can go ahead and begin executing the project.

Getting started on your senior project as an initial step is a good idea because a) it demonstrates your commitment to the club, and b) it may take some time to get approved and scheduled on the calendar (in the case of fast tracks, for example), so you'll want to leave yourself ample time.

Step #3: Pass the written test

The next requirement you'll need to work on is the written test. This exam will include questions pertaining to both dinghy and keelboat sailing and will assess the following:

- sailing knowledge (both theoretical and practical)
- how a sailboat works
- nautical terminology, boating safety, and navigation rules (both club and USCG)
- understanding of the sailing boundaries of each rating at CSC
- overall sailing judgment

To pass the written test (and, more importantly, to become a competent sailor), it is recommended to take CSC's Senior Study Group (offered once a year in the winter). This is a series of classroom lectures designed to supplement your sailing by giving you a theoretical foundation for what's happening during your on-the-water practice sessions. Attending these lectures is a great way to meet other aspiring seniors, build your theoretical knowledge of sailing, and learn from some of the best sailors at Cal Sailing. Studying the material in pairs or groups is a great way to reinforce what you're learning in class. There will also be practical sessions on dinghies and keelboats.

In addition to the Senior Study Group, it is recommended to read and study on your own from the following resources:

- *Colgate's Basic Sailing*
- Club Operating Rules
- Club's Dinghy and Keelboat Manuals
- Navigation Rules and Regulations Handbook
- Chart of the SF Bay

If you'd like to learn more about the technical theory behind the mechanics of a sailboat, check out the following resources:

- *High Performance Sailing* (and *Higher Performance Sailing*) by Frank Bethwaite
- *The Art and Science of Sails* by Whidden and Levitt

Typically, if you participate in the Senior Study Group, the organizers will set a test date after the course is complete. If you need to take the test at a different date, get in touch with Mark Yampanis (the CSC rating chair) who can arrange a test date for you.

STEP #4: Put together a senior kit

In order to keep yourself and your crew safe on the water, you must have a fully stocked senior kit with you on your boat when you travel outside the junior area. Ryan Alder put together this Amazon wish list with his favorite senior kit items, including an inexpensive radio.

Required items for senior kit:

- Dry bag
- All USCG required safety equipment
- Waterproof, floating VHF radio and/or cell phone secured to PFD
- Compass
- Two flashlights, at least one floating
- First aid kit
- Knife (ideally secured to PFD)
- Screwdriver, wrench, and pliers
- Whistles (ideally on PFD) or other sounding devices

Additional recommended items for senior kit:

- Ring dings for replacing rigging
- 6’ of line (ideally in PFD) + additional 20’
- Small, strong shackles (drop forged, not pressed/cut)
- Wire cutters
- Head lamp with white and red light
- Leatherman multi-tool
- Blood clot pads “quick clot pads” or “trauma packs”

STEP #5: Pass the practical test

Now that you’ve sailed for countless hours, gained a fundamental knowledge of boat mechanics through the senior study course and your own personal studies, completed your senior project, and put together your senior kit, you’re ready to tackle the most difficult step of achieving your senior rating: the practical exam.

If you choose to get your dinghy senior first, you’ll need to pass two practical exams with two different testers in two different boats (likely a JY and a Venture) in over 15 knots of wind. These exams will be long, challenging, and exhausting. The tester aims to wear you down and put you in uncomfortable, unfamiliar situations to see what your judgment and skills look like when you’re tired and frazzled. Chapter four outlines the skills that will be tested on the practical exam along with some resources and tips to help you master them. Keep in mind, however, that there is no “checklist” to passing your senior test and it is thus difficult to fully prepare for. The best way to prepare is to sail in challenging conditions and experience a myriad array of problems first-hand, so you get used to problem solving under stress.

ADVANCED DINGHY LESSONS

Each summer, the club offers a series of Advanced Dinghy lessons to help club members practice a variety of dinghy skills including those on the senior test. Each lesson is taught by a different senior/cruising skipper at the club, and almost always begins with a “chalk talk” to provide a theoretical basis for the practical exercise. Teachers also often provide a handout which explains the theories behind the skills and includes helpful tips to remember.

The Advanced Dinghy series is an invaluable opportunity to get excellent sailing instruction and ample practice on specialized skills, so it is highly recommended that aspiring seniors participate in the series.

PRACTICE

It cannot be emphasized enough that the most important thing to do in your journey to becoming a senior is to get out on the water and practice—on your own, with friends, or with highly rated club members. Refer to "Step 1" for more tips on what to practice and how.

Be sure that you've practiced in all of our boats, especially the JY, to ensure that you are comfortable with the rigging and handling of each boat. Make sure that you have practiced righting a Venture after capsizing, for example, as this will prove a more challenging task than it is on our other boats.

You'll need to know the basics of the gennaker (although this isn't heavily tested on the senior exam), so make sure you sail with seniors often enough to get some practice with it. You should be competent at rigging, hoisting, dousing, sheeting, and, of course, troubleshooting.

Another thing that is helpful when you're sailing with seniors is to ask them to point out the senior area from on the water. You'll want to get a sense of the boundaries on the water rather than just knowing where they are on a map.

