

## Missionary Sailing School

After giving several examples of boating accidents by offshore sailors, cruising veteran Don Street writes, “*Despite these disasters, some people luck through with the most elementary kind of navigation. One system supposedly has it that you steer east southeast from Morehead City until the butter melts, then south southeast, and you’ll hit St. Thomas or Puerto Rico.*” [Donald M. Street, [SEAWISE](#)]

### Lesson 10: Coastal Navigation Part Two

Before we learn to use a nautical chart let’s review together navigational marks with special attention to how they would be noted on a chart. Open this **webpage**:  
<http://www.schoolofsailing.net/aidstonavigation.html>

Read this entire page about buoys and marks, noting their respective chart symbols (with and without lights) and other details provided about them.

Some buoys, as well as some **markers**, will have flashing lights [and sometimes sound producing devices as well]. At the bottom of this webpage “Light Phase Characteristics” is discussed. The explanation here is that when two flashing buoys are near each other they will be given a different flash sequence so they can be distinguished from one another in the dark. This is the primary reason, but there are others as well. Study the illustrations given in this section and note that the white areas represent the period that the light is on, the black being when it is off.

#### Notes:

- The abbreviations for these lights are usually as follows: Fixed [Fix] , Flashing [Fl], Quick flashing [Q, Qk on older charts], Occulting [Occ], Isophase [Iso], Group flash [Grp], and Morse code [Mo with the letter that is flashed appearing in quotes – i.e. Mo “A”] The morse code flash is commonly used at the *seabuo*y, the outermost buoy positioned to guide ships from sea into rivers or inlets. This buoy is also identified by a name with an abbreviated marking such as “M” for Miami and “LW” for Lake Worth.
- Although the ‘quick flash’ is used in busy harbors where the many lights of multiple buoys can be hard to ‘make out’, most times it is used to alert special attention to a navigational concern (such as abrupt change in the channel or a danger laying nearby) It is always best to give these quick flashing structures plenty of ‘room’.

Understanding navigational marks is crucial to safe boating. As one more review, go through this animated slide show, again paying attention to the chart symbol accompanying each **nav aid** [to advance the slides click on the “NEXT PAGE” button at bottom-right]

[http://www.boatingbasicsonline.com/content/general/6\\_3\\_f.php](http://www.boatingbasicsonline.com/content/general/6_3_f.php)

## **1. The Nautical Chart (more than a roadmap)**

Many of the waters where boats can sail have been *surveyed*, meaning sounded for water depths and mapped for hazards underwater, as well as measured for the dimensions of the neighboring shorelines. All of this information, along with notations of aids of navigation and special features on shore, is printed on the flat surface of a nautical *chart* [which is quite a feat considering that the earth is round!] This process is interesting and many useful things can be learned by reading books and articles on the subject. But for our purpose of getting you started with the basics as quickly as possible, we’ll defer all the theory and technical aspects of the cartography of charts to your own later study. Watch these three brief **videos** as an introduction to nautical charts:

- <http://www.youtube.com/watch?v=zznt4fsJaUM>
- <http://www.youtube.com/watch?v=NfA667wxcUo>
- [http://www.youtube.com/watch?v=AIOIWI\\_bjLE](http://www.youtube.com/watch?v=AIOIWI_bjLE)

Next, read all of this **webpage** to get an overview of nautical charts. There is plenty of information here - try to digest what you can but don’t worry, we’ll become familiar with it (especially the chart symbols) as we begin using a nautical chart next:

<http://www.schoolofsailing.net/unlockingthechart.html>

## **2. Chart Datum – (getting the ‘details’)**

Open this **webpage**:

<http://www.charts.noaa.gov/OnLineViewer/11475.shtml>

**NOAA** is the government’s agency for most things concerning the sea and weather [this page is from one of their websites.] They are the source for nautical charts pertaining to all U.S. waters. You will become familiar with their services, particularly when getting their coastal weather bulletins via your VHF ship’s radio.

[All Atlantic coast charts can be found here, but don’t go there now:

<http://www.charts.noaa.gov/OnLineViewer/AtlanticCoastViewerTable.shtml> ]

Now look over the chart [webpage] you just opened. There are scroll bars on the right and bottom margins. Slide the right bar down now until it is centered. You should now see 'navigation buttons' [a '**Plus**', '**Minus**', four **arrows**, and a **circle** with an arrow pointing out of its top – this button functions to **RESET** the chart to its 'starting position'] We will be using these scroll bars and buttons to navigate around the chart while we learn various chart symbols and discuss their importance to the mariner.

