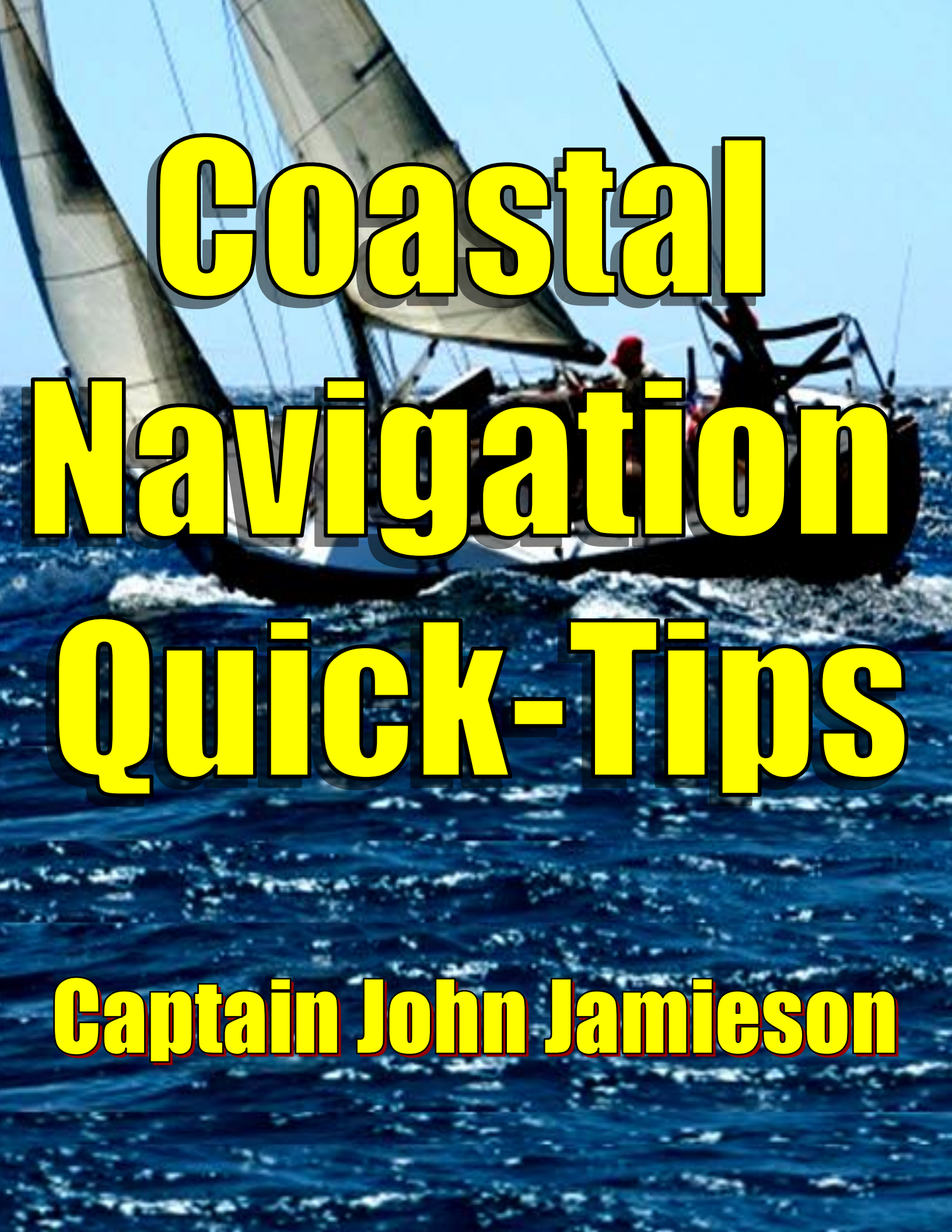
Coastal
Navigation
Quick-Tips
Captain John Jamieson

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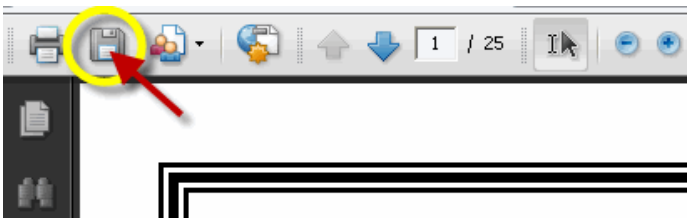

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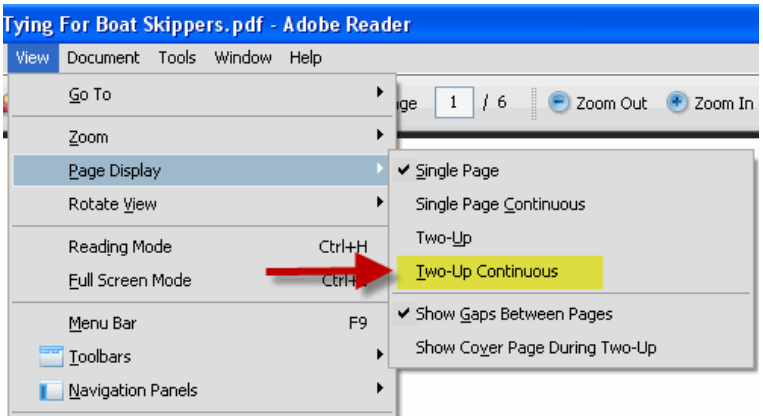