It's recommended that you practice with a live MOB, especially while rudderless. It's a very jarring experience to have someone fall out of the boat—very different from just throwing out the laundry jugs. Your crew's weight makes a big difference in high winds, especially if they're on the trapeze, so you need to know how it feels to suddenly lose a crew and have to go back and retrieve them.

UTILIZE HELPFUL RESOURCES

As you work through your senior skills, you will inevitably face challenges and roadblocks and find certain maneuvers particularly difficult. This is where the club's resources really come in handy, and hopefully this guide will be useful to you in accessing what's available.

The CSC website has a prolific blog about topics from capsize recovery to docking to sail trim, and it's all under the Blog on Sailing Skills and Theory section. In Chapter 4, you'll find our blog entries, videos, and articles organized according to each senior skill, in order to make them more accessible.

Colgate's Basic Sailing is a wonderful resource for learning about how boats work and gaining practical tips for how to execute various maneuvers. Spend time reading other books as well, watching videos that demonstrate various skills, and searching for other online resources that explain concepts you're finding to be challenging.

Finally, ask for coaching on the skills you're having trouble with. The seniors at CSC are usually eager to mentor and support aspiring seniors, especially those who express sincere commitment to building their skills and to CSC. Whenever you're feeling stuck on something, a couple hours on the water with a skilled skipper can help things click.

SCHEDULING A TEST

Even before you feel ready to take your exam, make sure that you reach out to as many folks on the rating committee as you can and ask them to give you a lesson. Not only will you learn a great deal, you will also be able to demonstrate your skills and show that you are nearly ready for an exam. Most testers will not administer a test to someone they have never sailed with before.

When you are feeling ready to test, give yourself plenty of time to find someone on the rating committee who will agree to test you. Senior tests are long and difficult for the testers as well, so it's a big commitment you're asking of them. Most testers ask for at least a week's notice, but it may take even more time to find a tester who is available when you are and willing to do the test. (This is why it's good to sail with as many testers as you can in advance, so you have several to choose from when the time comes!)

Another thing to remember is that testers may be inundated with requests for tests as the windy season comes to an end. If you aren't able to find a tester during the summer season, it is possible to test in the winter on a rare windy day (usually due to a storm), and some testers will do this with shorter notice to help you out.

CHAPTER 3: Advanced Sailing Skills + Theory

In this section we'll highlight some advanced sailing concepts and skills that are helpful for seniors to know in order to be better sailors, understand the mechanisms of the senior skill maneuvers, and get out of unsafe situations with skillfulness. Each subtopic includes a brief summary and a reference in case you'd like to read more. References listed are from the following books: *High Performance Sailing* (HP) and *Higher Performance Sailing* (HP2) by Frank Bethwaite and *The Art and Science of Sails* by Whidden and Levitt (Whidden).

Sail Shape: *Main Sail*

(Whidden pg. 124)

The sail controls are complex, as each control has impacts on multiple other features. For this reason, the observations around shaping sails are broken down into basic, intermediate, and advanced explanations. You might find it helpful to gather all of the basic information before moving onto intermediate. Then, when you feel you have a solid handle on the intermediate knowledge, move onto advanced.

When shaping our sails there are common concerns between the main and the jib. In both cases we are concerned about the depth of the draft and its placement fore AND aft. We are also concerned about the leech, which is where we find the sail twist profile. Because few controls affect both sail simultaneously, we are going to talk about each sail separately.

Basic: When you think about sail controls you need to think about which edge of the sail they affect. The halyard and cunningham affect the luff, the outhaul affects the foot and the vang effects the leech. The primary function of the cunningham and halyard is to move the max draft forward and aft. The outhaul affects the foot of the sail and by putting tension on the outhaul you reduce the draft. The vang affects the leech of the sail by pulling the boom down. As you put tension on the vang, the leech becomes tighter, reducing twist. The vang is one of the most complicated controls.

Intermediate: The power, performance, and balance of the main sail are governed by the size and location of the max draft, which can be tuned through 3 controls. These controls are cunningham, outhaul, and mast bend. The power in the sail is also partially governed by twist, which is primarily controlled by the vang. The draft is moved forward and reduced when the cunningham tensions

the luff of the sail. As the cunningham is tensioned, the sail is stretched along the luff pulling material forward, which is observed by movement and reduction of draft. The outhaul impacts the draft depth primarily in the lower section of the sail and doesn't impact placement of the draft significantly. The largest control of draft depth is the mast bend, which is partially tuned through trim of the vang. On a dinghy this is more dominant than on a keelboat. On a keelboat the mast bend is primarily tuned through the backstay, which compresses the mast uniformly, in contrast to the vang, which primarily bends the bottom of the mast. The twist of the sail is tuned by the leech tension, which is supplied by a combination of the vang and mainsheet tensions. The twist is the degree to which the angle of attack at the top of the sail and the bottom sail are different. As you tighten the leech, the top of the sail will become more in-line with the bottom of the sail. The optimal amount of twist changes with sailing conditions. In light air, you typically want a high degree of twist due to the difference in wind velocity, and therefore apparent wind direction, close to the water and far from the water like at the top of the mast. In moderate winds you typically want little to no twist, however in higher winds you can utilize twist to depower your sail.

