CRUISING UNDER SAIL
WITH THE WASHINGTON YACHT CLUB
A new edition for 2013

Table of Contents
PREFACE ................................................................. 2
THE BOATS .................................................................. 2
RATINGS ...................................................................... 2
ADDITIONAL READING ............................................... 3
CHECKOUT PROCEDURES ........................................... 4
RIGGING ...................................................................... 4
CRUISING EQUIPMENT ............................................... 6
LIGHTING REQUIREMENTS, SOUND SIGNALS, AND RIGHT OF WAY RULES ............................................. 11
MANEUVERING NEAR DOCKS ...................................... 14
BRIDGES AND THE BALLARD LOCKS ............................... 15
HEAVY WATHER SAILING ........................................... 17
NIGHT SAILING, DAMAGE CONTROL, CREW-OVERBOARD AND FIRE ......................................................... 20
ANCHORING .................................................................. 21
RUNNING AGROUND ................................................... 25
PILOTING ..................................................................... 27
WEATHER ..................................................................... 31
CRUISING IN CANADA .................................................. 33
CONCLUSION OF A VOYAGE .......................................... 33
KNOTS ......................................................................... 33
QUICK REFERENCE FOR EACH BOAT ............................... 35
ENGINES ..................................................................... 35
PREFACE TO THE 2005 EDITION .................................... 37
ONLINE REFERENCES ................................................... 39
PREFACE

"The time has come," the Walrus said,
"To talk of many things:
Of shoes—and ships—and sealing-wax—
Of cabbages—and kings—
And why the sea is boiling hot—
And whether pigs have wings."

Lewis Carroll

This book is designed as a concise guide to aid those WYC members who wish to sail and enjoy the club’s cruising keelboats, but who have not yet acquired the weather-beaten, salty look that comes with experience. This 40+ year-old text was thoroughly rewritten in 2013 in an attempt to modernize the book without losing its character. This update was made based upon a scan and OCR of the 1992 photocopied edition. The 2005 edition, while dated, has over 100 pages of interesting information about sailing the club’s keelboats. It is well worth your time to peruse.

This book’s rich history is reflected slightly in the prefaces to previous editions, included at the end of this edition. Allow me to summarize those preferences by saying that this book is a labor of love from many people throughout the club’s history—most recently myself, Dennis Bogh, Goran Zivkovic, Joel McCulloch, John Courter, Leo Morales and many others. But this book is necessarily unfinished. Read it with a critical eye and help to maintain and improve the text as you can.

Contact Andrew Pardoe, ap@uw.edu, or the WYC Librarian regarding maintenance and revision of this text. The last update to the version you are reading now was made on April 7, 2014.

THE BOATS

Our club currently owns four sloop-rigged, cruising keelboats: a Ranger 26, two Catalina 27s, and a Cal 3-30. They all have bunks for five, an enclosed head, a dinette and a galley with an alcohol stove, a sink, and an icebox. Most are equipped with outboard engines except for the Cal 3-30 which has a diesel inboard engine. Additional information about the inboard diesels can be found in the section on “Inboard Diesel Engine.”

The keelboats are the only boats in the club which require a reservation fee. Current fees can be found on the Keelboat reservation webpage. Boats may be reserved for as short a time as a half day or as long as two weeks. Reservations can and should be made in advance as reservations are otherwise on a first come, first served basis. At the time a reservation is made, the full price of the reservation must be paid. Reservations may be viewed online but they can only be made on the computer inside the sail locker. Payment for the reservations is to be placed in the box mounted on the inside of the keelboat locker.

The club also owns a variety of smaller keeled daysailors that can be sailed without reservation. They are not considered keelboats in the context of this text.

RATINGS

As with other club boats, ratings are required in the keelboats. There are only Novice and Skipper ratings as well as a Cal 3-30 specialty rating. A Novice may sail the Ranger or Catalinas in Lake Washington and interconnecting waters east of the Aurora Bridge. A Skipper may sail any keelboat for
which he has ratings in all waters covered by the club's insurance (as detailed on the WYC web site).

Policies on length of reservations are also found on the keelboat reservation webpage.

In order to qualify for a Novice Reservation Keelboat Rating, a person must fulfill the requirements found in the By-Laws. These include passing both the Novice and Skipper Centerboard/Daggerboard Written Examinations, demonstrating proficiency in tying a number of knots as well as in rigging and use of keelboat equipment, and checkout procedures. The person will also take a sailing exam to demonstrate proficiency equivalent to an Intermediate dinghy rating including recovering a man overboard. Any Chief with a Keelboat Skipper Rating may give Novice Ratings.

To obtain a Skipper Rating, a person must pass a Keelboat written test, and a practical exam, given in a keelboat, that will include your demonstrating proficiency in rigging, reefing, anchoring, and piloting in addition to sailing, and fulfilling the other requirements found in the By-Laws. The demonstration of proficiency includes many aspects of keelboat sailing in tidal waters, including basic navigation, anchoring, reefing and changing sails, and International Rules of the Road. Only a Designated Keelboat Chief may give Skipper Ratings.

The Cal 3-30 may be sailed by any member who has a Keel Boat Skipper rating and has demonstrated to a designated keelboat chief the proper operation of the boat. Details of this demonstration will be maintained by the Keel Boat Fleet Captain.

**ADDITIONAL READING**

*He studied the books of the olden day;*
*He studied but knew far more than they* 
*He talked to the learned men of the school--*  
*So wise he was they thought him a fool,  
A fool with the dark, dark, dreamful eyes,  
A child he was - grown wonder wise.*

*Youth and dreams are over past*
*And out, far out he is sailing fast* 
*Toward the seas he dreamed; --strange lands arise--*  
*The world is made rich by his great emprise--*  
*And the wisest know he was more than wise.*

"COLUMBUS"
Annette Wynne

No book the scope of this one can hope to adequately cover so vast a subject as cruising; outside reading is necessary in order to acquire enough knowledge to see you safely through your learning period (which, as you will discover, is your entire lifetime.) There are no books which perfectly fill our needs but here are some well-known examples.

John Rousmaniere's *The Annapolis Book of Seamanship, 3rd edition,* published by Simon & Schuster, is the book by which other sailing references are measured. Rousmaniere (pronounced “room-an-ear”) has over 30K miles of sailing experience, is a former editor of *Yachting* magazine, and has been repeatedly rewarded for his contributions to making the sport of sailing safer.
Chapman Piloting & Seamanship, formerly published as Piloting, Seamanship and Small Boat Handling when authored by Charles F. Chapman himself, remains an excellent reference. It is published by the Hearst Corporation and is currently authored by Charles B. Husick. It is available at marine-oriented retail outlets and most large bookstores. Always obtain the latest edition (there have been many) which is currently the 66th. Although Chapman concentrates on power boats, and evokes a New York Yacht Club atmosphere, his excellent and extensive chapters on rules of the road, lights, seamanship, piloting and weather are pertinent to cruising under sail.

Eric Hiscock’s Cruising under Sail, by Oxford University Press, is a classic how-to book, directed more towards the sailboat owner than the occasional boat user and suffers slightly from being written by an Englishman for Englishmen. That said, the book is well written by a man who has circumnavigated the earth twice, and is an excellent complement to Chapman. The last edition was published in 1991, five years after Hiscock’s death. It can be obtained in used bookstores and there are several copies at the Seattle Public Library (Main Library).

How to Read a Nautical Chart, by Nigel Calder, explains every aspect of electronic and paper nautical charts with the addition of having NOAA Chart No 1 included and annotated. In 2000 the U.S. Government ceased publication of Chart No. 1 but it is still available online. Calder’s book not only includes Chart No 1 but also explains how charts are created and the limitations of using either electronic or papers charts.

There are many other books available, some of them quite good, but none serve the purpose of covering a broad range of subjects with such expertise and clarity as these. Some references to these and other books in the Seattle Public Library catalog are included below.

**CHECKOUT PROCEDURES**

Fill out the calendar on the sail locker computer, put your money in an envelope then put it in the box in the keelboat locker. A Keelboat checkout form must be filled out and placed on the appropriate clip, along with membership cards, in the sail locker. If the boat is being picked up elsewhere than the WAC, the person surrendering the boat to you is responsible for placing the proper checkout forms, inventory list (discussed later), and membership cards in the appropriate location. Additionally, all guests must sign the waiver on the form regardless of their embarkation point. When you make your reservation it is wise to check the boat over before you take it out. Make sure all the systems are functioning properly and there is nothing that requires attention. Remember all keelboat sailors are responsible for the use and maintenance of the boats. If you find something out of order and you can fix it please do, otherwise contact the Keelboat Fleet Captain as soon as possible. If you have any doubts as to the seaworthiness or safety of the vessel, do not take it out, and contact the Keelboat Fleet Captain immediately. Note: If you plan on reserving a boat during a Husky Football game weekend you must depart the docks no later than 7:00pm on the Friday before the game and not return to the docks for at least an hour after the game has ended. No departures or arrivals are allowed from the WYC during Husky football game days. Contact the boat moving crew (usually the affiliate boat owners) if you have any questions.

**RIGGING**

*They went to sea in a sieve, they did;*  
*In a sieve they went to sea:*  
*In spite of all their friends could say,*
On a winter’s morn, on a stormy day
In a sieve they went to sea.
Edward Lear

The keelboats are rigged much the same as the dinghies, but minor differences between the boats must be kept in mind. Before raising the sails, all shrouds should be checked to see that there are cotter pins securing the turnbuckles and that the spreaders are attached to both the shrouds and the mast.

**Mainsails**
The boat should be pointed head to wind, otherwise the main fills when partially raised, making it difficult to completely raise it. To maintain steerage, often the motor is used at a low speed. The sail is already footed on the boom and is covered by a boom cover. First, remove the boom cover and attach the halyard to the headboard. Then make sure the vang, downhaul, and sheets are slack and cast off the sail ties which secures the furled sail to the boom. Check the topping lift (line running from end of boom through a masthead block and down to a cleat on the side of the mast) to ensure that the boom-end is angled up slightly. Hoist the main, if necessary feeding the slides into the track, but bear in mind that the headboard must be low enough to clear the backstay at the top of the mast when tacking. Cleat the halyard and ease the topping lift. Lastly, adjust the downhaul,outhaul, and boom vang for proper sail trim.

**Jibs**
Each boat has three jibs of different sizes. The proper jib to use will be discussed under heavy weather sailing. The jib tack is secured to a snap shackle at the bow, the luff is snapped onto the forestay, or fed into a prefeeder and luff foil depending on the boat, and the halyard is shackled to the head. Tie a figure of eight knot on the end of all jib sheets after running them through the jib cars / lead blocks. The jib is then raised and the proper luff tension is obtained by using the winch on the mast.

Note: The optimal position for the lead block on the track varies with the jib. Ideally, one adjusts the lead block fore or aft until the entire leading edge of the jib luffs at the same moment, when the bow is turned into the wind.

**Winches**
Winches provide mechanical advantage to allow tightening of lines. Our boats have three styles of winches: single speed, dual speed and self-tailing. Our boats also have winch handles, most of which do not float. Many spare winch handles can be found at the bottom of the lake if you have the proper equipment to retrieve them.

Lines must be wrapped around the winch from bottom to top, in a clockwise fashion. It is vital that you do not at any time allow the line to overlap itself. An overwrapped line with a heavy load will be nigh impossible to unwind. Many a finger has been lost to a badly wound line on a winch.

Insert the winch handle in the top of the winch to provide lever with which to wind the winch. On single speed winches, you can only rotate the handle clockwise. On double speed winches, you can additionally rotate the drum at half speed by rotating the handle counterclockwise.

The winch will not grip the turned line unless the end coming out of the winch—the bitter end—is under some tension. On a standard winch you must tail the line, that is, provide some tension, as you crank the winch. On a self-tailing winch you can insert the bitter end into the clip at the top of the
winch to provide tension. Two turns around the winch is normally a minimum wrapping. It's unusual to need more than three or four wraps unless you are grinding a very heavy load. Too many wraps can lead to overwrapped lines so use only what is necessary.

**Spinnakers**
The club has a spinnaker for each of the keelboats. Consult one of the keelboat-rated chiefs for the proper use of spinnaker and pole. The poles are on board.

**CRUISING EQUIPMENT**

**Care and feeding of marine stoves**
First, only use alcohol for stove fuel. Do not ever take gasoline, Coleman fuel, propane, or white gas below deck. Kerosene may be taken below on vessels equipped with kerosene heaters. Flammable fuel such as gasoline tanks for outboards and propane tanks, must be stored on deck where if spilt, the fuel will not enter or pool in lockers, cabin or bilge areas of the boat.