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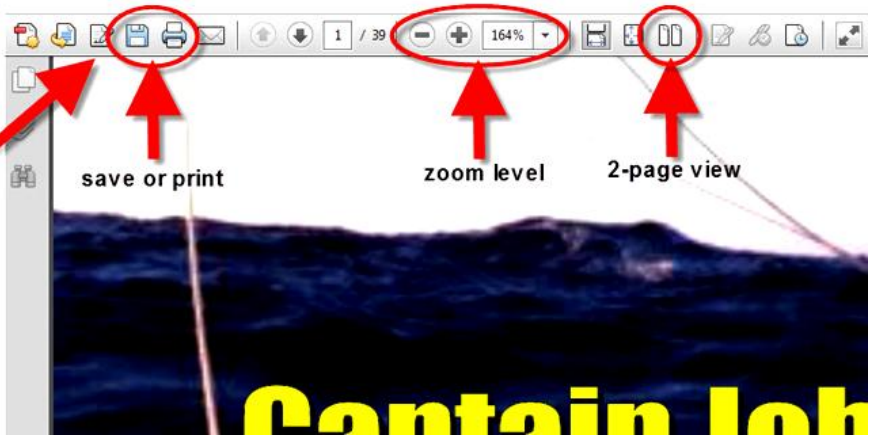


Introduction

How would you like to have fast, easy at-your-fingertips navigation techniques that could raise the bar on sailing navigation aboard your boat? After all, as wonderful as GPS or chart plotters are, they can black out in the blink of an eye. Or give you a false sense of security.

Just how did sailors find their way for so many years—fast and easy? And do most of their navigation without the complexities of plotting on a chart in a pitching, rolling cabin.

This book will show you how to pass a dangerous shoal without a nautical chart, find how far you are off the coast with just your fist, use canyons and valleys beneath the sea to find your way, and show you navigation methods on your chart plotter you won't find in any user's manual.

This book isn't meant to be an encyclopedic work. Instead, it will show you the cream-of-the-crop navigation techniques that you can use in a small, cramped cockpit in most any sailing weather.

With just a bit of practice, you can master the basics of sailing navigation and gain the confidence you need to navigate anywhere you please. So turn the page, dive in, and have fun!

John Jamieson
Vero Beach, Florida

Table of Contents

1 – Shoot Danger Bearings for Safety

Strong winds heel your small cruising boat as you approach the rock-infested entrance to the pristine cove you've selected for an overnight anchorage. Your main concerns are those ship-killing rocks on the starboard side of the entrance. What's the fastest, easiest method to back up your GPS navigation for safe passage?

In this Chapter, you will learn how to:

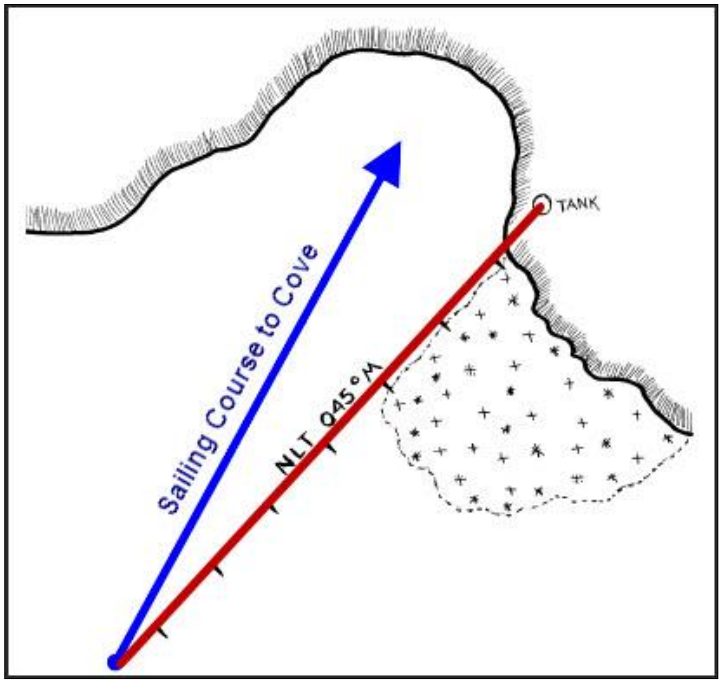
- ✓ Use a single plotted bearing line to pass a deadly shoal.
- ✓ Label danger bearings to keep your sailboat safe.
- ✓ Take action when you see your danger bearing rise or fall.

It's easy to ignore easy, traditional forms of navigation with so many touch-pad black box navigation devices at your fingertips.