Once you've understood and/or mastered the controls described in this section, you will start to change these controls while sailing. These can all be actively tuned, but arguably the most important main sail shape control is the leech, which is tuned by the vang and mainsheet. On most dinghies and some keelboats, the leech is trimmed by the vang tension and the angle of attack of the sail is tuned with the mainsheet on a dinghy or the traveler on a keelboat. This is commonly referred to as "vang sheeting" as the vang is taking the place of the main sheet on a keelboat, and giving the leech tension.

Advanced: In the previous paragraphs, the methods of sail shape tuning are discussed as an input and a reaction. Here we'll look at how and why these controls will change the draft position. First let's look at how a sail gains its shape. The shape of the sail, meaning draft and draft position, are designed into a sail by the luff curve. The luff curve of the sail can be observed by laying the sail flat on the ground and tracing the luff or boltrope of the sail. This is almost never a straight line. As the sail is hoisted, the luff of the sail is forced to follow the mast bend. The difference between the mast bend and the natural luff curve directly impacts the amount the draft amount and position.

Both the dynamic luff curve and mast bend are tunable through sail controls we've already discussed as well as some dry land controls we'll discuss shortly. Explicitly, we discussed that the cunningham tensions the luff of the sail and reduces the luff curve. Also we discussed that the vang impacts the lower mast bend and can also impact the top mast bend through the leech tension. The Vang (gnav) impacts mast bend at the boom (gnav gooseneck) by pushing the mast forward at this point. Boats commonly have lower shrouds to control bend that the vang (gnav) puts into the mast. Other influences of mast bend, for example, are: shroud tension, forestay tension, shroud attachment point (to the boat and to the mast), spreader angle, spreader length, forestay attachment point (to the boat and to the mast), mast butt position, and mast rake (angle of the mast to the waterline of the boat). If boats have multiple sets of spreaders (two for this example), the upper shrouds (cap shrouds) typically impact the mast bend between the lower set of spreaders and the mast tip. The shroud tension, in congruence with the spreader angle, impacts the mast bend, as the shroud tension is increased, the mast is pushed forward at the spreaders. If the spreader angle is increased, the ratio of mast bend to mast compression is increased. The mast butt position is origin of the mast bend, hence as the mast bust is moved aft, the mast bend is increased. The mast butt will also change the mast position and mast rake. The mast rake additionally impacts the balance of the boat through center of effort modification. Things like attachment points for shrouds and stays as well as gooseneck placement is designed by the designer/builder. The amount of tension on the shrouds is usually set on land before the sails go up. As is a basic forestay and backstay tension on boats with fixed forestays and backstays. On club boats this is set by some of the more advanced members of the club through practice experience. It sometimes gets modified when boats are maintained, and reattached by members with less knowledge. On many club dinghies the forestay is replaced by and adjustable with the jib halyard tension. The largest control you have over change in tension on the shrouds, stays, and the relationship between luff curve and mast bend curve while underway is the vang/mainsheet/backstay and their relationship to each other.

Sail Shape: ***How the jib impacts air flow around the main***

(Whidden pg. 73, 64)

Basic: When the jib is trimmed correctly, the telltales at the front edge of the sail should all break at the same time. As you bear away this will be harder and harder to make happen on all of the club boats(this will be explained later). The jib shapes the

wind that the main sail is affected by. It is important to make sure that main and jib are trimmed so they work together. The Jib changes the direction and speed of the wind. For the sails to be trimmed to work together the mainsail will be trimmed in, more then the jib.

Intermediate: Assume that you are paying attention to the basic aspects of the jib's and main's interaction. Another aspect of the interplay you need to pay attention to is not just the two sails relative trim angle but also how the twist of each sail is in relation to the other. If you are only changing the twist on one sail, then it should be to help match the twist of the other. (We will discuss how to adjust this part of sail shape on the jib later.) When our sails are trimmed to work best together, the wind doesn't interact with two separate foils, our main and jib become one sail plan that starts at the luff of the jib and ends at the leech of the main.

Advanced: To understand how airflow from the jib impacts the airflow around the main, you first have to understand how the air is moving around the jib itself. When the jib is trimmed correctly, a single airstream is split into two, one moving around the leeward (outside) of the jib and one moving to windward (inside) of the jib. Let's focus on the leeward side of the jib first. The air that moves to leeward finds a lower pressure along the surface of the jib than farther from the jib causing a bend in the airflow. This pressure change across a short distance increases the speed of the air and causes the airstream to follow the surface of the jib. If the pressure difference is too high or the bend is too tight, the air will detach from the jib resulting in turbulence. We refer to this turbulent condition as a stall. On the windward (weather) side of the jib, the airstream finds a high-pressure region along the curved section of the jib. This high pressure along the sail reduces the pressure gradient, slowing and bending the airflow. At the ideal trim condition, these two airstreams continue to flow along the surface of the sail to the leech of the jib, where they recombine without turbulence. The airstreams (windward and leeward) will ideally have similar speeds. The imbalance in exit speeds can be seen by watching tell tales on the LEECH of the jib. If your tell tale is folding to leeward, your sail is oversheeted or stalled. You will not see the tell tale fold to windward, as the sail will likely luff before this occurs.