The Ranger and Catalinas are equipped with non-pressurized Origo alcohol stoves. To use an Origo stove, first lift the top and remove the fuel canister. Take it out of the cabin onto the deck or cockpit (it is preferable to fill the canisters while onshore if possible). Tip it up 30 degrees and add fuel to the canister until full while tipped. Clean any fuel spills and wash down area with water. Put canister back into stove and close top. Make sure the neoprene cover that is for keeping the fuel from evaporating when not in use is removed. Slide the fuel control lever fully open and light the stove using a grill or candle lighter. Do not let the flame touch the top of the fuel canister for more than a second or two because it will burn the top of the wadding in the canister. If it does not light the first time try again it will light eventually. When done close the fuel control lever, let the stove cool completely, and then put the neoprene cover back on by lifting the top and placing it directly on the canister.

Caution: Stove canisters should not be refilled while hot, and should not be overfilled by not having them tipped high enough. If an alcohol fire occurs a generous dose of water from a pre-filled container will extinguish all flames. If the stove has been doused with salt water it must be rinsed with fresh water and dried to prevent corrosion. Alcohol, though safer than gasoline, is still quite flammable and should always be handled with care. Should the fire be more general and growing, use the dry chemical fire extinguisher. Instructions are on the extinguisher and when in use, the chemical should be aimed at the base (source of flames). After use, please clean up the mess around and on the stove.
Denatured Alcohol can be bought at any marina, at Recreational Equipment, Inc., and at many hardware stores. Note that a range of denatured alcohols are available. They are generally composed of ethanol, methanol, methyl ethyl ketone, acetone and water in differing percentages. Some fuels will leave a black residue on the bottom of pots when burning. Please choose a “clean burning” fuel for the benefit of your pots as well as others who use the stoves. Most “green” fuels are clean-burning but you can test a fuel by pouring a small sample into an oven-proof dish and lighting it. If any residue is left behind the fuel should not be used in our stoves.

The Cal 3-30 is equipped with a pressurized alcohol stove as well as a heater. Consult one of the keelboat-rated chiefs for the proper use of the stove and heater.

**Marine heads**

Instructions for the operation of the head, or toilet are printed on the bulkhead next to it, and in a briefer form, on the head itself. It is a good idea to acquaint yourself with the head and make sure your guests are familiar with those instructions well before the need arises. It is extremely important, on such a small boat, that the head be cleaned regularly. After all, someone may sleep within two feet of it. The most important instruction concerning the use of marine heads is to put only what one has eaten and toilet paper through. Matches, paper towels, and virtually everything else will jam it.

Most heads have a pump handle that either fills the bowl with sea water (“wet bowl”) or empties the bowl into the holding tank (“dry bowl”). The wet bowl setting not only pumps water into bowl, it also pumps water out. There is a switch on the pump handle for wet bowl/dry bowl. The dry bowl setting empties into a holding tank that should be pumped out before returning the boat to the WYC docks. The switch should be left in the dry bowl setting to keep the bowl from filling with water while sailing.

There is a seacock on the fill line that allows the line to draw in sea water. This seacock should be closed in heavy weather or when the boat is likely to heel in addition to the switch normally being left in the dry position. There is additionally a Y-valve on the discharge line that allows waste to be discharged to the holding tank or directly to the sea. This Y-valve should always be locked (i.e., with a zip tie) in the “holding tank” position when in U.S. waters. Although pumping out in some parts of Canadian waters is permitted, it is good practice to find marinas with pumpout facilities when you can. A map of pumpout facilities in the area is currently located at [http://goo.gl/maps/7pFFF](http://goo.gl/maps/7pFFF).

It is the expectation of the club that the holding tanks be emptied and the head cleaned before returning the boat to the WAC.

**Lights**

Coast Guard Rules require all boats to show proper running or anchor lights anytime between sunset and sunrise, or in other times of reduced visibility. When under sail alone, 10-point (112.5°) lights (there are 32 points to a full circle, thus a point is 11¼ degrees), a red one to port and a green one to starboard, must be shown directly ahead to slightly abaft the beam. In addition, a 12-point (135°) white light must show astern. When under power, or sail and power, an additional 20-point (225°) white light, mounted on the mast, must be shown. A 32-point (360°, or all-around) white light must be displayed aloft (say 6° or greater) when at anchor (running lights are not displayed at anchor).

Running and cabin lights are powered by a 12-volt battery which is kept in a dinette locker. With the exception of the Cal 3-30, the battery must be charged ashore, either using the club's charger, or
another. It is the responsibility of each skipper to make sure the battery is charged before the boat leaves the dock. Make certain to plug batteries in correctly to the chargers in the sail locker.

Lights are controlled from a master panel located in the cabin, cabin lights have individual switches at the lamp as well. Each incandescent bulb draws about one amp, so that with all lights ablaze, and a fully charged 80 amp/hour battery, the battery would expire after about 9 hours of use. A good solution to the problem of conserving battery power on a cruise of more than a few days is to use only navigation lights (running lights) while sailing or motoring switching on cabin lights for reading charts and for other temporary lighting. Of course, this necessitates at least two additional lights, an anchor light and a cabin light.

In any case, extra flashlights should be carried since they come in handy when a light is needed to shine on the sail to inform a blind power boater of your presence or while working at night on deck. A further discussion of navigation and anchor lights will be found in the next section (VII).

**Outboard Motors**

Personal feelings about engines aside, use of them will probably be necessary, so a few tidbits of information are hereby proffered in the hope that your encounter with this "convenience" will not be traumatic.

**Oil level and light:** Check the oil level before starting the engine and the oil light after the engine has started. It is very easy to overfill an outboard engine—the quantity of oil in an outboard is far less than any automobile. Do not tilt the engine when measuring the oil level and do not “top up” the engine if the quantity of oil is in the acceptable range. Take care when measuring the oil level to hold a cloth under the dipstick when removing it from the engine so as to not drop oil in the water. Remember when adding oil, add only a few ounces at a time and wait a short while for the oil to reach the sump. Recheck and add more until the level is within the range marks on the dip stick. As long as you are within the oil range of the dip stick you should be fine. Please contact the Keelboat Fleet Captain if you have any questions or doubts as to how to check the oil level. Each engine has a light indicating proper oil pressure.

**Starting:** Check the fuel line connections at both the tank and engine ends, squeeze the gas line pump (which must be on the end closer to the tank) until firm, pull the choke open, make sure engine is in neutral and the throttle is in approximately the proper position for starting. Then pull the starter cord firmly, but not to its full extent. A vigorous pullout to the end of the cord's travel quickly wears out the line and a broken starting cord results. If the cord breaks or is already broken, you may: (a) install a new cord in the automatic rewind apparatus or, (b) remove the cover, remove the pull starter assembly, wrap a piece of light line around the fly wheel once or twice and pull vigorously. In either case the engine should start easily. Close the choke very soon after starting or the engine will quit (a warm engine needs little or no open choke). Remember to keep your hands, clothing and any other dangly bits away from moving parts.

**Shifting:** Only shift engine when in idle. When shifting, reduce speed to idle then shift from neutral to forward or reverses. Always return to neutral before shifting into gear while engine is at idle speed.

**Outboards and heavy weather:** Outboards are nearly useless in heavy seas as the water pump and the propeller will be out of the water half of the time. This causes overheating, over-revving of the engine, strain to engine parts and is rather inefficient to boot. If the propeller is being lifted out of the water by
waves you cannot use the outboard and risk disabling it altogether. If there are following seas the outboard may be easily swamped by a wave and may cause it to stall due to lack of combustion air.

**Winter storage and use:** When the engine is idle it should be left immersed in the water (normal operating position) in order to minimize the possibility of freezing in the water pump (the results of which are obvious). If the boat is not going to be used for an extended period, it is a good idea to run the fuel out of the engine before leaving the vessel. This is done by disconnecting the fuel line, like you would normally do when disconnect the tank, and allowing the engine to run at idle until it stops.

**Repairs and frequent maintenance:** Fortunately, there is very little maintenance required on the newer outboards the club has acquired. The newer outboards do not have shear pins but do have rubber splined hubs and keelboat sailor should be aware of the differences.

The club still has spare outboards that use shear pins. The older Honda outboards that are blue or silver with a boxy type cowling typically have shear pins. There shear pin, as its name implies is there to prevent the transmission and propeller from being damaged when the propeller strikes a submerged object. It is sacrificial and is designed to break (shear) when an object is struck. The most common symptom of this failure of the shear pin is that when the engine is in forward or reverse, the propeller does not turn. At this point the shear pin must be replaced.

To do so, first make sure the engine is not running. Raise the engine out of the water and get comfortable because it can be a reach to get to the prop from the transom. There will be a cone-like nut that is held on by a cotter pin. You will need to remove the cotter pin with pliers and when removed unscrew the cone nut and put it in a safe place. You should now be able to slide the propeller off the shaft. You may find bits and pieces of broken shear pin still lodged in the hole on the prop shaft. All debris should be removed before installing the new shear pin. With the engine in neutral, rotate the shaft until the hole for the shear pin is parallel with the water. This will help the shear pin stay in the shaft before you reinstall the prop. A little bit of grease also helps to hold the pin in place. Slide the pin into the hole on the shaft making sure that it is protruding an equal distance on either side. Next, slide on the propeller making sure that it is seated on the shear pin. Screw the cone nut back on by hand and tighten slightly. Then back off the nut just a tad and install the cotter pin in the nearest hole. Make sure you bend the cotter pin ends so that it doesn’t catch debris. Done.
The newer motors all have props with rubber bushings. The easiest way to tell it’s a newer prop is the absence of the cone nut. Newer props have a large nut instead and holes through the hub to let exhaust gasses out. Basically there is a rubber impact absorber between the propeller and the drive shaft. When the prop hits an underwater obstacle, the rubber bushing will give and allow the shaft to keep spinning while the prop is obstructed. The symptom of having a “spun prop” (technical term) is that the regardless of engine speed the boat only goes slowly. This is better than having no propulsion alone but it does give you enough power to get out of trouble. Unfortunately, the only repair for this is to replace the prop and the boats do not carry spare props.

Refer to the section on “Engines”, below.

**Stopping the engine:** Turn throttle to minimum setting. Press the stop button. (If it doesn't work, pull the choke.) If you are leaving the boat (i.e., docking at the WYC at the end of your reservation period), disconnect the fuel line from the portable tank and allow the engine to run until it has combusted all of the fuel in its lines as indicated in the winter storage section.

**Removal:** If the engine is removed from the transom, always keep the top of the engine higher than the propeller. Tie a safety line to the motor before removal, so that if the motor is accidently dropped, it doesn’t sink to the bottom. The engine must be carried with this in mind as well. Look for the feet cast into the side of the engine, that side goes down. If you set it down the wrong way oil from the crankcase will spill out. In the storage area, leave the engine on the dolly. These precautions are necessary to prevent the cooling water in the lower unit from trickling down to the exhaust valves in the "upper unit" and entering the cylinders (which can ruin the block). This may have already happened once with an old WYC outboard resulting in an expensive repair bill.

**Locks and Fuel Hoses:** Most outboard will have an outboard motor lock attached. The key to the lock is kept inside the tool box. The fuel line hose is left attached to the motor. Fuel tanks are connected to the hoses using Honda quick connects. Keelboat fuel tanks should connect all the fuel lines that use outboards.

**Tilt-up mechanisms and engine locking:** There is a lock and lock-release lever on the forward side of the engine whose operation is self-explanatory. All engines must be locked down when in use.
Troubleshooting: If the outboard fails to start all most always it is because one of the following

- Fuel is not getting to the engine. Double check that the hose connections between the engine and the tank are firmly seated. The bulb on the hose should be firm and ovoid (not collapsed). If not then squeeze it several times. Check that fuel tank vent is open.
- The engine's transmission is not in neutral. Cycle the transmission from forward to neutral to reverse several times, ending in neutral before trying to restart.
- The choke is not correctly set. If the engine is cold, pull the choke out just until the engine catches and runs a few seconds, then slowly close it. If the engine is warm, then close the choke.
- A rough or “missing” engine or an engine with a lack of power may indicate a gummed-up or improperly gapped spark plug.
- In a very few cases it may help to have a more robust pull to the cord, but this is usually not the case.