Shorthanded sailors in particular need fast, easy, works-every-time methods that require a minimum of chart work.

Use the simple danger bearing. All your chart work can be done dozens of miles before you get close to shoals or dangerous reefs.

It's fast, fun, easy, and accurate. Grab your trusty hand bearing compass and follow these easy steps:



Draw a danger bearing along the edge of the shoal. Take care to label the danger bearing the correct way (see description below).

1. Choose a Prominent Object.

Study your navigation chart and find a prominent object on the same side as the danger. For example, if an outcrop of dangerous rocks lies to starboard, select a prominent tank, tower, lighthouse or other object on the far side of the danger on the starboard side.

Note in the illustration that the dangerous reef lies to starboard. The sailing skipper chooses a prominent TANK (note: on nautical charts--prominent, easy-to-see objects are always labeled in all capitals) on the far side of the dangerous reef on the same side as the danger (to starboard).

2. Plot the Danger Bearing Line.

Draw a line from the charted object back out onto the water (see illustration) on the outer edge of the danger. Note in the illustration how the line clears the danger. Extend the line far enough so that you can start taking bearings one to two miles before you pass the danger.

3. Measure the Danger Bearing Line.

Find the magnetic bearing of your prominent object. This will be the danger bearing you'll use. Check your measurement three times for safety's sake. That might seem silly, but parallel rules, protractors, and other measuring tools can slip and slide. Your bearings should read the same.

4. Label the Top of the Danger Bearing Line.

Label lines for safety. Not many things are as important as crystal clear labels in navigation, in particular with short-handed crews in tough sailing conditions.

Danger bearings are always labeled to tell you in an instant whether any bearing you take to the prominent object will be dangerous. Prefix your danger bearing with NMT (Not More Than) for dangers to port. Prefix your danger bearing with NLT (Not Less Than) for dangers to starboard.

Notice in the illustration the danger lies to starboard, so we prefix the danger bearing with NLT. This means any bearing we take to the prominent object--in this case a TANK--should read 045M or higher.

If we take a bearing of 045M, 046M, 047M, 048M… we are sailing in deep water. If we take a bearing less than 045M (i.e. 044, 043, 042…), we are standing into danger, and must change course away from the danger.

5. Take Bearings Often.

As soon as you sight your prominent object, start taking danger bearings. Continue to take bearings until you are clear of the danger. Follow the rule on top of your line. Adjust your sailing course toward the wind or current in order to compensate for drift or leeway. If at any time, your bearings fail to meet the danger bearing criteria written on top of the danger bearing line, turn hard away from the danger.

In the illustration, if we take a bearing to the tank of 043M, this indicates we are standing into danger. We must turn hard away from the danger and steer for deeper water. We will continue to shoot bearings to the TANK until the hand bearing compass reads 045M or more. That way, we will know right away as soon as we are back in safe water.

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Now you know how a single danger bearing can help you sail single or short-handed past the worst dangers in safety. Coming up in Chapter 2, use a second, famous method to pass a deadly coral reef or rocking shoal—without a nautical chart!
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2 - Pass a Deadly Reef with “60 Do-Da”

Your nautical chart shows a dangerous coral strewn reef just ahead off of the port bow. The sun will set in just under an hour. You want to clear the reef before nightfall. What is the safest, fastest way to do this?
In this Chapter, you will learn how to:

- ✓ Sail past a deadly reef with one simple calculation.
- ✓ Use a simple, easy-to-remember memory key for safety.
- ✓ Keep your sailboat in deep water to protect keel and hull.

Imagine that you are sailing through the islands. A deadly reef extends out from an island. You want sail so that you keep the edge of the reef at least one full nautical mile off your boat. How can you do this—without a lot of fancy plotting and hair pulling anxiety?

Use the “Rule of 60” to give you a safe sailing solution fast. This will take you no more than ten seconds, and it's accurate, and can be done without a lot of chart work. Follow these five easy steps:

1. Determine the Distance Off

Check the nautical chart and determine how close you want to pass the hazard. Leeway, or side-slip, makes a big difference in small cruising sailboats. Choose the downwind or down current side if your chart shows that side to be safe.

2. Measure the Distance Ahead
How far ahead is the hazard? Base this calculation on when you make your turn. For instance, if you plan on making the turn in five minutes, project ahead where your position will be in five minutes. Then measure the distance to the reef from that point. This adds a safety factor for peace-of-mind.

3. Make Two Simple Calculations

Multiply 60 time your distance off (Step 1). Divide this factor by the distance ahead. This gives you the number of degrees you need to change course to pass the danger safely.