The effect of the airflow from the jib onto the main is understood when comparing the airstream that the main would see with and without the jib. As we just discussed, the airstream coming off of

the jib is roughly parallel to the leech of the jib. Without the existence of the jib, the airflow would arrive from 15 to 20 degrees further to windward than with the jib properly trimmed. This change in the wind direction induced by the jib is the reason that a boat with a jib can sail much closer to the wind than a boat without a jib.

Sail Shape: ***How the jib trim impacts boat trim when overpowered***

(Whidden pg. 140)

Basic: The shape of the jib impacts the power of the sail plan to a much larger extent than simply the ratio of the sail areas (jib area/main area). The jib has a much higher camber (curvature) than is seen in the main. This increased camber creates a more powerful, yet more sensitive foil. The trim and profile of the jib is sensitive and typically the jib leech (twist) should have a similar profile to the main leech (twist), as in an ideal situation the main and jib act as a single airfoil. In higher than design-wind sailing conditions, the main sail trim is being frequently adjusted, which implies that the jib trim should be adjusted equally as frequently. In reality, this isn't commonly done outside of top racing teams, so one method of reducing the sensitivity of the boat trim to the jib trim is to ease the jib slightly (0.5" -1".) This increases the twist of the jib and opens the "groove", or accepted wind direction, of the sails. This can also be used when sailing and a sudden gust arrives. Another way to help "open the groove" is by moving the draft of the jib forward with increased halyard tension—from approximately 33% back from the luff to 30%. (More on this below.)

Giving the jib a small ease ("burping the jib") can quickly reduce heel when overpowered by inducing this twist at the top and opening the groove. This is particularly helpful in heavy wind and waves. But don't forget to trim it again once the puff has passed.

Advanced: When setting up your jib, pay attention to the draft and draft position, as these will impact the forgiveness and drivability of the boat. Decreasing your jib draft will clearly reduce the amount of lift/drive-force or heeling torque that the jib provides. Draft is controlled by halyard tension, jib sheet tension, jib halyard attachment point (mast bend), and mast rake. By increasing jib halyard tension, you will move the draft of the jib forward—similar to the way the main sail reacts to cunningham. Moving the draft forward decreases the chance of stalling and reduces sail collapse (luffing), effectively increasing the groove.

Sail Shape: *Depowering techniques and order of operation: vang, cunningham, and/or outhaul*
(Whidden pg. 128)

In order to depower the boat under sail, we will need to modify the mainsail profile to do three primary things, namely move draft forward, reduced draft, and increase twist. As we discussed above, we can move the draft forward through the use of the cunningham. Typically the cunningham is adjusted continuously from the lightest air setting to the above design wind (12 kts) setting. The draft amount is adjusted through a combination of all controls, but is mostly impacted by backstay on a keelboat and vang (gnav) on a dinghy followed by the outhaul. In less than designed windspeeds you will be doing most of your draft depth adjustments on the main with your outhaul. In high winds (much above the design wind, ~18kts.) The primary concern is reducing power and the most effective way to do that is to have the outhaul on hard and to induce mast bend. The mast bend will decrease draft and increase twist in both the main and jib. In a dinghy, we induce mast bend by using the vang, while on a keelboat a combination of the backstay and vang are used.

While optimal routes to depowering may differ depending on the boat, the ideas remain the same, reduce the draft and move it forward, followed by increase the twist.

Sail Shape: *When to increase leech tension/vang*
(HP pg. 310 and HP2 pg. 383)

The optimal amount of twist changes with windspeed. In light winds (0-4 kts), some amount of twist is ideal, as the wind that the sail sees at the top of the mast is farther aft and at a higher speed than the wind at the bottom. In these light wind conditions, the twist is set to enable all sections of the sail to be optimally trimmed and powered. In winds ranging from moderate to design, twist amount is generally reduced dramatically as the vertical wind gradient is reduced above about 6 kts of windspeed. In heavy winds, twist is re-introduced by decreasing vang tension. This spills air from the top of the sail first, reducing the heeling torque of the sails on the boat.

Sail Shape: *When to increase luff tension/cunningham*
(HP2 pg. 383)

The cunningham is used to place the draft position. In general, in stronger winds the draft is moved forward to increase the groove and improve the balance of the boat. The cunningham should be adjusted for each wind setting to place the draft accordingly. The main sail draft position should be set between 40-45% in most wind conditions.

The jib luff tension can also be adjusted through use of the jib halyard (for boats without a jib cunningham). The jib draft position is typically set between 30 and 35%.

Upwind Sailing: *Steer to Depower*

Upwind Sailing:
To depower quickly, steer boat slightly into the wind. Pinching slightly like this will luff sails and depower your boat if you are overpowered and heeling too much. Do not overdo this adjustment. A change of 3 degrees is a large change in this instance.

Downwind Sailing:
When sailing on a broad reach, with wind and waves, or with a spinnaker, when you are overpowered, you will turn downwind, away from a beam reach, to reduce the heeling force on the boat.

These two options of turning up to depower or turn down to depower are sometimes referred to as "escape up" or "escape down." Meaning that you will escape the added heeling force of a gust by turning the boat upwind or downwind.