Through hulls, Seacocks and Bilges
Through-hulls, as the name implies, are fittings that pass thru the hull above & below the waterline. They allow sea water into and out of the boat and also allow for waste water to exit from the boat. Seacocks are attached to thru-hull fittings that are below the waterline and to thru-hull fittings that may be below the waterline when the boat is heeled or swamped. Seacocks should always be closed when the boat is left unattended for a period of time or when you return to dock. There are a number of seacocks on each of the boats and you will need to get familiar with where they are and their purpose. The main ones you will need to know are the head intake, sink drain, and cockpit drain. There are a number of different types of seacocks installed on club boats and you will need to know how to operate them. Ball valve seacocks have a handle that is perpendicular when closed and inline when open. Gate valve seacocks have a round handle that rotates clockwise to close and counterclockwise to open. The cockpit seacock should be left open for it lets water in the cockpit drain out when it rains or get swamped by a wave.

Most of the boats have a bilge which is the lowest point on the boat. The bilges on our boats is under the floor board just above the keel. It usually fills with water, and now and then, need to be pumped out. There is usually a way to remove the bilge water from the bilge either using and electric bilge pump or a manual diaphragm type pump. The electric bilge pump can be used to pump out the water but make sure that you monitor it and turn it off as soon as it is done. The manual bilge pump can also be used and the handle for the pump is located on the boat. When the bilge pumps are working you will notice water exiting the boat through a thru-hull on the back of the boat.

LIGHTING REQUIREMENTS, SOUND SIGNALS, AND RIGHT OF WAY RULES

Old joke:
Lost concert-goers to passerby with violin case: Hey, mister! How do you get to Carnegie Hall?
Violinist: Practice, man, practice!

Older Joke:
In the early eighteenth century, a penniless Irish gentleman went up to London in the hope of marrying money. Speaking to a wealthy heiress at a concert, he remarked that fiddlers were
fortunate in that, not only could they please others with their music, but that they could raise their own spirits, in times of trouble, by playing their violin in private. The young lady answered "Oh, well said, sir!... And tell me, can YOU play the violin?" To which he famously replied "I don't know, I've never tried."

All sailors should be familiar with the requirements specified in the US Coast Guard Rules for Navigation (72 COLREGS). The rules are available in marine-oriented retail stores and are currently obtainable online from http://navcen.uscg.gov/pdf/navRules/navrules.pdf.

Our keelboats have the following navigation light arrangements: 10-point (112.5°) red and green sidelights in a single fixture mounted on the bow pulpit, plus a 12-point (135°) white stern light on the aft pulpit, and a 20-point (225°) white mast light facing forward mounted up on the mast. Most sailboats you will encounter have lighting arrangements like ours. You may see an occasional sailboat, under sail alone, displaying a red over green mast light in addition to the normal lights as described in the Cruising Equipment chapter. These are optional lights. Another option under sail alone is a tricolor light at the top of the mast that has the same sectors and colors as the regular navigation lights. If this light is lit the regular navigation lights must be off.

In addition to knowing sailboat lighting requirements it is essential to know light requirements of the average pleasure motor boat and certain commercial vessels. In essence, powerboats have the same lighting requirements as sailboats under power or under sail and power with these important variations: 1) small powerboats, usually open ones, will generally combine the 12-point white stern and the 20-point white forward light into a single 32-point (360°) white stern light elevated above the level of the red and green lights (usually in combination on the bow). 2) Vessels > 50 meters long must have a masthead light forward and a second abaft of and higher than the forward one. The second masthead light is optional on smaller power vessels.

Three types of commercial vessels which have special light arrangements that everyone should be able to recognize are double ended ferries, tug boats, with and without tow, and fishing boats. Remember that the red and/or green lights are visible only if a vessel is approaching or crossing you. Tugs use a series of lights to indicate the length of their tow. The cable between a tug and a tow is often just below the water line, in range of a keel. Never pass astern of a vessel displaying three or two vertical white lights as the mistake might likely be fatal. Fishing boats engaged in fishing are a particular hazard as their nets, trawls or seines may lie at some distance from the boat. In addition these vessels and their gear have right-of-way over sailboats (and powerboats).

You should understand and memorize the COLREGS regarding light requirements for commercial vessels before venturing into the Sound. Ferries and large shipping vessels are quite common, as are fishing vessels and even the occasional submarine. Possibly the most deceptively dangerous are tow boats which can catch your keel if you cross between the tow boat and the boat it is towing. Memorize and understand Part C (rules 20 through 31) such that you can read and interpret any lights you may encounter in the Sound.

Endeavor to remember these lights; the legal consequences can be severe. As you can see the entire subject of navigation lights is complex and a review of Rousmaniere and/or Chapman's chapters on light requirements for all vessels is highly recommended.

**Fog Signals**

Fog is defined for legal purposes as any significant reduction in visibility due to any of the manifestations of high humidity be it heavy rain, mist, snow or sea-level clouds ("fog"). Since visibility
is restricted it is important to use ones navigation lights and maintain a careful visual watch, but in addition, it is necessary to sound the proper signals and be able to recognize and interpret the signals of other vessels. If underway all signals are made on a horn, siren, or whistle and are either "prolonged blasts" (4-6 seconds) or "blasts" (1-2 seconds) depending on the type of vessel and its activity.

**RULE 35: SOUND SIGNALS IN RESTRICTED VISIBILITY**

a. A power-driven vessel making way through the water shall sound at intervals of not more than 2 minutes one prolonged blast.

b. A power-driven vessel underway but stopped and making no way through the water shall sound at intervals of not more than 2 minutes two prolonged blasts in succession with an interval of about 2 seconds between them.

c. A vessel not under command; a vessel restricted in her ability to maneuver, whether underway or at anchor; a sailing vessel; a vessel engaged in fishing, whether underway or at anchor; and a vessel engaged in towing or pushing another vessel shall, instead of the signals prescribed in paragraphs (a) or (b) of this Rule, sound at intervals of not more than 2 minutes, three blasts in succession; namely, one prolonged followed by two short blasts.

If vessels are approaching one another, the proper signals may be sounded more frequently if needed.

All vessels at anchor (except in special anchorages such as marinas) in fog must sound the following signal on a bell (or similar instrument like a dish pan or a wrench striking an aluminum mast) - rapid ringing of a bell for 5 seconds at one minute intervals.

**Right of Way Rules and Proper Sound Signals**

It is assumed that the reader of this material is aware of our right of way rules involving converging situations between sailboats, and between sailboats and powerboats. This assumed, sailing vessels under sail alone should never sound passing signals to powerboats (or sailboats) nor respond to such a signal with a sound signal. The warning or danger signal of 4 or more blasts (one second each) is, of course, permissible for sailboats. A sailing vessel under power or under sail and power is, however, a power vessel and must obey the powerboat rules which follow.

First, the area from dead ahead to 2 points (22.5°) abaft the starboard beam (see diagram) is to be considered a danger zone and any other vessel approaching in that zone has right of way. This zone encompassed by the angle of 10 points (112.5°) is the area one must watch carefully while motoring. Second, when overtaking any vessel one must stay clear of the overtaken vessel through a 12-point (135°) sector as shown in the diagram.

**32 points of relative bearing**

A vessel can be described in four quarters of its enscribing circle: the port and starboard × bow and stern quarters. Each of these quarters divides into eight points of 11.25° yielding the traditional system of 32 points of relative bearing.

When proceeding dead ahead, the 10 points abaft the starboard beam are considered the danger zone. Any vessel approaching in this area has the right of way. This is the red area indicated on the diagram to the left below.
When overtaking one must stay clear of overtaken vessels in a 12 point sector ranging from two points abaft of port beam to two points abaft of the starboard beam. This is the red and blue areas indicated on the diagram to the right below.

Passing signals are rarely used, in our observation, but are legally required and their proper use is to be encouraged. They may be initiated by either the privileged vessel (that with right of way) or the burdened vessel (that without right of way) though generally the privileged vessel should signal first. Note that the proper use, the failure to use or reply, or the incorrect use of passing signals does not absolve either party of responsibility for a collision. Passing signals are largely informational except for one situation to be covered shortly and are used primarily to reduce confusion as to the maneuvers about to be taken.

Please read Rousmaniere and/or Chapman carefully in order to gain an understanding as to the meaning of the basic passing signals. The two basic signals are a single blast meaning (for the initiator of the signal) "I plan to pass you on my port side", and two blasts meaning "I plan to pass you on my starboard side". The replies (a single blast for a single blast or a double blast for a double blast) should generally be interpreted to mean "I understand your signal" and not "I agree with your signal" except in that special case yet to be discussed. Cross signals (a single blast in reply to a double or vice versa) must never be used; instead sound the danger or warning signal of five or more rapid blasts to indicate confusion over or disagreement with the initial signal. Passing signals should only be used when a danger of collision exists.

The special case referred to above is when two vessels are meeting head on. Only one response is legally acceptable. One vessel (either) should initiate a single blast and the other must reply in kind. A failure to respond especially with the proper turn will cause responsibility for a collision to fall on the improperly responding skipper.

**MANEUVERING NEAR DOCKS**
**Getting underway**

Getting away from the dock requires more effort and care in a keelboat than in a dinghy. If the wind is adverse for sailing away from the dock (blowing towards the dock, for example), the iron spinnaker, or motor should be used. Because the small motor has relatively little turning effect, use the vessel's rudder for steering.

If, on the other hand the wind is parallel to or blowing away from the dock, the boat may be sailed away though it may be necessary to first turn the boat at the dock to point the bow upwind, thus, allowing the mainsail to be raised. Sailing away under jib alone is generally not advisable because the ability to sail upwind is markedly reduced. Having raised the sails the boat can be pushed alongside the dock to gain steerageway or in order to place it in a more favorable position, the jib can be backwinded to turn the bow away from the dock without moving forward, or the bow may be pushed sideways. In all these maneuvers, including departure using the motor, special care should be taken to fend the stern off the dock.

**Docking**

When approaching a dock, remember that a keelboat, being much heavier than our other boats, carries way (coasts) much farther. To compound the problem, the reverse thrust of our outboard motors is rather small. Rig mooring lines and hang fenders on the appropriate side and at the correct height for the dock, well in advance and do not hesitate to add more if the dock appears inclined to take a bite out of the boat. If the boat is to be tied for only a short time, a bow line and stern line are generally adequate to secure it, but if it is to be moored longer, if left unattended, or if there are wind and wave conditions that are moving the boat, spring lines in addition to the others should be used to keep the boat parallel to the dock and prevent chafing due to fore and aft movement.

**Caution:** Mooring at a fixed dock (one which cannot rise or fall vertically) or to pilings in tidal waters is to be avoided because the rise or drop in water level will result in either excessive chafe as lines slacken or extracted cleats as lines tighten. If you must moor at a fixed dock make certain that your lines can rise and fall as much as the tide will change.

**Caution:** When motoring in reverse in either keelboat, the tiller must be securely held on center or the rudder blade will spin around and tear the tiller from your grasp. The Ranger’s rudder will turn completely around and the tiller may be flipped upside-down to steer comfortably when motoring in reverse.

**BRIDGES AND THE BALLARD LOCKS**

In order to enter Puget Sound from Lake Washington it is necessary to pass through a series of bridges and the Hiram M. Chittenden (Ballard) Locks, a venture which generally takes about one-half hour from the time one approaches the lock area until exiting the locks.

**Bridges**

There is a series of drawbridges along the Lake Washington Ship Canal between the WYC docks and the Ballard Locks, another between the Ballard Locks and the Puget Sound. Smaller boats can pass safely under all the bridges east of the Locks while the bridge is closed except for the Fremont Bridge. The Cal 3-30 has a taller mast and thus cannot pass through any of the bridges in the Ship Canal without the bridges being opened.

From East to West, the clearance for the center of each bridge at mean regulated lake level is:
Montlake Bridge, clearance 46 ft / 14 m
University Bridge, clearance 42.5 ft / 13 m
Fremont Bridge, clearance 30 ft / 9 m
Ballard Bridge, clearance 44 ft / 13.4 m

The Salmon Bay Bridge (BNSF “Bridge No. 4” commonly known as the “Railroad Bridge”) is outside of the locks and therefore subject to tides. It has 43 ft clearance at high tide (mean high water at 10.5 ft.) You should refer to the local notices to mariners (see “Online References” below) for status on the Salmon Bay bridge as well as the status of bridges in Lake Washington.

**Ballard Locks**
The Ballard Locks are two sets of locks in parallel, a small one having a capacity of but a few boats and a much larger one. The small locks are almost always use except during peak hours. A guide to the locks and their operation is distributed free at the locks.