Now, move your cursor [appears as a 'pointing hand'] so that it hovers just below the word "Pierce" [top-center] and **left-click** [your mouse button.] This will 'center' the chart where you want it. Then click three times on the **Plus** ["+"] navigation button [chart will enlarge by increments] . You should now be able to read the following information [use the scroll bars to move the screen if all the lines are not in view]:

- **Fort Pierce Harbor** - the central feature of this chart.
- **Mercator Projection** - meaning, a round earth laid out onto a flat piece of paper by proportionately adjusting some of the dimensions of various features such as land.
- **Scale 1:10,000 at Latitude 27° 28'** - This **latitude** is the midpoint of the north and south positions of the chart area. The *scale* means that one 'unit' on the map represents ten thousand 'units' in the 'real world'. This is a *harbor chart* – everything is fairly 'close up' with more detailed information. Compare this to, say, the *offshore chart* covering Cape Hatteras (NC) to the Straits of Florida (a chart with a scale of 1:1,200,000)

[Take a look at that chart at this time:

<http://www.charts.noaa.gov/OnLineViewer/11009.shtml>

Drag the right scroll bar down until the 'nav buttons' just appear. Place your cursor along the shoreline about an inch from the bottom (where the coastline begins to bend off towards the NW.) Left click to 'center' the chart here. Then click twice on the **Plus** button. You should now be able to see Fort Pierce Inlet. If not, hold the left mouse button down and 'drag' the chart downward until it appears. Notice there are few 'details' at this **scale**. Do you see a line of arrows leading to the top of the chart along the right side? This is the position of the center 'axis' of the Gulf Stream, where the fastest current is found. This chart is good for sailing offshore but not for coming into harbor. For that you would need a Harbor Chart. Now close this window and return to the harbor chart of Ft. Pierce.]

- **World Geodetic System 1984** - This refers to the 'standard' that determined the latitude and longitude used in creating this chart. More on those terms in the next lesson. But for now, this information is important when using a GPS device (also to be covered later) in which

you would have to enter which *chart datum* you are using. [This one would be abbreviated **WGS 84**]

- Finally and most importantly **SOUNDINGS IN FEET**. You need to always know what ‘unit’ was used in measuring the water depth on a chart (in this case ‘feet’). Thus a ‘1’ placed over the water portions of the chart is one foot of water depth at average low tide [called *mean low water* in chart talk]; a ‘6’ is six feet; a ‘½’ is...[well you get the point]. But what if the soundings were in **Meters**? Then a ‘1’ would be about three feet, a ‘2’ nearly 6½, and any decimals would be ‘tenths’ of a meter [meters are used on most charts for waters outside of the U.S.] And there are *fathoms* (one unit is 6 feet) used for the greater depths of offshore charts [such as the offshore chart you looked at a few moments ago.]

It is obvious why you must never confuse the depth notations as you move from one chart to another. As a precaution, I have always highlighted the soundings notation with a bright color and, on some of my charts, I wrote “METERS” or “FEET” in large letters several places around the chart. [Trust me...mistakes do happen!]

### **3. Using the Nautical Chart**

Now that we know the type of chart we are using, let’s begin our ‘journey’ from seaward, as though we are coming into this harbor from, say, the Bahamas. Our *approach* is going to be from the SE [lower right corner of the chart.]

First, **RESET** the chart to the ‘starting position’ [by clicking on the button having a circle with an arrow pointing out - should be along the bottom of your browser window at this time.]

Note that ‘ocean’ fills the right side of the chart (to the East, white in color) and ‘land’(beige) with shallower ‘inland waters’ (blue) to the left (West). Now, **left-click** on the letter “A” in the slanted word “ATLANTIC” [along the right side of the chart - the chart will move, ‘centering’ on this selected spot] Then click once on the **Plus Button**.