Upwind Sailing: *Ease to depower*
Whidden pg. 126

Easing the mainsheet to luff the sail will also help you depower and is typically the fastest way of reducing the healing forces. Again this adjustment can be overdone. Paying attention to the size of the windspeed change can help you tune in your adjustments. This may be as small as a couple inches of ease on the mainsheet, (which, after adjusting for the multipurchase of your mainsheet system, might only be a ½ inch change to the boom) or ¼-1/2 inch changes on a traveler.

Upwind Sailing: *How the choice (of steering or easing) changes with boat type/design or wind strength*

(HP pg. 167)

Both methods of depowering are used on all boats, but the dominant method will vary depending on the type of boat. This is due to a difference in planing or semi-planing boats, such as our dinghies, and a proper displacement mode boat, like the commanders. The wind in the gust changes both the apparent wind speed and apparent wind direction, and in displacement boats this increase of wind speed and change in wind direction can be turned into a small increase in boat speed when a gust hits. Given the crews relative position to boat controls and general body position the reaction time take too long to take advantage of this and or is too small to make it worth the effort even on the racecourse. So pointing into the wind (pinching) reducing heeling forces and allowing the boat to sail upwind more (closer to the wind) is the preferred method. When a gust hits, the apparent wind moves aft, so turning the boat up should be natural.

In a dinghy, especially a fully planing dinghy, the wind in the gust changes both the apparent wind speed and apparent wind direction, which can more easily be turned into extra speed as it doesn't have the hull speed limitations, or problems of crew positions, of displacement boats. Additionally, the use of the rudder on a dinghy will slow it down more noticeably than on an over-powered displacement boat, where drag forces (bow wave) are already high. The extra speed gained in a gust will allow the dinghy to go upwind faster, similar to the displacement boat, but through a different means— speed change, rather than direction change.

Upwind Sailing: *"Ease, Hike, Trim"*

(HP2 pg. 361)

When a gust arrives, always remember to ease the sheet, hike out, and then trim when the gust is over. This is the most optimal way to maintain control and balance of the boat without burning extra energy.

Upwind Sailing: *Two-handed Drill*

(John's summary: Two-handed Drill)

One way to practice both of these methods in a single response is to have one hand on tiller and one hand on mainsheet. When the boat heels, bring your hands away from you (head up/sheet out), when it flattens, bring them towards you (fall off, sheet in). Please remember subtlety is key.

Bearing Away: *Sail controls (jib, vang, cunningham, backstay, outhaul)*

On a high performance boat, when bearing away, you need to make sure the jib is adjusted properly (ideally the jib is eased continuously through the turn, but easing it early is commonly sufficient.) As you head down, ease both the main and the jib. Ease cunningham, backstay, and outhaul. What you do with the vang depends on a lot of factors, but generally easing the vang will help if you are overpowered going downwind as it increases twist and reduces the heeling forces that turn the boat up in a gust.

Bearing Away: *Ease main before driving down*

As you fall off and bear away, start to ease the sail before your start steering the boat with the rudder and ease gradually. This will help you fall off just like when sailing rudderless. In high winds this may be the only way to make a clean bearaway.

Below Water Foils: *How the centerboard/daggerboard/keel creates lift*

(HP pg. 232)

Basic/intermediate: The centerboard has two primary roles, which are additive. The first role is to reduce sideslip to allow the sails to work. As the boat begins to move forward due to the sail power, water will flow over the centerboard. In theory this can be thought of as the same way wind flows over sails. In the case of the centerboard/daggerboard/keel, the water moves across the board at different rates and pressure on each side, due to a combination of motion to lee and forward. This speed/pressure difference creates the second role, lift, which is increased as the boat speed is increased. The lift and drag of the centerboard are equal partners with the wind on the sails in creating boat heel.

Advanced: Realistically, the drag that is commonly discussed as reducing side-slip is actually the flow-generated lift on the centerboard. If the centerboard is creating drag and not lift, you are stalling the flow over the centerboard by not moving forward and you need to ease your sails. This is equivalent to having your sails sheeted in hard while sailing on a beam reach.

The lift generated on the centerboard is due to a combination of the amount of flow (boat-speed) and the asymmetry in the flow over the windward and leeward sides of the centerboard. (Angle of attack = leeway.) As the boat speed increases, the lift generated will reduce the leeway until it becomes only a few degrees. At this point, the leeway is no longer sensitive to the boat-speed, and the centerboard is only creating increased drag with increased boat speed. Additionally, the lift on the centerboard is spread across the length of the centerboard, and increased lift creates increased heeling torque. In order to mitigate both drag and heeling force, the centerboard or daggerboard can be raised, which decreases the drag and decreases the lever arm for the lift reducing the healing torque. Decreasing the amount of centerboard is good for balance when sailing at higher speeds, but can impact maneuverability at low speeds, such as when tacking.

Below Water Foils: *Why rudder is important to driving properly*

(Whidden pg. 75)

The rudder is an important part of the lateral resistance that is induced by the centerboard, the hull in the water, and the rudder.

On a properly balanced boat, you will have to hold the rudder at a slight angle to balance weather helm, and that creates additional lift and allows you to point a few degrees higher. The amount of angle and pressure should not be measurable more than in medium air if your boat is balanced properly.