The two locks differ in more than just size. The walls of the small locks are metal floats which rise and fall with the water level while those in the large locks are concrete and fixed. The bollards (large round cleats) to which boats are secured during locking are located on the floating walls in the small locks which permit short securing lines to be use. The large locks have fixed bollards at the top of the walls which require long lines. The second important difference is the strength of currents which are particularly strong in the large locks when the upper (eastern) gates are opened to the lake, bow lines should be well secured as these gates are opened.

The speed limit near the locks is 4 knots and within the locks, 2 knots or less. There is also a system of red and green lights which indicate clearance to enter but not necessarily for all vessels. Pleasure boats have a very low priority and must allow commercial, fishing and government vessels first access. Thus a green signal does not automatically mean that you are allowed to enter the locks and you must watch for additional signals from lock attendants.

Prior to entering the locks two fenders should be rigged on each side of the boat, placed fairly high on the sides in the widest part of the gull. Two 50 foot lines should be prepared with a large loop (2 or more feet) in the end of each and placed at bow and stern with one person to tend each. The actual process of entering requires careful attention to lock attendants who will signal the side which one is to secure and how far to go. Proceed slowly but maintain steerageway (it is most embarrassing to end up sideways in the locks) and stay near the designated wall or, in the center, if the attendant has directed you to raft with another boat already secured to the wall.

Tying up involves securing the stern first, to stop the vessel, then the bow. In the small locks one should secure one end of the line to a cleat aft (doing the same with a line forward) and pass a bight (an open loop) around a bollard on the floating wall and take a wrap (not a hitch or cleat knot) with the unattached end around the cleat aft. In the large locks the attendant will either:

1. Take your long stern line, loop first, as you pass along the wall, if you are coming from the lake, or
2. Heave a light line to the person in the stern if returning from Puget Sound. This light line should be loosely tied to the loop of your long line so that it may be hauled up to a bollard on the wall. As soon as the loop has been placed on a bollard, a wrap should be taken on the stern cleat and the vessel then braked to a halt. The bow is then secured in the same fashion as the stern.
While the water is changing, heel the boat away from the wall to avoid damaging the spreader and shrouds, and the persons stationed at the bow and stern lines should not permit the lines to become too slack or excessively tight. The floating walls of the small locks occasionally jam and this is why the lines are only wrapped and never made fast (secured) around a cleat.

Exiting the locks entails reversing the procedures given above. Always wait until the lock attendant tells you to leave. In the large lock he will cast off your lines together, in the small locks you cast them off, generally the "lake side last." Push the boat (not just the bow or stern) away from the wall and apply a moderate amount of power to quickly obtain steerage way; more power when entering the lake than when entering the Sound.

Clearly, as implied in the above description, it would benefit anyone who has never locked through to at least visit the Ballard Locks and watch the procedure. It is exciting and frequently comical entertainment as well.

HEAVY WATHER SAILING

No matter how cautious a sailor you might be, eventually heavy weather will be encountered. If a person is properly prepared, such an event can be safe, exciting, and add but one more story to your stock of sailing yarns. If ill-prepared, such a voyage in heavy weather can be terrifying and dangerous, and may end tragically. The first rule of cruising is not to go out in weather for which you are not qualified. A storm may come up while you are away from anchorage or similar safe haven, however, so it is best to be prepared to handle any weather conditions that may develop. If a club boat cannot leave the dock, or make it back on time because of foul weather, reservation fees are not charged for the extra period. Rain is not considered foul weather.

Sail Changes:

As wind force increases, resulting in excessive heel and/or severe reduction in control, it becomes necessary to reduce sail; the first change is to reef the main (unless large genoas are being used, in which case a smaller jib should be substituted to protect the larger sail from excessive stress). Our mainsails are equipped with what is sometimes called California reefing, the equipment for which is diagrammed on the next page.

To reef the mainsail:

0. Make certain to wear a life vest when reefing the main and, if appropriate, secure yourself with a harness. Reefing often requires both hands leaving little protection for the crew.
1. Point the boat close to the wind to ease the sideways pressure on the sail cloth.
2. Secure or lift the boom with the topping lift
3. Ease the sheet, vang and downhaul
4. Slacken the halyard until a black band on the rope tail of the halyard is even with the main halyard cleat, or until the luff reefing-cringle can be pulled down to the boom. Depending on the vessel, the halyard may not be properly marked.
5. Temporarily cleat or hold fast the main halyard.
6. Tighten the luff reefing line and cleat it, then pull tight the leach reefing line so that the clew reefing-cringle is snug against the boom, and cleat it. Important: the luff-cringle must be brought down to the boom before the leech to prevent horizontal strains on the sail which will destroy the luff.
7. Adjust the halyard as necessary.
8. Sheet the mainsail properly, ease the topping lift eased, and reset the vang.
The mainsail is effectively reefed at this point but to neaten the appearance one can optionally furl the part of the mainsail now hanging below the boom and secures this rolled up section with the shock cord attached to the reef point in the body of the sail. Lead the shock cord around the rolled sail and boom and tie with a square knot (actually, even "half" a square knot will work because of the elasticity of shock cord). It’s better to not use reefing points when they are fitted with a line that does not stretch as an improperly tied line is liable to rip the sail cloth.

Note that Nightshade has a Cunningham-style downhaul rather than a reefing hook and does not have reefing points on her mainsail.

"Shaking out" a reef (restoring the sail to full size) is done in the reverse order, exactly, remembering these key points:
1. Free the furled section of the sail first (failure to do so will probably result in a torn mainsail).
2. Top up the boom with the topping lift before easing the halyard or either reefing line.
3. Ease the leach reefing line before the luff reefing line.

Changing headsails in heavy weather is far more difficult than might be imagined because of the violent motion of the bow. The method described below is not the fastest by any means but is relatively safe and reliable.

0. Make certain to wear a life vest when reefing the main and, if appropriate, secure yourself with a harness. The foredeck is dangerous and offers little protection to the crew.
1. Bring the new jib on deck and carry it forward to the bow. The lower half of the jib's piston hanks are then hanked on (attached) between two of the lower hanks of the present jib (one of the hanks may have to be removed from the forestay to obtain sufficient room for the new jib's hanks). At this point neither the head nor the tack is attached to halyard or tack shackle.
2. Lead the new jib sheets through the appropriate blocks and tie figure-of-eight knots in the ends.
3. Drop the old jib and unhank it all the way but do not remove the halyard. You will notice that in order to unshackle the jib head it is necessary to stand. In heavy weather conditions this is difficult and the risk of losing the halyard up the mast is high.
4. Scramble back to the mast carrying the heads of both jibs and switch halyards there; return to the bow, switch the tack shackle from the old jib to the new, snap on the remaining hanks, hoist the jib and sheet it in.

The above sequence may seem overly cautious but if it is really blowing hard and number of experienced crew is few, it is a procedure one can use with confidence without leaving the vessel bare headed (without a jib) for long.

Anyone working on the foredeck in rough seas should be wearing a life jacket. In addition a safety line should be fastened around the chest (preferable to around the waist) with a bowline and the other end similarly secured to the mast, a shroud, lifeline or the bow pulpit.

As for the wind velocity at which one should change headsails the determining factor is really the strength of the cloth and sail area rather than heeling. Large genoas are not meant to be used in strong wind and the cloth will be adversely affected if they are so used. The following arbitrary maximum wind speed limits for various jibs are suggested as a guide:
1. Large Genoa - 15 knots
2. Small Genoa - 20 knots
3. Working jib - 30 knots; go to a storm jib above 30 knots.

The sails can be used in stronger winds but this is hard on them and they become rather difficult to handle. **Caution:** If hit by a violent squall, waste no time dropping some or all sails.

**Broaches and Knockdowns:**
Downwind sailing in heavy weather is accompanied by the danger of accidental jibes and/or broaches. An accidental jibe, caused by sailing by the lee or catching a wave at an awkward angle on the quarter (port or starboard transom), can carry away essential rigging or break the boom. Or, the boat may suddenly refuse to respond to the rudder and round up into the wind in a broach.

The increased heeling caused by the rounding up will result in the boom dragging in the water, further loss of steering control and a possible knockdown. If a knockdown does occur, release all sheets (spinnaker sheet too, but not the guy) and hang on, eventually, and it may seem to take forever, the boat will right itself. The best way to prevent broaching is to reduce sail. Apparent wind velocity is always somewhat less than true wind velocity when broad reaching and running, and the true wind may increase appreciably without the skipper's realizing it. One way to judge wind speed is to periodically round up to a close reach, whereupon the true force of the wind can be felt. If the boat cannot handle the amount of sail carried while close reaching, it may not be able to safely handle it while broad reaching or running.

**Heaving to, Lying Ahull, Running under Bare Poles**
Heaving to is done when there is a need to ease the motion of the boat in order to rest the crew or make repairs, but cannot be done when near a lee shore. The jib (working jib, or storm jib only, never with a genoa) is sheeted tight and the boat tacked without easing the jib sheet. The main is sheeted in just enough to keep the boat headed slightly into the waves on a fairly straight course. The helm may then be left untended or lashed to leeward. While hove to, a boat makes very little headway and a moderate amount of leeway so it is not done near a lee shore.

Lying ahull is done in very strong winds and high seas and involves simply removing all sails and letting the boat lie as it will. This usually results in a boat lying with the wind approximately abeam and drifting to leeward at 1-2 knots. The motion is sometimes uncomfortable (because the vessel is lying abeam to the waves) but the boat is generally quite safe as long as the main companionway boards are installed and there are no really heavy breaking seas. Again, be careful of lee shores.

Running under bare poles before a storm is perhaps the safest for boat and crew in very high winds and involves removing all sail and steering directly before the seas. Leeway is considerable, however, (3-5 knots) and thus a great deal of sea room must be available to leeward. Towing a long bight of line astern (line is attached at both ends to each side of the transom) may markedly reduce speed and increase steering control. Note: Laying a sea anchor over the bow does not appear to work well on sailboats and subjects the rudder to large stresses as the boat backs down before the waves.

**Safety Precautions in Heavy Weather**
The forward hatch should always be closed and dogged down (secured) in any but the lightest weather; in heavy weather the main companionway and hatch should be closed to prevent taking in water in the event of a knockdown. Life vests are awkward to wear on deck until you fall overboard, whereupon all their awkwardness seems to vanish; besides those worn by the crew, a life vest or buoyant cushion should be kept available in the cockpit (in all weather) so that it may be thrown to anyone falling
overboard. The stove should not be used in heavy weather as the probability of an accidental fire is quite high because the pre-ignition alcohol can spill easily. Further there is an increased danger of burns to the person unfortunate enough to have to cook in those conditions.

Winches and accessories can become dangerous in heavy weather conditions and the following are a few thoughts gleaned from experience:

1. Take at least 3 turns around the winch drums (clockwise, of course). Fewer turns will slip and endanger your fingers when self-tailing (pulling the end of the sheet as you turn the winch) or cleating the sheet.
2. Keep your fingers away from the drum; they can get pulled into the drum very fast.
3. Avoid overrides (sheet not wrapped around the drum but over another turn of itself). These can really jam in heavy weather; this is the time when fingers end up in winches.
4. Do not stand in front of a turning block of a genoa or spinnaker sheet. If you are standing in the bight formed by the sheet as it leads from the sail to the turning block aft and on to the winch, the failure of the block will result in a sling shot effect with the block and you, as projectiles.
5. Winches rarely fail but keep your face away from the handle anyway.

NIGHT SAILING, DAMAGE CONTROL, CREW-OVERBOARD AND FIRE

"When in danger or in doubt
Run in circles, scream and shout."
-Traditional

When sailing at nighttime one should always wear a lifejacket while on deck as the difficulty of finding a man-overboard is rather greater than in the daytime. If the wind and seas are high a safety line, as described above, should be worn to maintain a significant relationship with the vessel. Striking large logs is another danger particularly acute in the debris infested waters of Puget Sound. Difficult to see during the day, water-soaked logs are invisible at night and can hole the boat. Night sailing in heavy weather in our area might be regarded as an unseaman-like practice in small, light vessels like ours.

Should the hull be breached by a log, rock or other object, the hole must be plugged immediately. Life vests or clothes can be stuffed into small holes and cracks, while a sail can be wrapped around the hull to plug leaks well below the waterline. Flooding through holes at or near the waterline can be stopped temporarily by sailing the boat on the tack which will lift the damaged section out of the water or in the absence of sufficient wind the boat may be heeled farther by hanging out on the shrouds on the side opposite the hole. As soon as the worst is over everyone should don life jackets. Each keelboat should have a wooden through-hull plug that can be used as temporary repair. One might consider intentionally grounding if the breach threatens to sink the boat (if not already done).