You should be able to see what appears to be a ‘roadway’ [two dotted lines and a solid one in the center] across the center of your chart. This represents a *dredged channel*, one that has been deepened by man, usually having fairly steep sides. The center line will be the deepest water. [usually a *magenta* (purple-like) line on paper charts. Magenta is used on charts for the preferred channel and for red navigation marks because that color is still visible when charts are viewed at night

using a red light. Using red light helps preserve your night vision.] This is the *ship's* or *entrance channel* into the harbor.

There is a lone buoy to seaward [appears as a magenta 'cone' on right side of chart] Left click on this buoy, then press the **Plus button twice**.

This is a **red** buoy having the number "2". It also has a red flashing light with a 4 second delay between each flash. Even though this is a typical 'channel buoy', it is here functioning as the *sea buoy* [which are usually a two colored, taller buoy having a white or yellow light and a 'letter' rather than number] Notice that the water depths around this buoy are between 38 and 41 feet at low tide.

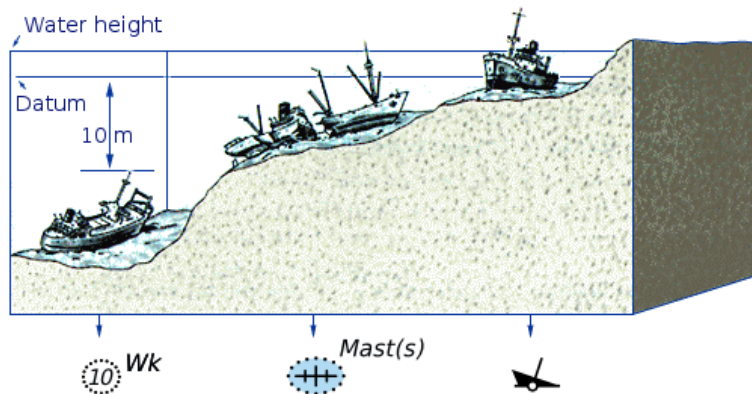
Now, let's head towards shore. To 'head west' along the entrance channel hold down your left button and 'drag' the chart to the right until the next two buoys are about centered. Note that red "4" will be on your right as you 'return' from sea, green "3" on your left [port]. They both have flashing lights, but at the quicker rate of 2½ seconds between flashes. Thus, as you are approaching from sea you will be able to readily tell which 'red' you are looking at, even on a very dark night.

The 'squiggly' lines leading away from these buoys are *depth contour lines*, very much like the contour lines used on topographical maps which describe elevation changes in the landscape. Follow the lower one going south [away from buoy "3"] until you see a small "30" turned sideways within the line. This means that anywhere along this line the depth is 30 feet. [Notice that depths to the right of it are more than 30 and to the left below 30.]

Go a little further 'south' along the line and you will find a depth notation of "29" with an "S" beneath it. The 'S' is describing "bottom characteristics" [in this case it is mostly 'sand', an excellent place to anchor] An "M" would be 'mud', "Co"=coral, "Sh"=shells, "rky"=rocky, etc. Knowing the 'bottom condition' is important when anchoring, but is of most interest to commercial fishermen.

Now let's 'sail' slightly 'west' and you will find a blue circle with a dotted ring, having something like fence posts in its center. This is the chart symbol for a 'sunken wreck' [either a boat that was lost or some other submerged object] Always treat these as a navigational 'hazard' - though they may sometimes be in waters deep enough to be passed over by smaller craft. The letters "**PA**" stand for "*position approximate*" meaning it is not necessarily in this exact spot but at least close to it, so be extra careful!

The following illustration gives three of the chart symbols normally used to identify these ‘obstructions to navigation’ with a corresponding example of what you might expect to find there. Notice the line marked “Datum” – that would be the depth at MLW on the chart near where this hazard is found.



There are more than a hundred various chart symbols, and even more variations of them, covering nearly everything of concern to the mariner (both things on or under the water, as well as features on shore that may be needed to assist in navigation.) It would take time to learn all of them and for that reason I am trying to limit this lesson to those which will be most common.

The full listing of all chart symbols is found in the “U.S. Chart No.1” produced by NOAA. This is published in booklet form and can be found at most marine stores. Also, there are *Chart Kits* [a collection of charts for particular cruising locations – such as the Bahamas] that will include lists of chart symbols.] But you can download the lists in PDF format, by their groupings, from the following NOAA site [check it out later, though]:

<http://www.nauticalcharts.noaa.gov/mcd/chartno1.htm>

Just west of this ‘wreck’ is another **depth contour**, this time measured at 18 feet. It makes an oval, suggesting a rise in the sea bed of either sand or, more likely, coral. Here the shallowest point is 15 [not much trouble if we sailed this way ourselves.] But always watch for much shallower ones that can appear in areas of otherwise deeper water!!!