Below Water Foils: *Saul's "5 Things a Rudder Does"*

(Whidden pg. 75 + Saul)

1. A meter for helm balance.
2. A brake (the only brake we have on boats besides running into things)—turn it hard to one side and then hard to the other side. While you're sailing, every boat has an angle that the helm should be (btw. 3-5 degrees, for example). If you're steering the boat and your helm is at 10 degrees, you've stopped creating lift and you've started creating turbulence,

which slows the boat down.
3. Propulsion: sculling for a straight line, you're essentially paddling the boat, and tiller flicking to help you turn.
4. Creates lift as a foil under the water.
5. Part of the center of lateral resistance.

Heeling: *What heeling does to above and below water foils*

Basic: When heeling, the lift generated on the centerboard and rudder is reduced. This increases leeway, reducing upwind progress.

Advanced: Heeling changes the apparent area of your foils and can change the apparent chord length and camber. In light air, this can help achieve a more powerful sail, when the amount of lift from the centerboard/daggerboard is small, however in heavy air, this reduction in apparent area will dramatically increase leeway. One way to test this is to sail on a matched course with a boat sailing in the same direction, at a similar speed. As you heel your boat, your course (not your heading) will start to move closer to a close reach. This is why it is best to depower your sails through controls discussed above or by easing your mainsail to avoid excessive heel. On dinghies, the centerboard/daggerboard position can be tuned to reduce the amount of lift on the centerboard and this should be considered after the sails are fully depowered.

When heeled, the rudder is tilted in the water. This means that when the tiller/rudder are off the centerline of the boat, there is vertical lift on the stern of the boat. If the boat is heeled to leeward, and the tiller is pushed to leeward, the stern will be pulled down into the water and the bow will lift. When the tiller is pulled to windward the stern is lifted and the bow is driven into the water. This is especially of concern when turning from an upwind course to a downwind course on an over-canvased boat. If the boat is turned while heeled to leeward, the bow will have a tendency to submerge, making the bear-away more challenging than if the boat were flat or heeled to windward.

Heeling: *Drag changes when heeling*

Drag is increased significantly when changing heeling and by heeling in general due to increased hull drag, which is why we try to keep boats (esp. dinghies) flat and at a constant heel to keep optimum speed.

Heeling: *Why heeling is generally bad*

In a dinghy, heeling is generally bad because it slows down the boat due to increased drag and reduces your ability to plane. "Flat boat = fast boat." Keelboats, however, by nature use the weight of the keel as an additional righting moment. The righting moment given by the keel is increased as the heel is increased, so keelboats are generally designed to have a small amount of heel when sailing up wind. So the degree of heeling that is acceptable varies based on the boat. As an example, a Commander likes approximately 20 degrees, Merits like 14-16 degrees and J-80s like 10-12.

Rudderless

Everything that you learn for rudderless is a helpful concept/skill for sailing with a rudder. Everything you do to head up when rudderless (sheeting in, easing jib, getting weight to leeward) is also applicable to sailing with a rudder. And everything you do to head downwind (sheet out, jib on, weight out) helps you to bear away when you have a rudder. Your boat will be more manageable, better balanced, and generally have better boat speed, if you continue to use your sails and sight to steer your boat even when sailing with a rudder.

CHAPTER 4: Maneuvers Required for Practical Test

The chart below organizes each required skill for the senior test along with resources and tips on acquiring it. Note that these are typical of the maneuvers that you will be asked to perform on your test, but this is by no means a complete list. In general, you will need to demonstrate sailing skills and judgment in 15-25kts of wind. You will also be asked to handle situations that you cannot have prepared for in advance.

Topic	Skills	Club Resources	Quick Tips
Rudderless	• All points of sail • Tacking • Gybing • MOB (Port and Starboard, 3 min each) • Dual MOB (5 min) • Docking (to buoy) • High wind boat control • Wide circles (constant radius)	Rudderless But Not Adrift: Sailing Without Your Rudder A Practical Guide to Rudderless Sailing Rudderless Sailing Practical Rudderless Sailing (video)	To head up: • Sheet in main • Ease jib • Weight in • Centerboard down To fall off: • Ease main • Sheet in jib • Weight out • Centerboard up To sail a straight course: Imagine the bow of the boat is a pendulum that keeps moving back and forth. Catch it just before it comes to the end of its swing and correct to go the other direction. Small movements are key.
Gennaker	• Rigging/ testing • Hoisting and dousing • Communicating with crew • Sailing • Capsize recovery	A quick and dirty guide to asymmetrical spinnakers How to rig and fly the gennaker on a Laser Bahia (video)	To rig the gennaker: -Run down two sides of the sail to make sure it isn't twisted -Attach tack to bowsprit -Attach halyard to head of the sail -Run dowsing line through the retrieval points -Attach gennaker sheets to the clew of the sail -Run sheets through the gennaker blocks, tie off Sheets should run above the dowsing line and forward of the forestay. Head should be forward of everything else. Always rig on land before you sail. Give clear instructions to crew before hoisting and dousing. Sheet to maintain slight curl in the kite. Douse gennaker before capsize recovery or MOB recovery.