Because many problems seem to occur at night it is felt that this is a good time to discuss fire. As stated before, small alcohol fires can be extinguished with water. Larger alcohol fires or any fire involving kerosene or gasoline should be fought with the dry chemical fire extinguisher aiming at the base of the flames. Fiberglass is as flammable as wood and should a fuel fire ignite either of these two materials the fuel fire must be extinguished first and the less flammable material's fire second. Use water, and a great deal of it, to stop a fiberglass or wood fire. Cut into charred wood or glass to expose possible hot areas and cool them with water. Fires in clothing or sleeping bags must be very well extinguished with water as there is a high potential of residual hot areas reigniting.
The crew overboard procedure discussed in Daysailing needs to be elaborated for two reasons: the seas and boats involved are larger, and the freeboard of our keelboats is considerably greater than that of our dinghies. First, because keelboats are heavy and the waves are larger it is essential to aim the final approach to a person in the water so that the vessel stops to windward of the victim (you should make the general approach from slightly downwind in order to retain control of speed and course). The principal reason is that large waves will then not pound the victim against the rather unyielding hull. The second difference lies with the increased difficulty of lifting the victim up the high sides to the deck. It is nearly impossible to bodily hoist even a fairly light person out of the water. The situation will dictate the necessary procedure but a good general rule would be to attach a line to the person around the chest (it should be tight in order to avoid it ending up around the neck) and lash him to the boat. Then you have time to think of the easiest way to hoist him aboard. Several people could hoist the victim by the line or, if shorthanded, a halyard and the winch could be employed.

No time spent studying or practicing the techniques of crew overboard should be considered wasted. Important points to consider include the following:

- Crew overboard often happens to skippers as well as crew. Consider if your crew has the knowledge to rescue you were you to fall overboard.
- Crew overboard normally occurs in adverse situations. Always consider your preparedness to execute a rescue whether you be sailing in heavy weather, executing tricky maneuvers during a race or crossing a commercial channel.
- Each of our keelboats is equipped with a Life Sling, a floatation device attached to a long, floating line. The Life Sling has been shown to be one of the most effective methods to recover crew overboard. You should familiarize yourself with its proper usage.
- In addition to the “Figure Eight” rescue procedure you should also understand how and when to use the “Quick Stop” procedure by heaving-to. Heaving-to can be easier and faster to perform short-handed and can be taught as an automatic response.

If you are the victim you will notice how cool our waters are. If you are wearing a life vest don't waste energy trying to swim to the boat or removing boots; if not, you may have to remove your boots or shoes to make treading water easier. Do not remove clothes, and endeavor to remain motionless. Swimming increases the rate of heat loss and speeds the onset of paralyzing hypothermia. You might survive perhaps three or more hours if you remain fully clothed and still; far less if you swim vigorously.

ANCHORING

...it is essential that you look directly with your mind’s eyes at God, just as directly as a ship’s anchor-cable is stretched in a straight line from the ship to the anchor; and fix your mind’s eyes on God as the anchor is fixed in the ground. Even though the ship is on the waves out at sea, it is safe and sound if the cable holds, because one of its ends is fixed in the ground and the other is fixed to the ship.  
--from King Alfred’s translation of the Soliloquies of Saint Augustine

Anchoring a keelboat is a skill that comes only with practice and experience in a given boat. Once the basic techniques are mastered, anchoring becomes so routine that many people are inclined to get sloppy and the result may be a dragging anchor or a beached boat, either of which is obviously dangerous. Select an anchorage carefully. Consult a chart unless it is a familiar area and from it.
determine whether the anchorage offers protection from winds from every quarter, or only from certain directions. At times you may have to anchor under a windward bank, with protection from only one side if so keep a ready watch for wind shifts. Landlocked anchorages are best, but even good anchorages are often exposed on one side. Avoid a lee shore, where the wind, or forecasted wind, blows you toward the beach as it may be quite uncomfortable and is always risky. Scan the chart for rocks, shoals, and reefs to be avoided when entering. Give them a wide berth when the anchor is let go for you may swing through a circle whose radius is only slightly less than the rode (anchor line) that you have veered (paid out over the side). Avoid cable areas; these are also shown on charts, and sometimes are indicated by a sign ashore. Parallel broken lines on a chart show the limits of both cable areas and dredged channels. Do not anchor in a channel; you may obstruct navigation.

The nature of the bottom determines, to a considerable extent, the anchor's holding power. The chart shows, by symbols and abbreviations, whether the bottom is mud, sand, gravel, shells, clay or whatever. Generally speaking, very soft mud or loose sand represent poor holding ground because anchors will "float" through such a bottom. Rocky bottoms present obvious problems and very weedy bottoms prevent an anchor from reaching whatever surface lies below. A mixture of mud and clay is considered to constitute excellent holding ground, soft enough for an anchor to penetrate easily yet firm enough to give maximum holding power.

Checking depths and tides in anchorages is always important. The chart gives depths at mean (average) lower low water (explained in piloting section to follow) but a sounding is the only sure way to determine water depth beneath your vessel. Sounding, using a lead and line, involves slinging a lead weight attached to a light line forward (if moving forward) of the boat and measuring the length of line that went underwater when the lead reached the bottom and the line was vertical. This depth can be calculated roughly, by counting the number of arm spans of line brought up from beneath the water or more accurately by reading specially prepared marks attached at measured points along the line. The tidal range can be obtained from the tide tables. If entering a harbor at high tide, be sure that you will have plenty of water beneath the keel at low tide. Also, consider the approaches to the harbor: will you be trapped by a shoal across the entrance at low water?

Approaching the anchorage, note how other boats are lying and figure on lying in the same direction. If there are no other boats, judge the effect wind and current will have on the boat, and head into whichever is stronger. Reduce speed and choose a spot wherever there is room to swing clear of other boats. Consider the following: a shallow draft motorboat will swing to wind shifts which would never affect a deep keelboat caught in the grip of a current, or, the boats around you may be lying to a greater length of rode, or, to two anchors and not one. Make allowance for these possibilities and leave room to veer extra line in case the wind freshens.

Prepare anchors and lines well ahead of time. The safest system is to leave the anchor in the cockpit or in its locker with the first several feet of the line coiled so as to run freely and carry the bitter end (the end opposite the anchor end) and the remaining coil of anchor line up to the bow, passing it outboard of all shrouds, lifelines and the bow pulpit and underneath all sheets, through the bow chock and tie it to the mast with a bowline. If attached to the bow cleat instead of the mast it must be uncleated in order to adjust the amount of scope (ratio of line veered to depth of water plus height of bow), thus risking the loss of anchor and rode overboard.

If approaching the anchorage under power, simply motor upwind or uptide, whichever is stronger, until in the desired area. Put the motor in reverse and when the boat is moving backward over the ground,
lower the anchor from the cockpit until it reaches the bottom, then veer more line while continuing to reverse. Never throw anchor and chain over all at once; the chain may foul (wrap around) the anchor. Continue to back down (downwind or downtide, that is) until the desired scope has been veered, then put a strain on the rode. The anchor should quickly dig in.

Anchoring under sail is complex, but with practice it too can become routine. Most of the how-to books say to anchor under sail much as under power, backing down to set the anchor. Backing a short-keeled boat under sail is difficult and frustrating, and the vessel is usually backing down too slowly to set an anchor properly.

A better system is to sail up into the desired area, and if in high winds, drop and furl the main (remember, you can't drop the main while sailing downwind). Bear off and lower the anchor as before from the cockpit, being careful to pay out the chain slowly until the anchor is on the bottom. Continue to sail downwind until the desired scope has been veered, take a wrap on a cleat, push the helm alee and let the boat's momentum dig the anchor in. If the anchor is holding properly the vessel will remain pointed upwind with jib flogging (luffing itself to death). The jib should be quickly dropped and stowed. The main precaution required is to lead the anchor rode along the side of boat that will be the windward side when the anchor is being set. For instance, if the anchor line is led forward to the bow and the mast along the port side, the logical side because the anchor is stored in the port deck locker, the boat must be on port tack when the anchor is lowered, or jibed onto port tack before the end of the line is reached. If this is not done, the anchor line may foul the keel or rudder or both when the helm is put alee to turn the vessel upwind.

Club keelboats are equipped with two Danforth type anchors each, a bower, or large anchor weighing about 20 pounds, and a kedge, or smaller, 8 pound anchor. The kedge is adequate and convenient for temporary use or in very sheltered anchorages, but the bower provides much greater holding power and should be used in all other circumstances. Each has a length of chain attached which effectively increases the weight of the anchor and reduces the horizontal angle of pull. It also minimizes the chafing of the rode (nylon line) against the bottom and is harder to foul. Each anchor has about 150 feet of line spliced on. Allow plenty of scope when possible. Three to one is the absolute minimum (for temporary anchoring only), five or six to one is generally adequate, and ten to one is necessary during storms. Remember to allow for the rise and fall of the tide and the height of the bow when estimating scope. Remember, scope is the ratio of the line veered to the height of the bow above the bottom as diagrammed below, and is usually written as 3:1, 7:1, 10:1 etc. In this diagram, 42:14 is a 3:1 scope and 98:14 is a 7:1 scope.
There are times when two anchors can be used to advantage; these include during storms, in strong tidal currents, and anchoring in particularly restricted waters. For a storm, anchors placed as shown in diagram A, below left, increase the total holding power and reduce the strain on each anchor and rode. Note, however, that there must be adequate line available to obtain large scope on both anchors. One anchor with, say, 10:1 scope would have considerably higher holding power than two anchors with 5:1 scope, in storm conditions.

Two anchors set as in the second diagram would be quite useful in a strong tidal current running in one direction. Without a second anchor a boat tends to sheer badly (move rapidly from side to side); the second anchor prevents much of this motion. A good method for setting two anchors in this pattern is to motor to the spot where the first anchor will lie, lower it and back down under motor until 1/2 the rode needed to give the desired scope has been veered and set the anchor. Then, keeping the line moderately taut, motor the vessel in an arc out to the right (or left) until you come abeam of the first anchor. Lower the second and back down again until 1/2 the rode needed to provide the desired scope has been veered. The boat will then lie about midway between the two anchors and downwind (or current) from them. The second anchor is now set and the two anchor rodes are veered together until the desired
scope is obtained. Each line should be cleated using separate bow chocks and cleats if possible. If done correctly the angle between lines is less than 30°. Angles greater than 30° result in a significant reduction in holding power.

In a small anchorage, or one with rocks and shoals, or any place where it would not be advisable to allow the boat to swing to the full extent of its anchor line, two anchors can be set diametrically opposed to one another as seen in diagram B, on the previous page. Notice that the radius of the circle through which the vessel could swing is approximately that of the length of the boat and the line from the bow to the union of the two rodes. To establish this arrangement, set one anchor, under sail or motor as one would usually do, but veer twice (actually, a little less than twice will do) as much scope as needed. Then lower a second anchor (over the stern is easiest) and haul in on the first anchor's rode and veer the second anchor line until the boat is midway between the two. Be sure to lead this rode forward to the bow outside all shrouds, life lines and the bow pulpit. The two rodes must now be secured together and here it would be desirable to learn to tie a "Lineman's Loop," also called an “Alpine Butterfly Knot.”

This loop will not jam; thus can be easily untied later. To this loop, tie the other, second anchor line using a bowline. Then veer an additional boat length of rode to allow both lines to clear the keel and rudder as the vessel swings. Do not tie both lines at the bow for as the boat turns one or both may foul the keel or rudder. Nor should you secure one anchor line at the bow and the other at the stern as any wind or waves coming from abeam will exert great strain on the anchors. Be aware that if you are using the double anchor system to reduce swing, boats nearby which are lying to one anchor will swing through a much greater arc than you.

In cases where the bottom slopes steeply away from shore, it is necessary to set one anchor offshore, and run a line from the boat either to a solid object ashore or to an anchor on or close to shore attaching the lines together as shown on the previous page. Again, any wind or waves from abeam will probably result in a restless night if the lines are tied at the bow and stern.

Getting under way from an anchorage is usually much easier than anchoring, and is commenced by heaving in the line until the scope is about 2:1. Then use the sails and/or start the engine and pull rapidly in on the rode as you approach the anchor. If done rapidly, the boat will coast over the anchor and pull it free. It is then hoisted high enough to clear the bottom easily and the rode is carried aft to the cockpit where the anchor is brought to the surface. Since it is usually muddy or covered with grass it is best to move it up and down in the water to clean it, then hoist it into the cockpit locker and coil the line down on top.