4. Apply the Degrees to the Compass Course

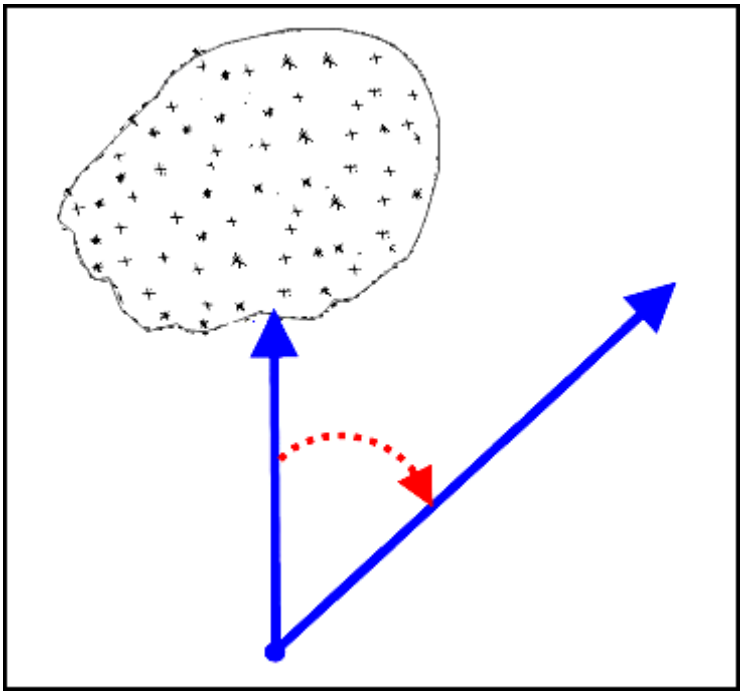
Take care to apply the degrees to your compass course in the correct direction. Use this memory aid:

REEF-RIGHT-REDUCE

REEF-LEFT-ENLARGE

* To keep the reef to the right (starboard) side of the boat, REDUCE (subtract) the degrees from your sailing course.

* To keep the reef to the left (port) side of the boat, ENLARGE (add) the degrees to your sailing course.



Use the "Rule of 60" to pass a reef in safety. Determine the distance the shoal lies ahead, how far off your want to pass, and which side to pass. (See description below).

5. Check the Chart Again

Look at your chart one more time. Measure the new course and see if it makes sense. If it doesn't, stop or heave-to until you get oriented and understand the navigation picture.

Example:

*Y*ou are northbound in the Bahamas, reaching on port tack in a brisk northwesterly breeze. You are on a course of 000^{o} true (see illustration above).

Three miles ahead lies a large coral reef. You check the chart and decide that you want to keep three miles off of the reef and keep the reef on your left (port) side as you pass.

60 X 3 (distance off) = 180 / 3 (distance ahead) = 60^{o}.
We want to keep the reef to our left. Add (REEF-LEFT-ENLARGE) 60^{o} to your course.

000^{o} + 60^{o} = 060^{o} degrees true. Apply variation to convert this true course to a magnetic course. Remember to add westerly and subtract easterly variation to find the magnetic course (see the eBook "*Sailing Navigation – Easy Calculations for Sailors*" to learn more about variation).

Captain John's Sailing Tip:
Always use the "Rule of 60" with caution. It does not tell you the effect of current or leeway once you change to your new course. You must estimate and apply current and leeway to any sailing course. See these references to learn more about this…

- *Sailing with Leeway* http://www.skippertips.com/snip/819.htm
- *Sailing in a Current:* http://www.skippertips.com/snip/820.htm
- *"Seamanship Secrets"; Chapter 5, Tides; Currents, and Leeway.*

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Practice the "Rule of 60" to gain the confidence and skill you need to pass any dangerous reef that lies ahead in your path. Coming up in Chapter 3, learn a "fun to know" way to find your distance off land with just the fist of one hand.
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3 – Make a Fist for Distance Off Land

As a sailing skipper, the more you know about sailing navigation backup methods, the better you will be equipped to handle the unexpected. And a lot of tricks and tips are just plain fun! Here are five favorites you will want to add to your treasure chest of knowledge.

In this Chapter, you will learn how to:

- ✓ Determine your distance to an island without chart work.
- ✓ Make a fast navigation calculation in less than 10 seconds.
- ✓ Use a fast, easy technique to backup your GPS navigation.

Did you know you can use your own fist to tell how far you are from land? Try this simple calculation to give you a rough idea of your distance from two objects, islands, or points of land. Follow these three easy steps:

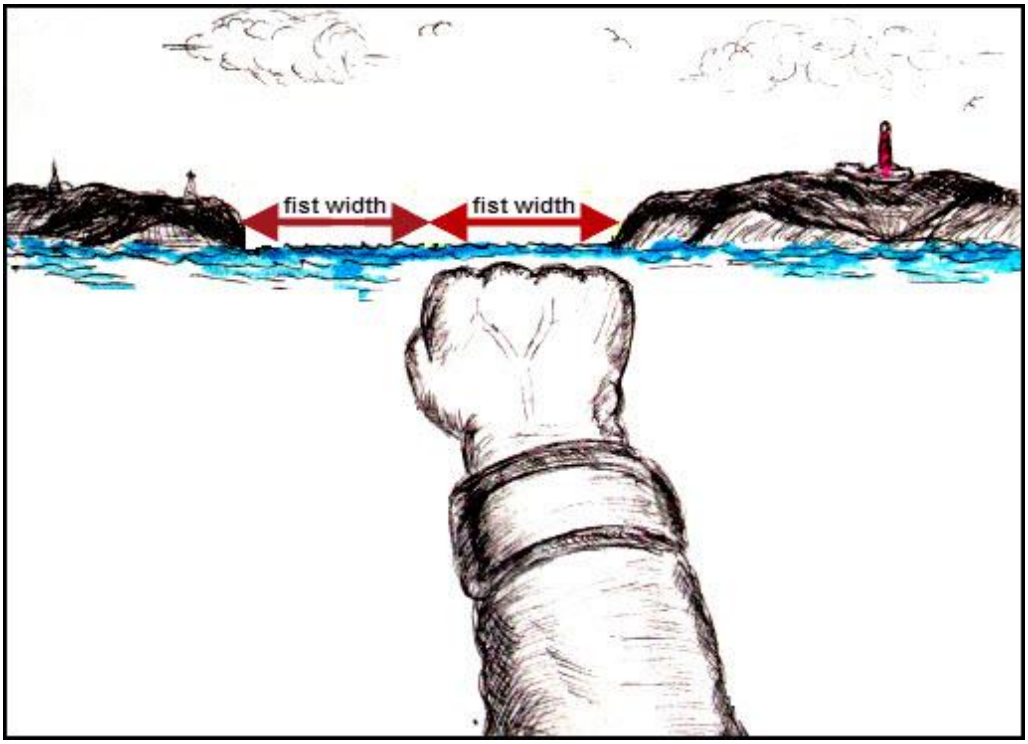
1. Locate two objects on your nautical chart. These might be buoys, lights, or landmass. Measure the distance between the two objects. Write this number down.

2. Step outside and find both objects or land points. Make a fist and extend your arm straight out in front of you with the fist horizontal. Place one edge of the fist alongside one of the objects.

3. Use your other fist to "walk" over to the other object. Count the number of "fists" between the two objects or land points. Use your best judgment for parts of a fist. Use .25 for each full knuckle. Write this number down.

4. Divide the number of fists into **7** (the "constant" in this calculation). For example, if you counted 2 fists, your calculation would be **7** / 2 = 3.5.

5. Multiply this number by the distance in nautical miles you measured between the objects on your navigational chart. This gives your distance off the objects.



Use a fist to determine your distance off of two islands. Divide the number of fists into 7. Multiply the result by the distance between the island edges.

Example:

You are approaching a pass between two islands. You measure 1.4 miles between the islands on the chart. Then you step outside; make a horizontal fist with each hand, and walk the fists from the inside edge of one island to the other.

You estimate 2 fists between the islands. How far away are you from the island pass?
7/2 =3.5
3.5 x 1.4 = <u>4.9 miles</u> to the island pass.

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Write simple sailing navigation tips like these in your logbook for future reference. Practice them with other forms of navigation to increase your skills and gain confidence in your abilities as a sailing skipper. Coming up in Chapter 4, discover a little-known technique to use underwater canyons and valleys to lead you to landfall in thick pea-soup fog!
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4 – Find Your Harbor in Pea-Soup Fog

Imagine that you approach landfall in thick, pea-soup fog. Your plotter or nautical GPS have become unreliable. You have a sick crew aboard and need to make port. Now what, skipper?

In this Chapter, you will learn how to:

- ✓ Locate charted depth contour to find your way home with confidence.
- ✓ Use a hundred-year little-known technique to sail to your landfall.
- ✓ Arrive in safety at a harbor entrance in fog, haze, or heavy weather.

Use one easy method of sure-fire navigation that's proven itself time and again for over 100 years. Think of this technique—called “longshore piloting"--as the *deliberate miss* to make positive landfall.

Tools You Need:

- Nautical chart
- Parallel Rules, Protractor, or Weem's Plotter
- Plotting Compass
- #2 Pencils
- Highlighter (any color except red)

1. Choose Your Contour with Care

Remember that depths are shown on depth contours in increments of 6 (see related article below). Look near the land you are aiming for. Locate the contour curves that parallel the coast.

Look for a contour at least 2.5 X the draft of your boat (rounded up to the closest interval of 6). For example, if you have a draft of 6 feet, 2.5 X 6 = 15 feet. You should look for a depth contour equal to or greater than 18 feet. Highlight this curve so that it stands out on your nautical chart.

2. Measure Two to Three Miles Upwind

Determine which side of the channel entrance lies upwind. You will aim for the upwind side so that you can reach or run to the entrance.

Use your plotting compass to measure two or more nautical miles on the right or left (Latitude scale) side of your chart. Push the needle point of the compass into the entrance buoy or light that marks the entrance to your channel. Sweep the other (pencil lead side) plotting compass leg over the upwind side of your navigation chart.

3. Plot Your Course

Measure your course from your current position to your aim spot. Convert your course from true direction to magnetic direction (see related article below). Use your plotting compass to measure the distance from your current position to your aim spot.