Now ‘sail’ back up to buoys “3” and “4”, then follow the channel towards shore to the next pair of buoys [go west].

This pair is Green 5 and Red 6, both with 4 sec. flashers. To keep your chart at the same setting as mine, click now to **RESET**, left click between these two buoys [to ‘center’ the chart here], and then click the **Plus** three times.

Do you see the two beige land features pointing towards sea from the left side of your chart? [There is a dashed magenta line connecting them – the line means that the regulations governing mariners offshore ends and the rules for inland waters now applies.] This is the *jetty* (which may be earth, concrete, but most often just piles of very large stones.) They are used to prevent sand, which is moved along the shore by the breaking surf, from filling in [*shoaling over*] the channel. They can also be a sailor’s worse nightmare when caught in bad weather or fog while ‘heading in’. Don’t chance hitting one. Read your charts and use good judgement. [There is a good rule: “*When in doubt – stay out.*”] Most jetties will have flashing buoys or markers positioned immediately beyond their ends [this one doesn’t] Often their lights will be ‘quick flashers’ [every second].

Notice that that the water near the north jetty is shaded blue. There is also a place SE of the south jetty that is colored blue (a circle with a “6” in it). At the scale of this chart all water that is 6 feet [one fathom] or less is colored blue. This aids in quick identifying of waters likely too shallow for most boats. [You should always confirm how the chart you are using is indexed for color coding, however.]

Place your cursor on the “COLREGS’ line [dashed magenta line] and left click. Note that the contour lines on either side of the channel (between the jetties) are quite close, indicating an abrupt shallowing just outside of the channel. A ship’s channel like this can be anywhere from 35 to 50 ft deep, but here the waters along the jetties are a mere 8 feet or less. Now ‘sail’ to buoys 7 & 8 [drag chart until they are centered]

All of these astericks and plus signs above and around ‘Red 8’ indicate debris, rocks, or obstacles under the water and a danger to boats. The dotted line surrounding them also warns of danger in this area, and the word “Foul” means “*don’t try to anchor here – your anchor will get fouled*” [stuck on something]. On top of all that, the area between the two magenta lines is labeled “**Cable Area**”, meaning power or telephone cables cross over here, laying on the seabottom. Obviously, you should stay well south of ‘Red 8’ and don’t anchor here!

Now look along the shore around Dynamite Point [NW of Red 8]. There is a part of the water colored green having a dotted line around it. The green means that it is exposed at low tide but will be underwater at high tide. [Remember: a dotted line means ‘danger’] Dotted can also mean ‘prone to change’ with tidal conditions whereas a solid line [such as bordering the land areas] usually does not change.

Just west of the second magenta line you will see two “signs” across from each other [small circle with word “Sign”]. These structures must always be watched for because they are never lighted, sometimes too close to the navigatable channel, and once in a while missing their ‘sign’ [only a dark pole remains because someone ‘ran it over’] You may not even see any of it left but –trust me – there is probably a ‘stump’ beneath the water waiting to put a hole in your hull! Signs are used for everything from alerting to a marina up ahead, to slowing you down for Manatees, to marking the boundaries of a state park. If there is a chance you will sail outside of the regular channel it is a good practice to ‘highlight’ these in a bright color on your chart so you don’t forget to look for them as you sail by.

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This has been a long lesson and so we are going to continue from here in our next installment. Meanwhile, visit the NOAA site where you can download PDF files for chart symbols and notations:

<http://www.nauticalcharts.noaa.gov/mcd/chartno1.htm>

Finally, enjoy this *video* of children in St. Vincent (Caribbean) as a reminder of the precious souls that await us and the **good news** our ‘Gospel ships’ will carry:

<http://www.youtube.com/watch?v=1DaZguaJUtU&feature=related>

And for more sights and sounds of sailing in the Caribbean enjoy this one as well,

<http://www.youtube.com/watch?v=pBm97sTQscM&feature=related>