If the anchor has been buried in the bottom for several days or if a storm has passed, the anchor may be very deep and resist efforts to free it. Persevere. Heave in on the anchor to make the rode as vertical and taut as possible, cleat it at the bow and cause the boat to pitch by moving crew weight fore and aft, gunning and cutting the engine, or letting the natural swell, if it is large enough, snub the taut rode. If this fails to free the anchor try circling the anchor under power keeping the anchor line taut. The last recourse is to dive for the anchor (Shiver!) because if the above steps have failed, the anchor is probably on a cable, a rock or someone else's anchor chain.

**RUNNING AGROUND**

Running aground is usually the consequence of improper anchoring, though occasionally vessels are sailed directly onto shoals, rocks or beaches. The response in either case must not be one of panic or
"Abandon Ship" tactics, but must be a rational one based on a calm assessment of the factors which led to going aground. Running aground while anchored is most often the result of either:

1. Anchoring in water which is too shallow when the tide ebbs or near such water over which the boat may swing with a shift in wind or current, or
2. Dragging the anchor due to it either being improperly set or set with insufficient scope.

The preventative measures in either case are fairly obvious, but the responses should grounding occur are less so. Generally the realization of having gone aground while at anchor comes when the boat starts to heel and often it may occur too late to do anything to free the boat. If grounding was the consequence of having dragged the anchor then you are probably on a lee shore, which can be quite dangerous to yourself and the boat if any sea (large wave action) is running. A major attempt to free the keelboat must be made in these conditions. Check first to see if the anchor is now holding; if so, try any or all of the following methods. Heel the boat by placing crew weight on one side, or if this isn't sufficient to lift free, a crewmember or two can take a halyard and walk out on the shoal to one side of the boat and heave the boat down while others pull on the anchor line. The motor may be used to assist if the water pump is still underwater. But, be sure the anchor is holding first or you will possibly be blown further ashore before the motor can be started to power out. If the anchor is not holding, the anchor must either be placed further away and reset, or a second anchor walked (or rowed if you have a dinghy) offshore and set.

If not on a lee shore, or the vessel did not drag its anchor, and the possibility of getting free appears hopeless, the proper procedure is to secure the vessel as well as possible. All hatches and seacocks should be closed, the boat forced to heel towards the shore, if possible, and the bottom around the hull and keel checked for boulders or logs which if present should be moved or the hull protected with bunk mattresses, cabin sole hatches, or other flat pieces of wood (don't use the main companionway boards), in order to prevent serious hull damage due to pounding. Anchors should be checked and the scope increased in anticipation of the next high tide. Important: remove the battery from the battery box and place it where it will remain upright in order to prevent acid spilling and other nastiness. (Our keelboats now have sealed gel batteries.) Then wait.

Running aground while under sail can occur with almost infinite variation making it impossible to provide definitive responses here. A very good reference on the subject is to be found in Eric Hiscock's *Cruising under Sail* (pp. 225-230 of the second edition).

There are, however, some general considerations that the reader might wish to ponder:

1. The tidal conditions at the time of going aground—if the tide is falling one must act fast to free the boat.
2. The nature of the bottom—a hard rocky bottom requires more rapid and vigorous action to free the vessel or at least to protect it. The slope of the bottom is also important in that a steeply sloping bottom is easier to clear but also can present a greater hazard if rocky or if the boat should layover with the mast pointing downslope. The cabin would be quite vulnerable to flooding at the next high tide.
3. The weather conditions—those at the time of grounding and those which develop over the next several hours obviously determine to a considerable degree the seriousness of the situation. Whether the wind is off or onshore during the time your boat is aground is a major factor in being able to free the vessel or having it driven on harder.
4. The exposure of the location—its exposure to storms or wakes of large vessels (the latter can be used to advantage in clearing a boat barely stuck) is a factor to be considered if the next sufficiently high tide is say 12-24 or more hours away.
Of course, if the speed of the boat is slow, the tide rising, the wind light and offshore in direction, there is usually little problem. If these are not the conditions when striking ground under sail, then the best solution, generally, is to convert the vessel under sail to one at anchor. Drop all sails, walk or row out an anchor quickly, then strive to free the boat as described above. It is a rare thing to be able to sail a keelboat off a shoal, sails usually drive the boat more solidly aground.

**PILOTING**

*Was I ever lost? Well, no, but I was once a mite bewildered for a few days.*

Daniel Boone

*The fog comes in on little cat's feet*

Robert Frost

Piloting is the art of conducting a vessel from port to port when aids to navigation are available and the depth of the water is such that vigilance must be maintained. As such, piloting is but one aspect of navigation, the coastal and intracoastal aspect, and involves the observation of visual aids to navigation and the use of those tools required for such observation. Piloting is thus the aspect of navigation in which we are primarily interested due to the enclosed nature of our waters, the large number of visual aids available and the simplicity of our tools. It is not possible, in this space, to adequately deal with the subject of piloting and the reader is highly recommended to refer to the appropriate chapters of Rousmaniere and/or Chapman which cover the subjects introduced here.

In the daytime and on clear nights, one can navigate the open waters of Puget Sound with but a casual glance at the chart and a certain few references on land. In the San Juans, in narrow passages and harbors, in most Canadian waters, or anywhere when the weather thickens, one will have to depend more on piloting skills and the tools available.

**The Chart**

It is reasonable to say that an ability to quickly translate symbols, abbreviations, numbers, and scales into coherent information is the basis of all piloting. For example, charts provide information on depth of water, aids and hazards to navigation, the nature of the bottom in prospective anchorages, and magnetic and "true" course headings. Charts are made in several different scales; that is, one inch on the chart represents differing numbers of real inches, or miles with conversion, and charts of a scale smaller than 1:80,000 (for example 1:100,000, 1:150,000, 1:200,000, which means one inch on the chart equals 100,000; 150,000; 200,000 real inches) are not to be relied upon for entering narrow, or shoal ridden harbor entrances.

Our keelboats are not supplied with charts. We recommend you purchase, to begin with, charts from the "Small Craft" series of charts. The "Small Craft" series of charts are different from ordinary charts in their booklet layout, the fact that their edges are not parallel with the North-South and East-West cardinal directions, in the presence of large scale (1:10,000; 1:20,000; 1:40,000) insets of complex or narrow passages and harbors, and in their wealth of information on tides and chart symbols placed throughout the front and back of the charts. The specific charts from this series that are most useful are the 18423 ("Bellingham to Everett, Including the San Juan Islands") and the 18445 ("Puget Sound, Possession Sound to Olympia, Including Hood Canal"). These charts have a basic scale of 1:80,000 and large scale insets from 1:10,000 - 40,000. If you plan to cruise in Canadian waters, you should purchase Canadian charts of the appropriate scale for the area you plan to visit. Charts and several commercial cruising atlases are available at Captain's, Metsker Maps, Fisheries Supply and West Marine, amongst
For the purpose of learning piloting using charts it is recommended that chart 18440 be purchased. This is a general chart of Puget Sound and, for novices, is much easier to read due to its larger size and conventional layout. It is also an excellent chart for planning cruises anywhere in the Sound. A copy of this and other charts may be seen in the WYC Office.

The most important features of any chart are:

1. The table of data—provides the scale, date of the latest revision of the chart, states whether soundings are in fathoms (six foot measures) or feet, the basic level against which all soundings are made, usually mean lower, low water (that is, the average of the lower of the two daily low tides).
2. The compass rose—found in several places on the chart; this is a triple compass representation with true bearings on the outer circle and magnetic bearings for the local area in the inner rings. At the center of the rose is a cross and a statement of the amount of magnetic variation (to be discussed later) and its annual change. Course headings and one's location are obtained by using these roses.
3. There is an additional piece of information found on large scale charts which is vital for sailboat skippers. This is the height of bridges: for waters subject to tides this is shown as a height above mean higher, high water (the average of the higher of the two daily high tides). One should always scan charts for low bridges and overhead electric wires when entering an unfamiliar passage.

The Compass

The compass is the basic instrument which enables one to follow predetermined courses, and to determine position (of your boat or other objects) by taking bearings. A bearing is an angular measurement relative to some standard; in our case, there are two standards, true (geographic) north, and magnetic north which do not lie in the same direction in our locality. Thus there are two distinct bearings for any object observed from one's boat. Some of the important characteristics of compasses are:

1. It provides magnetic bearings only.
2. It is subject to the local magnetic variation of an area. In this area there are approximately 16 degrees of easterly variation (error) from true north. (In 2013, the variation is 16° 27' changing by -10.4' per year.) This variation is constant for all headings (courses) of the vessel. Thus all magnetic bearings in our area (true north, true south, southwest, etc.) contain this 16 degrees of variation from true bearings. This is because a compass only points in one direction (parallel to the magnetic lines of force of the earth) and the boat turns beneath, ensuring that the amount of variation remains the same.
3. A compass is also subject to deviation (another form of error) caused when ferrous (iron) metals are brought close to it. Care must be taken, therefore, to keep all ferrous metals at least 3 feet from the compass when steering by it or taking bearings to determine one's position. Anchors especially should be stowed far aft in the cockpit locker. "Tin" cans, flashlights and knives are other common sources of deviation which must be kept away from a compass. Unlike variation, deviation errors vary with the vessel's heading.
4. When the compass is fixed in its normal position, the lubber line (fore and aft line of a compass) is parallel to the centerline (fore and aft line) of the vessel and is the mark against which headings (vessel's course on the compass card) are read.

Compass cards are generally marked both in degrees and 'points'. Degrees of angle are understood by everyone (if not, read Rousmaniere and/or Chapman), but points are a little more complex. Points such
as the cardinal ones (north, east, south and west) are known to everyone, but perhaps less well known is that there are 32 points (11¼ degrees per point) to a full circle and that each of these is divided into quarter points which are named differently in the two systems in existence today. Some very experienced seamen use points to the exclusion of degrees but there is little doubt that it is easier to develop skill using a system based on degrees than one based on points.

Recall that it was stated that the two inner rings of a chart's compass rose are based on magnetic north. The innermost corresponds to the points and quarter points while the middle ring (of the three) corresponds to the 360 degrees of a circle and is the one to be used for all course and position determination. By using this ring you will avoid the process of conversion from magnetic to true and vice versa which can lead to gross errors in headings (double the 16 degree magnetic variation in this area).

All compasses have some deviation and deviation tables will be placed aboard, if these errors are large, to make deviation corrections possible and hopefully, simple. Refer to the several references in Rousmaniere and/or Chapman on compass errors and their correction as well as for the simple process of determining the course to be steered and the fixing (determining) of the boat's position by taking bearings.

Bearings for finding one's position are best made by removing the compass from its mount (if of the portable type) and sighting across the lubber line towards a known object (which must be present on the chart) and reading the bearing off the card. This procedure is repeated for another known object and the bearings transferred to the chart (with a pencil preferably).

**The Course Protractor** (not supplied on our boats):
The course protractor is an instrument used for determining courses to be sailed and transferring bearings to the chart when making fixes. It is pictured below and consists of a straight plastic arm attached to the center of a clear plastic compass rose. The arm pivots around the center throughout 360 degrees.

This diagram illustrates only the essentials of a course protractor; most protractors have additional features. Avoid excessive clutter on the compass card. The Danforth Delux C-P, from which this drawing was modeled, is a sophisticated but highly usable C-P.

The course protractor has been selected for discussion here because of its low cost, simplicity and flexible arm which permits its use on irregular surfaces such as a cockpit seat. Parallel rules and a few other devices also work well but only on flat surfaces. When shopping for a course protractor desirable qualities are a large center hole, an arm about 15-18 inches long, distinct and uncluttered degree markings on a highly translucent compass card, and an arm which extends to the opposite side of the card with a line or cut-out edge (see drawing) which, if extended, would pass through the center hole. This feature provides instant reciprocal bearings as discussed below and thereby precludes error-producing computation.

**Course determination with the course protractor (C-P)**
1. A light line is drawn between the vessels known position and the destination (or an intermediate turning point if sailing a twisting passage). The center (the hole) of the C-P is placed over the boat's position.
2. The arm is swung to the nearest compass rose on the chart and one edge, (either will do) of the arm is run directly through the cross at the center of the compass rose. The C-P rose is turned until the reading, in degrees, where the arm passes through the C-P rose and the middle ring of the chart's rose, (magnetic degrees) are the same. The C-P is then oriented to magnetic headings on the chart.
3. The arm is then swung to the course line already drawn and the bearing indicated on the C-P rose is the course bearing to steer in order to reach the destination (disregarding current, etc.).