4. Label Everything for Clarity

Write the magnetic course in big bold letters on top of the plotted course line. Use a capital C, hyphen, the magnetic course, direction arrow. For example: **C-135°->**

Place a similar speed label on the bottom of the line beneath the course label. Use a capital S, hyphen, the distance in nautical miles. For example **S-5.0**. Labels make your course and speed easy to read for all hands, avoids confusion, and lowers stress levels.

5. Calculate Time to the Contour

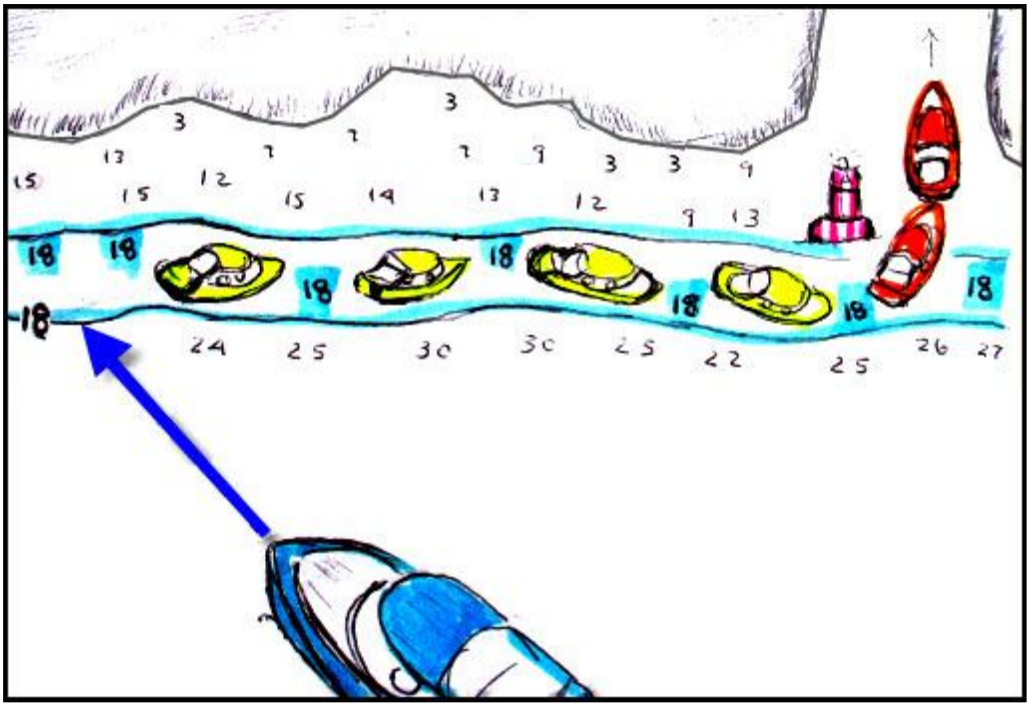
Divide your distance by your estimated speed. For example, for a distance of 8 miles and speed of 5 knots, your time enroute would be 8 / 5 = 1.6 hours, or 1 hour 36 minutes.

Add this time to the time you begin to steer the new course. If you begin at 1000, your estimated time of arrival at the contour would be 1136.

Place a dot and half circle (DR symbol) onto the contour line. Label this DR position with the time and type of position. In this example you would label the line 1136 DR.

6. Watch the Depth Sounder

Correct the charted depth to the depth that will be displayed on your depth sounder. You need to do this so that you know when you arrive at the charted contour curve. Charts show depths at mean lower low water (MLLW) or lowest astronomical tide (LAT).



Look for contour lines on your nautical chart that run approximately parallel to the coast line. Aim 2 miles or more upwind or up current of your destination. Turn at the contour line and sail downwind to your destination.

Example:

What will your depth sounder read when you arrive at the 18 foot curve (illustration)?

Location of transducer 4 feet below waterline = -4.0 feet
Tidal correction from GPS or tide table = +2.0 feet.
-4.0 feet (transducer) + 2.0 feet (tide correction) = -2.0 feet corrected depth.
18 feet charted contour line – 2.0 feet corrected depth = <u>16 feet on the depth sounder</u>.

7. Turn and Run to Your Destination

Steer your course and watch the depth sounder. As soon as your depth sounder reads the same as your calculation, turn downwind or down current. Determine an accurate course, new speed, and time of arrival to the buoy or light that marks the entrance to your harbor.

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Now you know how to use "longshore" piloting in thick weather to find your way home—even if your black box navigation goes on the blink. Coming up next in Chapter 5, create a “highway of safety” on your chart plotter or GPS to sail through a narrow pass smooth and easy!
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5 – Sail through a Pass with Longitude

Do you backup your sailing navigation with more than one technique? Did you know that you can use your gps longitude to help you navigate through a narrow passage with dangerous shoals all around?

In this Chapter, you will learn how to:

- ✓ Combine the power of traditional and electronic navigation.
- ✓ Use the magic of longitude to keep your boat in safe water.
- ✓ Boost you sailing navigation with less stress and more fun.