High Wind Sailing	• Close-hauled (with crew on trapeze) • Broad reach/run with swells >3' • Tack, gybe, circles • Jib only • Main only • No centerboard • Single-handed • Reef underway • Anchor	Tips for skippering with crew on the wire How to Make the Most of your Weight in High Winds How to survive 30 knots, or, what to do if you've bitten off more than you can chew Downwind sailing and the evils of rounding up Single-Handing in High Wind Sailing Small Circles	With crew on the wire: Try to keep the boat relatively flat. Ease main or point higher (for upwind sailing) or lower (for downwind sailing) during gusts if boat heels too much. Recover during lulls. Jib only: It will be very difficult to make upwind progress; only take main down if you're grossly overpowered. Start out on beam reach, head up as speed builds, and keep the trim perfect at all times. Main only: Since you can't point as high, tacking will be a bit harder, so use your weight and sail trim as in rudderless to make it through each tack. You need to tack from farther down to make it work. No centerboard: Tacking will be tricky. Sail on beam reach, get speed, and keep it as you head into the tack. Trim the main in as you head up and ease the jib as you enter into the tack. You can "roll" the tack by keeping your weight windward (this helps the jib back sooner and gets you through tack), then move over. Always wear a harness in case crew falls out and you need to trapeze to keep boat upright.
Miscellaneous	• Point out area limits from current location • Verbalization while under pressure • Backwards sailing (50') • Get your head out of the boat	Backwards Sailing (video)	COMMUNICATE. Verbalize your thought process and explain what's going to happen to your crew each step of the way when under stress. Be in charge. If you look stressed out, it will affect your crew negatively. Tips on backwards sailing: -Sail close-hauled, steer into irons, and turn to face stern -Try to keep the boom on the centerline. As it moves to the left, move your tiller to the right to compensate and vice versa. -Make small movements to adjust -Use your body weight to lean the boat (rudderless technique in reverse)
What-If Scenarios	• Crew issues/ injuries • Boat issues • Weather issues • Safety issues	Man Overboard on Dinghies Slow Sailing (for MOB)	Never get far from or lose sight of a MOB. If a crew is seriously injured, Mayday USCG immediately. Many problems can be solved by reducing sail area and/or anchoring. See Chapter 5 for detailed strategies on common problem scenarios. Remember that the boat protects you—don't leave it.

CHAPTER 5: Troubleshooting

It's good to be prepared for anything that can go wrong on the water, especially some of the most common issues (outlined below.) Of course there is no substitute for time spent sailing and encountering each of these issues first-hand, but learning some practical response strategies in advance can prove helpful when things go awry.

Common Issue	Possible Response Strategies
Shroud breaks	• Tack to take the load off the windward shroud. If you can sail home on that tack, great, otherwise rig a temporary shroud with the gennaker halyard or something similar.
Mast breaks	• If mast breaks halfway down, you can fashion a little bit of a sail to it, use that to sail. What do you do with the top half of the mast? Need to cut everything off immediately on a keelboat. • If the whole thing breaks off, you can disconnect boom from mast and stick it down where the mast goes, use it as a mast with the jib. A broken mast can put a hole in your boat if it isn't controlled.
Vang breaks	• This is not a big deal, you can get home without it.
Jib sheet breaks	• Always carry 6' line and a 20' line in your PFD, so it's instantly accessible • Furl jib and sail main-only
Rudder breaks	• This is why we practice rudderless! See Chapter 4 for rudderless tips and resources.
Boat ends up too close to the rocks, about to hit them	• Don't ever get close to the rocks. Always look out for your lee shore and make sure it's far away. • If you do get too close, throw your anchor down • Call the Day Leader to pull you off the rocks, or sail away from them • Keep yourself safe, don't get yourself between the boat and the rocks.
Crew falls out in high winds, boat keeps capsizing during pick-up	• Go out with a trap harness, it's awkward without a tiller extension but you can do it. Just stand further back, lean in and reach out to what extension you do have. It can help you get upwind. • Ease your jib 3inches. • If you capsize and can't get boat up, furl the jib (hopefully your main is reefed already), make sure you uncleated everything • If boat keeps re-capsizing, anchor. This will make getting the boat back up easier as it will help you point into the wind. • If you still can't get it up, take down your main all the way.
Anchor gets stuck, can't be pulled up	• Use the waves to your advantage. Pull the line taut when the bow goes down, kind of like sweating the main. • If you absolutely can't get it up, untie it and tie an MOB or PFD to the end of it, go back and get it later (with Day Leader.)
Crew gets hit in the head with the boom, may have concussion, bleeding a lot	• Whenever you suspect a serious injury, Mayday the USCG immediately • If you're close to the club, radio Day Leader and head back quickly • Use "quick clot" pads from your senior kit to stop the bleeding

CHAPTER 6: The Practical Test

KNOWING WHEN YOU'RE READY TO TEST

If you've followed the steps in this guide (especially if you've participated in the senior study group, taken the advanced dinghy lessons, and put in countless hours on the water), you are probably getting ready to take your practical tests.

The best way to know if you are ready for your tests is to go out in a JY in high winds (20+ knots)and practice all the rudderless maneuvers (tacking, gybing, MOB, docking, and circles). If you feel comfortable with all these, you are probably ready for your test.