**Position Determination with the C-P; the procedure above is reversed using the bearings taken.**
1. Place the center of the C-P on the known object on the chart and orient the C-P as before.
2. Swing the arm 'til it falls on the reciprocal of the bearing you took of the object (that is, the bearing in the opposite direction, from the object to the boat. A reciprocal bearing = Bearing +/- 180 degrees) and draw a light line.
3. Repeat the procedure with the other bearing and where the lines intersect is your position at the time the bearings were taken.

**Piloting in tidal waters**
If piloting did not have to contend with tidal currents it would be a simple art indeed; however, our waters are more than slightly influenced by tidal currents. There are few times in a day when most of the water in Puget Sound is not flowing inland, to the sea or in both directions at once. Again, Rousmaniere and Chapman contain excellent discussions on correcting one's course to compensate for tidal currents. This space is best devoted to listing some general characteristics of tidal currents (and tides).

1. Each day there are two high tides and two lows of unequal height. The daily highs and lows are shown in table form for specific areas on charts l84SC and l85SC. Note that the time of, say, high tide varies with location and that there is a delay in the time of high and low tide as one proceeds in from the sea.
2. Tidal Currents can be quite strong in our inland waters. Currents of 2-3 knots are not at all uncommon and certain narrow passages are nearly impossible to navigate at times. The Small Craft series of charts contain notations of average ebb (outgoing) and flood (incoming) currents for frequently used passages.
3. Tidal currents increase in strength away from shore; in fact, the current near shore may run counter in direction to that in the middle of a passage and generally runs roughly parallel to the shore.
4. The period of 'slack water' (no current) between tides is short and generally does not coincide with tidal 'stand' (the period of highest or lowest vertical water level). The lesson to be learned from this is that one should not misconstrue, say, a flood current as evidence of a rising tide. The tide ('tide' refers only to vertical motion not to incoming or outgoing tidal current) may already have begun to drop and the vessel may have considerably less water beneath her than expected. One should always depend on accurate tide tables with time corrections for locality, as needed (Rousmaniere, Chapman, and government tide tables discuss time corrections).
5. In addition to the simple tide tables found in the Small Craft charts, one can obtain booklets (often free) at several marinas. The federal government sells a superior set of tide tables having time corrections for various well known places along the Sound.
Aids to navigation
Rousmaniere and Chapman contain several excellent chapters describing buoyage, lights and fog signals and should be your source for gaining knowledge about these important aids to navigation. Much can also be gleaned from a careful study of charts. A few items come to mind, however, which might prevent harrowing experiences.

First, most aids to navigation, and especially nuns and cans which mark the starboard and port sides respectively of a channel when entering from the sea, are not lighted. These aids to navigation painted red (nuns) and green (cans) are both black at night and represent a serious hazard to an unwary skipper. For example, there were two red nun buoys marking the sharp bend in the Lake Washington ship canal under the Freeway Bridge. When returning from Puget Sound at night it would prove quite easy to cut the corner and strike either of these multi-ton steel spectres. In November 1973, it was noticed that there was only one buoy left; perhaps the other was run down by some large vessel.

Second, one should not place too much faith in the presence of an aid to navigation. Chained buoys are constantly being damaged or lost and an aid may have been removed or moved permanently since the chart being used was printed.

Third, do not expect light signals to appear exactly as described on the chart. Sometimes timing is not quite as described, or, as in the case of the Point No Point light, the reflection from a building ashore turns the group flashing white light with three flashes into a group flashing white light with six flashes.

Fourth, you should be aware of the many (the number seems to change constantly) new mid-channel marks (black and white vertical stripes) in Puget Sound, Rosario Straits, and other passages. They are traffic buoys intended to separate incoming, and outgoing commercial shipping and are lighted with a white light flashing one short, one long (Morse "A") several times per minute. They are in such open water that some skippers may not be watching and collide with one of these monsters.

Vessel Traffic System (VTS) for Puget Sound and adjoining waterways
The new V.T.S. for large vessels is now in effect and is a prominent feature on new charts. The salient features and rules of the V.T.S. and the impact on private boats are:

1. The VTS consists of two, one-way lanes (one for incoming traffic and one for outgoing) 1000 yards wide each, isolated by a separation zone 500 yards wide. The mid-channel marks mentioned above are stationed in the separation zone at points of junction or course change and provide a visual means of determining your position versus the VTS lanes.
2. Large commercial vessels, passenger vessels, tugboats and certain other vessels are required to use the proper lane (the starboard lane) whenever navigating in VTS waters and may not enter or cross the separation zone without permission (from a 'Vessel Traffic Center').
3. Private vessels shall not impede passage of a vessel properly in its lane.
4. Any vessel crossing a lane shall do so perpendicular to the lane. The effect on small craft is this: pleasure craft may sail in the VTS lanes and separation zones but if a vessel required to use a VTS lane approaches, you must leave the lane being used via the shortest possible route (which is a course perpendicular to the lane).

WEATHER
Everyone talks about the weather, but nobody does anything about it.
Mark Twain
When the wind blows, worship its roar.
Pythagoras

This chapter has been prepared to disseminate a few generalities about storms and what can be done to prevent some of their worst effects. Few storms strike without warning and there are various public organizations which provide short term forecasts. If you have a radio, tune in before starting into open water or anchoring at night in that exposed anchorage. (All our keelboats have radios. Tune into WX radio information on Channel 1.)

Coast Guard stations and some port facilities fly warning flags. The daytime signals are:

1. One red triangular flag means "small craft advisory" to indicate predicted winds to 33 knots.
2. Two red triangular flags hung one above the other means "gale warnings" to indicate predicted winds to 48 knots.
3. A square red flag with a smaller black square in the center equals "whole gale warning" to indicate predicted winds above 48 knots.
4. Two of the flags in #3 above hung one above the other equal "hurricane warning" to indicate predicted winds capable of peeling the mother of pearl off an oyster shell.

The nighttime signals for 1 through 4 above, are:

1. Two lights vertically, red above white.
2. Two lights vertically, white above red.
3. Two lights vertically, both red.
4. Three lights vertically, top and bottom red, middle one white

Assuming you are not near any public warning system you can still predict a storm at least an hour before it strikes. Unusually warm, muggy days spawn most thunderstorms and squall-lines (a series of particularly intense thunderstorms). Thunderstorms nearly always approach from the west or southwest and give ample warning as towering cloud systems (cumulonimbus). The appearance of massive, vertically developed clouds in the west and southwest quadrant is a warning which should not be ignored. Squall-lines often appear as a long line of sinister gray-black in the west and move in with startling rapidity. As both of these storms will bring strong, shifting winds, sail should be reduced to a minimum before they strike, the vessel should sail well clear of all shores and areas where there is a strong tidal current, the fore-hatch should be closed and dogged, the companionway boards placed in position, life vests and foul weather gear put on, and all gear below deck secured. Above all, the stove should be extinguished as the first gusts of a thunderstorm or squall-line has laid many a vessel on her beam ends (her side) and a raging fire or serious burns are hardly welcome at such a time.

If anchored in a protected bay (protected in all directions from large waves) one should veer more line to increase the scope and thus the holding power of the anchor. The second anchor should be prepared and halyards and engine readied in case the anchors drag or for some other reason you are forced to leave the anchorage. Again, all gear below should be secured and hatches closed in anticipation of a forced departure.

If sailing in the fall, winter or spring in open water, you are encouraged to read the appropriate chapters in Rousmaniere, Chapman and Hiscock to educate yourself in weather forecasting. The storms a person encounters in these seasons are generally of longer duration than summer storms and have earlier warning signs. Education in greater depth about Puget Sound weather patterns can be obtained by studying a book such as The Weather of the Pacific Northwest by UW professor Cliff Mass.
CRUISING IN CANADA

Those interested in cruising in Canadian waters should make themselves familiar with the customs and immigration requirements of both Canada and the US. Canadian customs must be cleared when entering Canada and United States customs when returning. Information on customs ports, hours of operation, overtime fees, and fishing regulations can be found in a folder on Canadian Sailing which is maintained in the WYC office. We will add information to the folder upon suggestions of those who have visited Canada and encountered regulation or other problems. The official names of our vessels for customs statements are, incidentally, Caravel and Excalibur Charlotte, Deception, Rascal, and Nightshade.

It is highly recommended that you research border and customs information before setting out on a cruise to Canada. Useful links for both Canadian and US border agencies are included below.

CONCLUSION OF A VOYAGE

*Home is the sailor, home from the sea...*

R. L. Stevenson

Upon returning from any trip, skippers of keelboats are responsible for cleaning the boat, removing the battery for recharging, if needed; checking in the boat and checking in the equipment. Returning from a trip to salt water, especially one of several days duration, particular maintenance must be carried out to protect the sailboat and prepare it for the next user. Specifically, salt and salt water should be washed from the cabin, decks, cockpit, lower parts of the shroud and stays, lights and motor with fresh water. With respect to the motor, the cover should be removed and the innards doused (cover the air intake well, first!). If the engine was immersed by heavy seas this is especially important to get the corrosive salt off of all the parts. The bilge should be pumped dry, and all interior lockers, doors, hatches, etc., should be opened and bunk cushions set on edge to facilitate drying and prevent rot.

A very kind gesture to the next person who rents the boat is to leave sufficient gas in the tank to enable him to power at least as far as the local marina for more gas. Finally, if there is damage to, or problems with, the boat or motor, a repair form properly filled out would greatly help those who volunteer their services to keep this program working. If the boat, a sail, stove, head or motor is disabled the fleet captain must be contacted.

KNOTS

A sailor uses a variety of knots. You should be familiar with each of these knots, able to tie them with one hand behind your back in the pitch black of a starless night. More importantly, you should understand the qualities of each knot and know when to employ the correct knot. There are many good references on the Internet but a quick reference is supplied below.

*Figure 8*, used as the most common stopping knot, is easy to untie when jammed.
Figure 8 on a bight can be used for a loop when the strain is moderate. It can be difficult to untie when jammed. Do not use this knot where a bowline is called for.

Bowline, a simple knot consistent of a loop and a bight, is a simple and versatile knot that’s easy to tie and untie even after being subjected to load. The loop will not slip or tighten.

Clove hitch consists of two half-hitches around an object. The loop can slip under load depending on the line used. The clove hitch is easily adjustable.

Rolling Hitch is designed to resist lateral movement in one direction only. A common use is to release tension on a sheet so that an overwrapped winch can be cleared.

Sheet bend is a knot that joins two lines together. It is similar in structure to a bowline. The larger line in the diagram should be used as the initial bight. The sheet bend can work free when not under load. For the strongest hold leave the workin ends on the same side of the knot.

Cleating hitch is used to secure a line to a cleat, commonly found on docks that are better-equipped than those at the club.
Reef knot/square knot: The reef knot ties two lines together in an insecure fashion. If you do use reefing points you should use reefing knots as they are less likely to tear the sail apart. There is a right way and a wrong way to tie a reef knot. The right way will release easily. The wrong way is known as a “granny knot” and will not release easily. Leave the working ends on the same side of the knot.

Lineman’s loop, also known as an Apline Butterfly, is used to form a fixed loop on a bight. It handles loads well in any direction. It is frequently used to create steps in a rope ladder.