If you are anything like me, anything that makes tough navigation simpler ranks high on my “must know” list. Use the power of your nautical chart and chart plotter (or GPS) when you create a virtual “highway” in the water.

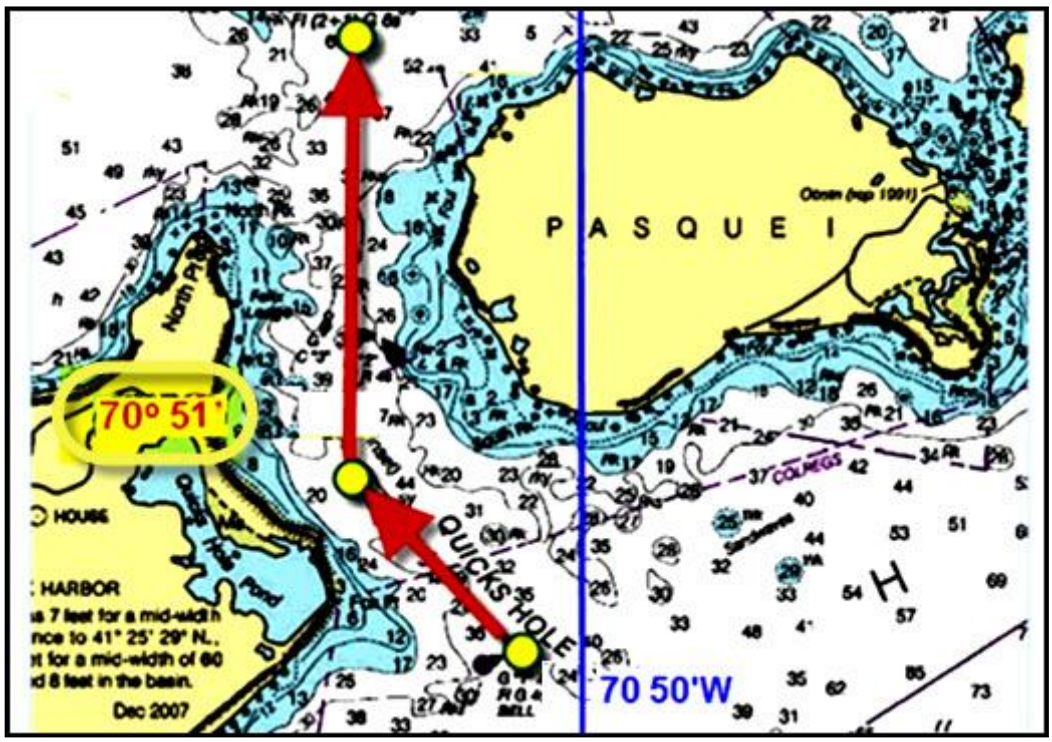
Longitude lines run north and south on your nautical chart or chart plotter. And, there are an infinite number of these lines. Chart cartographers just show a few of these on your chart or plotter.

Study your chart and determine if it’s safe to run a north or south course through a pass, between two islands, or down a channel. If so, you can use the longitude of your course line as a road—or street –to stay in the deeper water of the north/south pass.

Follow these three easy steps along with the illustration to see how to do this:

Tools You Need:

- Nautical chart
- Parallel Rules, Protractor, or Weem's Plotter
- Plotting Compass



Create longitude “limit lines” when sailing on a due north or due south course. Label and highlight the longitude so that it stands out (yellow circle). In this example, the northbound course equals longitude 70-51W. Your GPS longitude should also read 70-51W on this northbound leg through the pass.

1. If your course takes you due north or south through a passage, you can backup your nautical gps waypoint navigation with a longitude limit-line. Find the closest longitude line drawn on your nautical chart. Highlight this line (blue line in the illustration)

2. Plot your course line through the passage. Measure from the drawn longitude line (step 1) to your due north or due south track. Determine the longitude of the courseline and write this down near the course line (circled in yellow to the left of the course). This longitude equals the longitude of the north- or southbound course.

3. As soon as you turn onto the due north or due south courseline, watch the gps longitude. As long as it reads the same as the longitude of your north- or southbound course, you are staying on course. As with all of chart navigation, back this method up with other forms of navigation (i.e. visual bearings, soundings, radar) for navigation safety.

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Follow these easy steps to thread your way pass when sailing north or south with confidence. Coming up next in Chapter 6, unlock seven secret ways that you can use your GPS to make sailing or anchoring safer.
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6 - Use Your GPS to Warn of Danger

If you're anything like me, easy and fast sailing navigation tricks are the way to go. Set your nautical GPS alarm function to warn you when you approach dangers or cross over significant boundaries.

In this Chapter, you will learn how to use your GPS to:

- ✓ Warn you when you anchor starts to drag.
- ✓ Clear dangers by any desired amount at the touch of a button.
- ✓ Use underwater sea canyons safer sailing navigation.