One more thing that can be helpful as you're preparing to test, however, is to spend some time thinking through some "what if" scenarios and how you will handle them if they come up. It can be useful to sit down with a senior club member and talk them through together, discuss various strategies, identify pros and cons of each, and imagine how you might handle them yourself. If you feel like you have a solid idea of how to tackle various situations that can go wrong, you will feel much better going into your test and be more prepared to handle what the tester throws at you.

WHAT TESTERS EXPECT

In putting together this guide, a number of testers were surveyed about what they look for in a successful test. Here are some of their responses:

"Passing your senior is smaller part skills and larger part judgment and decision-making."

"I am looking for a person to understand at any moment what is a best and worst case scenario, weigh their options, and do what looks best at any given time."

"First and foremost, a person has confidence in their skills but also has a realistic assessment of them."

"Crew and boat management are a high priority. It means people need to be looking a number of moves ahead."

"The candidate should have knowledge of each maneuver I ask about. I look for good judgment, knowledge of the days' tidal heights and expected weather. Be able to perform all the junior skills in high

wind, reef underway, scoop up immobile crew into cockpit while righting a dinghy."

"A high level of skills demonstrated in a dinghy, and more emphasis on quality, maturity, situational awareness, and leadership."

"Confidence in unfamiliar situations."

ADVICE ON PASSING THE EXAM

- People tend to worry a lot about their technical skills and all their knowledge and answers to these "what if" questions being perfect. But what's most important is just getting out there and sailing a ton. You'll encounter all of these scenarios at some point and being prepared mentally for them will help you deal with them in real life.

- Know where the leeward shore is, so if you capsize and can't get the boat back up, where are you going to end up? Is it the pier? The rocks? Try to sail dinghies in places where, if something goes wrong, you just end up in the junior area and it's not a big deal. This reduces stress. For keelboats, think about danger areas such as lee shores. If you're near one and something goes wrong, you've increased your risk quite a bit.

- When something does go wrong, stop and think through your strategies. Don't just keep trying the same thing over and over again. If the boat keeps on capsizing, you need to do something different.

- Remember that you're in charge. You can disagree with what your tester says and say, "that's not safe," and choose to do something else. They are testing your judgment and your ability to maintain a cool head despite what crew might be saying or doing.

TEST-DAY CHECKLIST

- Check the wind and the tides
- Make sure your senior kit is stocked and your radio is charged
- Eat well and bring an energy bar (in your PFD) as well as a water bottle secured to boat

- Dress for the weather
- Review this guide and think through some "what if" scenarios so you feel prepared for what might happen
- Check your boat thoroughly (your tester is likely to mess with it before and during the test)
- Remember: you're in charge and you need to demonstrate your ability to command the boat in any situation

Whether or not you pass your test, remember that it's a great learning experience no matter what. If you make mistakes, you now know exactly what you need to work on and practice for the next time. Don't give up. Becoming a senior is usually a long and very difficult process (it's designed to be that way for a reason), but there are many people at the club who will help you if you just ask for support.

CHAPTER 7: You're a Senior! Now What?

Congratulations! You've achieved the much-coveted senior rating at Cal Sailing. As many of our skippers will tell you, this is the beginning, rather than the end, of the journey. Continued learning should be a component of your sailing.

Part of being a senior is a commitment to continued growth and learning, to cultivate yourself as the best sailor you can be, for both the safety of your crew and the benefit of the club community. It means giving back in a new way and taking initiative to better the club.

When you become a Senior, your required volunteer hours per quarter to renew membership goes up from 2 hours to 10 hours. Here are some ways that seniors can contribute:

- organize clinics
- teach skills that you feel confident in
- give junior tests
- mentor other aspiring seniors
- look for opportunities to use your talents to support the club in unique ways

Seniors have a high level of responsibility, both on the water and off. Seniors must always sail with *anticipation* of problems that could go wrong, and be prepared for them. The best way to do this is to sail with folks who are better than you, in challenging conditions, and learn as much as you can. Don't be afraid to ask

questions or ask for support in sharpening a skill that you need to work on. Never stop practicing skills, like those odd-wind launchings and dockings on keelboats. Team up with other club members to do this. That's what our community is for, after all.

Being a senior at the Cal Sailing Club means getting to sail with highly skilled and diverse skippers, and learning from them each time you go out. It means staying attuned to new trends in sailing and helping others to learn and grow as sailors. It means carrying forward the CSC tradition of fostering sailing access to folks who haven't traditionally seen sailing as accessible.

Every rating, including this one, is just a learner's permit at a higher level. Being a Senior means that you're on your own (you can't rely on the Day Leader to help you). Hone your skills in bigger conditions, and pass them on to others. Remember that when you are at the western boundary of the Senior Keelboat area, you are as far from land as anywhere in the central bay.

Wherever you are in the process of becoming a senior, I hope this guide has been of some benefit to you. I expect it to be an ever-evolving document, so please send your feedback and suggestions. Enjoy your time on the water, never stop learning, and mentor others the way so many skippers have mentored you. Happy sailing!

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Spearheaded by: AnnaLise Hoopes
Project Sponsor: John Bongiovanni

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