**QUICK REFERENCE FOR EACH BOAT**

<table>
<thead>
<tr>
<th></th>
<th>Ranger 26</th>
<th>Catalina 270</th>
<th>Cal 3-30</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hull type</strong></td>
<td>Fin keel</td>
<td>Fin w/bulb &amp; spade rudder</td>
<td>Fin w/spade rudder</td>
</tr>
<tr>
<td><strong>Rig type</strong></td>
<td>Masthead sloop</td>
<td>Masthead sloop</td>
<td>Masthead sloop</td>
</tr>
<tr>
<td><strong>Mast height</strong></td>
<td>41 ft / 12.5 m</td>
<td>47 ft</td>
<td></td>
</tr>
<tr>
<td><strong>Length overall (LOA)</strong></td>
<td>26.25 ft / 8.00 m</td>
<td>27.00 ft / 8.23 m</td>
<td>30.07 ft / 9.17 m</td>
</tr>
<tr>
<td><strong>Length waterline (LWL)</strong></td>
<td>21.75 ft / 6.63 m</td>
<td>23.00 ft / 7.01 m</td>
<td>26.31 ft / 8.02 m</td>
</tr>
<tr>
<td><strong>Beam</strong></td>
<td>8.67 ft / 2.64 m</td>
<td>9.83 ft / 3.00 m</td>
<td>10.17 ft / 3.10 m</td>
</tr>
<tr>
<td><strong>Sail area (working)</strong></td>
<td>322 ft² / 29.91 m²</td>
<td>316 ft² / 29.36 m²</td>
<td>474 ft² / 44.03 m²</td>
</tr>
<tr>
<td><strong>Draft (maximum)</strong></td>
<td>4.33 ft / 1.32 m</td>
<td>5.00 ft / 1.52 m</td>
<td>5.50 ft / 1.68 m</td>
</tr>
<tr>
<td><strong>Displacement</strong></td>
<td>5860 lb / 2658 kg</td>
<td>6420 lb / 2830 kg</td>
<td>10500 lb / 4763 kg</td>
</tr>
<tr>
<td><strong>Ballast</strong></td>
<td>2050 lb / 930 kg</td>
<td>1819 lb / 825 kg</td>
<td>5000 lb / 2268 kg</td>
</tr>
<tr>
<td><strong>Sail area ÷ displacement</strong></td>
<td>15.90</td>
<td>14.96</td>
<td>15.87</td>
</tr>
<tr>
<td><strong>Ballast ÷ displacement</strong></td>
<td>34.99%</td>
<td>29.15%</td>
<td>47.62%</td>
</tr>
<tr>
<td><strong>Displacement ÷ Length</strong></td>
<td>254.26</td>
<td>228.96</td>
<td>257.38</td>
</tr>
</tbody>
</table>

**ENGINES**

**Inboard Diesel engine (Cal 3-30)**

Unlike the other vessels, Nightshade requires her own rating and has a manual prepared especially for her by the WYC. Please familiarize yourself with her specific instructions, especially operation of the inboard diesel engine. Note that the inboard engine burns diesel oil. Do NOT put gasoline into the diesel engine tank!

**Before Starting Engine**

1. Check oil level, should be at full
2. Check fuel diesel tank level, there should be at least X inches of fuel in the tank as measured on the fuel measuring stick.
3. Check that the fuel shut off valve is open
4. Check fist fuel filter bowl for water or other obvious contaminants
5. Check the water cooling system:
   a. Check that the water intake valve to water pump on engine is closed
   b. Check that the filter on the water intake line is free of debris.
   c. Check that the water intake valve to water pump on engine is open (critical)
6. Check that there are no strong fuel odors in the engine compartment. If so, ventilate.

Starting the Engine
1. Turn battery # 1/2 to ON position (battery is on ALL)
2. Put transmission lever in neutral (centered)
3. Put throttle level to approximately 2 o’clock position relative to centered.
4. Turn the ignition switch to ON position to energize the fuel pump, glow plug and oil pressure light
5. Press and hold the glow plug button for 30 to 60 seconds depending on ambient air temperature. You will need to continue to holding the glow plug button while holding the start button in very low temperatures. Release both buttons immediately after the engine starts.
6. Check the oil pressure light (should go out within 5 seconds after engine starts)
7. Check that water is coming out of the exhaust pipe along with exhaust fumes.
8. If either the oil pressure light (“Low Oil”) stays on or no water is coming out of the exhaust pipe, stop the engine immediately.
9. Idle engine for 10 minutes at about 1000 RPM to allow engine to warm up.
10. Return throttle to idle position (centered).
11. Shift the transmission lever forward to check forward movement and backward to check reverse movement. If okay, return transmission lever to neutral.
12. You are now ready to make way.

Stopping the Engine
1. Put throttle level to idle (centered).
2. Put transmission lever in neutral (centered)
3. Let engine idle for 1-2 minutes to cool down
4. Pull the shut-down (“Idle Cutoff”) lever until the engine shuts down
5. Turn batteries OFF
6. Close water intake valve

Before Leaving the Boat
1. Confirm at least ¼ tank of fuel
2. Check condition (charge) of both batteries
3. Confirm condition of engine raw water filter

Bleeding the Fuel System
This may be necessary if the fuel tank is allowed to run dry. After adding fuel to the tank, have some means (e.g., rag) available to catch any fuel escaping during the bleeding procedure.
1. Be sure there is sufficient fuel in the fuel tank before starting.
2. Open the fuel shut-off valve at the tank
3. Start the electric fuel pump by switching the key to ON
4. Slowly loosen the air bleed plug on the primary fuel filter, letting air escape until a free flow of fuel is evident.
5. Tighten the air bleed plug
6. Loosen air bleed plug/bolt between primary and secondary fuel filter, letting air escape until a free flow of fuel is evident.
7. Loosen air bleed plug/bolt between secondary fuel filter and injectors, letting air escape until a free flow of fuel is evident.
8. The fuel system should be ready for use.

PREFACE TO THE 2005 EDITION

Thank you for helping proofread the spring 2005 edition of *Cruising Under Sail.*

The previous version of this manual, published in 1980, was 32 pages long, typed on a typewriter, and contained any number of typos. And by the time I read it (about 1989), some of the information in it was dangerously obsolete.

So I wrote and published the first edition of this version, in 1992. Later updates appeared in 1995, 1997, and the millennium edition in the year 2000. Unfortunately, the club continued to use the 1992 edition (green cover), in part because, after making a hundred copies at several dollars a copy, they wanted to use them up before proceeding. And when they ran out, they took the last copy to the copy center and made another hundred copies...

These things happen.

Later editions WERE listed on various web pages, sometimes even the club web page, and chapters from subsequent editions have been passed out as handouts in navigation, outboard and COLREGS classes. And every time a new edition has come out, I have distributed at least 10 copies to the various chiefs, instructors, and most active keelboat users. But this time we're going to try to get the new edition, THIS edition, published in bulk for the students.

So please read carefully and tell me what you think. This is the proofreader's copy, but I am aware that it still has a number of deadfalls - places where I didn't know what to say, so I just put in a few question marks and promised to come back later.

Please read the manual as carefully as you can. The previous versions had a serious error that went undetected for more than ten years before being caught by Randy Eakin's eagle eyes. Even things as trivial as typos, misspellings, grammar errors, and lacuna (look it up), are confusing to beginners. And that's who we want to read and learn from this manual.

Please do not feel that you do not know enough to comment - this manual is intended for beginners. If you are a beginner, and don't understand something written here, I want to know! If you are an expert and disagree with something I have said, well, how am I going to learn if you don't tell me?

For technical reasons, the illustrations are not included within the text, but are added at the end of the document (and are not the final versions of the illustrations - I'm still working on that).

In an attempt to simplify updating in the future, facts about the current condition of the boat, temporary and transient issues, and uncertainties have (mostly) been moved into appendices. Where they can be
changed without having to rewrite and re-publish the entire document. In particular, it should be possible to update them on the link from the WYC home page, as often as necessary or desirable.

The first two appendices, especially, are incomplete - it is my intent to decide what goes in there on the basis of the feedback I get from the proofreaders - which means YOU. And I hope to hold regular discussions with all the interested parties between now and the time the final version of this manual is published.

It is inevitable that this rough draft will be used by some instructors (and some students) in keelboat classes, before you and I have had the opportunity to locate and correct all the errors, omissions and anachronisms. If you are a student who has been given this document to learn from, please let me know, and be careful about relying on the accuracy of the contents of this draft. I intend to give copies of this draft to a few raw beginners / novice keelboat class members to comment on, as these are the sort of people the manual is intended for. If you are one of those students, please try to give me as much feedback as possible. If it is not clear to you that something I said is correct, say something! Don't assume that since I wrote the manual, I must know what I am talking about. The mistake that went unnoticed for ten years was the omission of the word 'not', an error which inverted the meaning of the sentence, resulting in exactly the wrong instructions being given to the reader.

And make it a point to bring to my attention any differences between what I have written here, and what you may have learned from your instructor. It is not my intention to criticize or correct any of the keelboat instructors, but how can we align our teaching if the students don't have some way to compare what they hear from their instructor with what someone else (in this case, me) has to say on the same subject?

I would appreciate it if you made your corrections and suggestions on this draft and then returned it to me. If you wish to keep and continue to use this document until the final version comes out, just let me know, and I will return it to you after copying your corrections.

Once again, I thank you.

**Preface to the previous edition:**

**ACKNOWLEDGEMENTS**

It was originally my intent to thank all those who taught me the information in this manual by name, but I find that there isn't room. Special thanks should, however, be given to those who helped with the actual writing and editing: Evan Abramson, John Courter, Dan Callahan, Leslie Carver, Randy Eakin, Amy Groncznack, Ralph Jackson, Chris Peragine, Robert Van der Pol II, Glen Unruh, Lisa Weber....

Thanks are also due to all of my many sailing partners and crewmates. None of whom have (so far) made any serious effort to kill me.

Further thanks are extended to my many keelboat students, each of whom taught me more than I taught them.

**DEDICATION**

This manual is dedicated to the keelboat sailors of the Washington Yacht Club.

**FOREWARD**
The rationale for the keelboat program at the Washington Yacht Club is to make it possible for University of Washington students to skipper cruising sailboats on Puget Sound, something they probably couldn't otherwise be able to do. The purpose of this manual is to provide a brief, convenient, inexpensive guide to the club boats and rules, and the most basic facts and procedures necessary for safe, easy cruising on Puget Sound. Ultimately, sailing can only be learned from experience. So learn what you can from books, then get out on the water. Only then will we have succeeded. It is assumed that the reader is already familiar with the Washington Yacht Club (WYC) and the Waterfront Activities Center (WAC), and has already learned how to sail dinghies. A certain familiarity with the nomenclature of sailboats is taken for granted, but no really esoteric words have been used. In this manual, references to "the current time" or things that have been changed "recently" are to be taken with respect to the approximate dates of compilation: The summer of 2003.

Foreward to the previous version of this manual (including typos):
This book is designed as a concise guide to aid those UWYC members who wish to sail and enjoy the club's cruising keelboats, but who have not yet acquired the weatherbeaten, salty look which comes with experience. I could add to the acknowledgements all the new people who have helped me with this manual since then, but there are too many. So I will thank the club as a whole instead.

ONLINE REFERENCES

Books available at the Seattle Public Library
  [http://seattle.bibliocommons.com/item/show/2649006030_chapman_piloting_amp_seamanship](http://seattle.bibliocommons.com/item/show/2649006030_chapman_piloting_amp_seamanship)
  [http://seattle.bibliocommons.com/item/show/1797519030_cruising_under_sail](http://seattle.bibliocommons.com/item/show/1797519030_cruising_under_sail)
  [http://seattle.bibliocommons.com/item/show/251764030_the_weather_of_the_pacific_northwest](http://seattle.bibliocommons.com/item/show/251764030_the_weather_of_the_pacific_northwest)

Border and Customs information
- Pleasure boat border crossing information from the US Customs and Border Patrol  
- Pleasure boat border crossing information from the Canada Border Services Agency  
- CANPASS program for frequent travelers (Canada Border Services Agency)  
- NEXUS program for frequent travelers (US Customs and Border Patrol)  
- Small Vessel Reporting System (CBSA program in cooperation with US CBA)  

Bridge and Locks information
- Boater information for Hiram M. Chittenden Locks from the US Army Corps of Engineers  
• Lake Washington Bridge information from the WA State Dept. of Transportation. Includes information on SR-520 bridge openings as well as environmental information such as temperature and wind speed.  
http://www.wsdot.wa.gov/traffic/bridges/

• Lake Washington Ship Canal Bridge information from Seattle Dept. of Transportation. Includes bridge clearance and opening information for all bascule bridges over the ship canal.  
http://www.seattle.gov/transportation/bridgeopenings.htm

NOAA
• Magnetic field calculator for calculating current magnetic declination/variation from the National Geophysical Data Center  
http://www.ngdc.noaa.gov/geomag-web

• Nautical charts from the Office of the Coast Survey (including downloadable charts)  
http://www.nauticalcharts.noaa.gov

• WX Radio weather information from the National Weather Service Marine Forecasts  
http://www.nws.noaa.gov/om/marine/wxradio.htm

US Coast Guard
• Navigation rules from the US Coast Guard Navigation Center  

• Weekly local notices to mariners, 13th district, also containing information about the SR-520 and Salmon Bay (“Railroad”) Bridge  
http://www.navcen.uscg.gov/?pageName=lnmDistrict&region=13

Other sources

• http://sailboatdata.com Crowd-sourced data about thousands of sailboats. Take care in that there are many models of boats, all with slightly different characteristics.

• http://captnmike.com Useful advice on boating and safety from a local Coast Guard-licensed Master sailor