Always use the nautical chart along with your GPS. This provides a cross-reference between these two navigation systems. Highlight your navigational chart and set your GPS alarm to trigger when one or more of these events happen along your sailing route:

1. Approach a Waypoint

Most GPS receivers beep when you get within half a nautical mile or so of a pre-determined waypoint. Pull up the "proximity" menu. This allows you to select any waypoint, increase the distance of the alarm, and toggle the alarm. Your proximity alarm has a distinct series of beeps to distinguish it from other alarms.

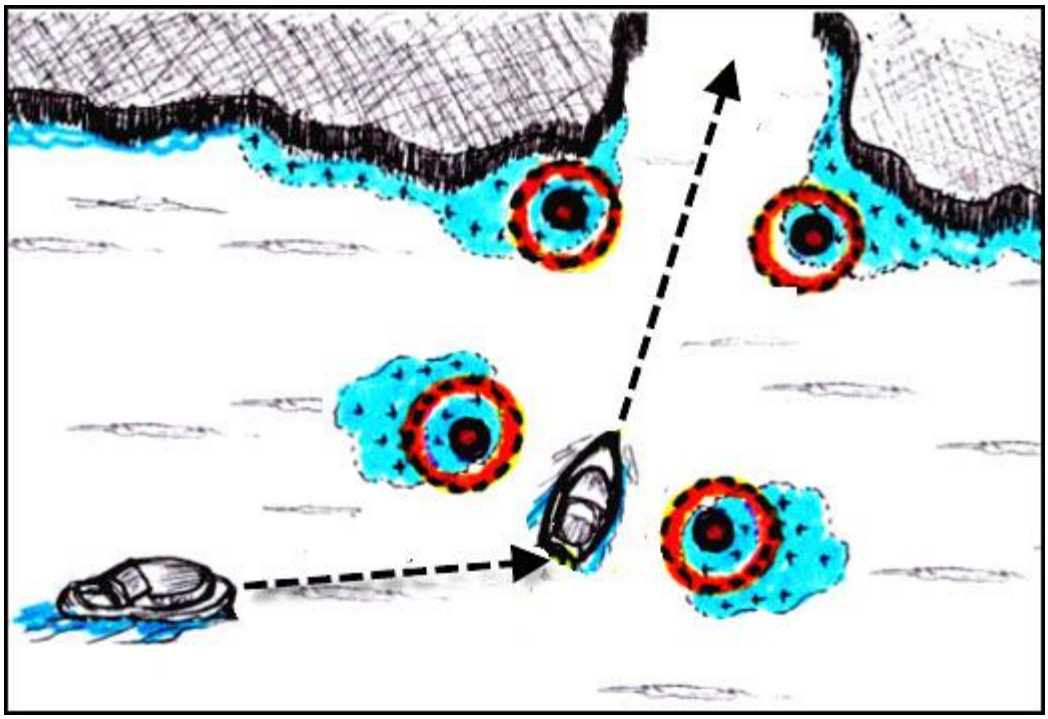
2. Arrive at a Turn

Do you have a critical turn up ahead? Will it require heading up, falling off, tacking, or jibing? Set the alarm to trigger well ahead of time. This gives you time to get ready for new sail trim or to take over from the auto-pilot.

3. Prepare to Make Landfall

Few things are as important as sighting an island peak or blinking light after days at sea. But few things cause more apprehension. You need time to orient yourself, double check that you are where you want to be.

Move the distance of your alarm so that it sounds when you are at least one hour away. This allows you time to scan the horizon with binoculars, get the anchor ground tackle ready, and make preparations for chart navigation in coastal waters.



Use your GPS proximity waypoint function to form “circles of safety” around dangers (Tip 6). The GPS alarm will trigger if you touch the edge of the circle.

4. Sail onto Soundings

When will you cross the 100 fathom curve? For centuries, this has marked the nautical boundary between offshore waters and coastal waters. Even if your depth sounder won't sound that deep, check the navigation chart and set a waypoint at the spot to trigger an alarm.

5. Cross over Depth Contours

Squiggly lines or enclosed circles on the chart show a number somewhere in the break of the line or circle. Check the navigational chart to see whether this denotes fathoms, feet, or meters. Program the alarm to sound when you cross specific contour curves as a backup to your electronic navigation.

6. Clear Deadly Dangers

Determine the closest safe distance to pass rocks, reefs, mud flats, or sand bars. Use your nautical chart to determine the latitude and longitude of the danger's center. Program this as a waypoint.

Use your nautical chart to draw an enclosed circle around the danger. Increase the radius by 50%. Set the radius for that waypoint in your GPS proximity function.

7. Warn of a Dragging Anchor

Draw a swing and drag circle around your anchored position. Set your alarm to trigger when the boat touches the edge of the circle. Make sure that you allow enough room for your small cruising boat to swing with wind and current changes.

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Use these seven nautical gps sailing tips to make your sailing navigation easier and more efficient than ever before.

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Keep these little-known coastal navigation tips and techniques handy to make your sailing navigation safer than ever before—wherever in the world you sail, race, or cruise. Stay safe and sail well!

Warmest regards,
Captain John Jamieson
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