

Greetings, this lecture series will cover some basic COLREGS, ATONs (Aids to Navigation), and Navigation. **DISCLAIMER:** It is by no means all inclusive and probably more helpful to new crew that have little to no experience on the water. I only highlight some items. There are many more details in the regulations, please read those for the entire story vice the abridged summary.

## Navigation rules

### Pilot, navigate, communicate

What do I mean? I was trained in Naval Aviation and we had the priority of accomplishing tasks in the cockpit as, Aviate, Navigate, Communicate. Meaning, fly the airplane first, then do navigation, and finally, when both of those are squared away, communicate over the radio. For sailing, I changed Aviate to Pilot, meaning to drive the vessel.

- All vessels on high seas subject to International Regulations for the Prevention of Collisions at Sea, abbreviated to 72 COLREGS
- Individual countries have variations for inland waters
- COLREG demarcation lines printed on charts, i.e. Chesapeake Bay
- International and Inland rules published side by side in Nav Rules
- Vessels over 12m (40 feet) required to carry a copy onboard

### Stand on or give way

- Vessel required to take action is the Give Way
- Other is the Stand On vessel

### Appropriate Action

- Rule 16: take “early and substantial action to keep well clear”
  - course change significant enough so Stand On clearly sees
- Rule 17: Stand On required to maintain course and speed
- However, Rule 2: “General and Prudential Rule” requires all vessels to take whatever action necessary to avoid collision
  - i.e., Don’t steer your boat into a collision just because you are the Stand On or Right-of-Way (according to RRS)

### Just like RRS, Rule 14: **14 AVOIDING CONTACT**

A boat shall avoid contact with another boat if reasonably possible. However, a right-of-way boat, or one sailing within the *room* or *mark-room* to which she is entitled, need not act to avoid contact until it is clear that the other boat is not *keeping clear* or *giving room* or *mark-room*.

This should really be rule #1! See and Avoid! Why I use Pilot, navigate, communicate. The Helm should not be buried heads down in the cockpit and should be looking out and then scanning inside to his/her instruments, while listening to the radio.

### Rule 5: Lookout rule

- “Every vessel shall at all times maintain a proper lookout by **sight** and **hearing** as well as by all means available appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.”
  - anyone on deck can be a lookout; even passengers are encouraged

### **Rule 12: Sailing Vessels**

- Starboard tack is the Stand On
- Port tack is the Give Way
  - as determined by position of boom; boom to starboard = port tack

This comes from square rigged vessels back in the day. On a port tack, the end of the spar was tacked forward on the port side (port tack) with port being windward and starboard leeward.

TIP: don't sail across the bow of the Stand On if there's the least chance you will pass close. Anything causing you to slow down now risks collision. Pass astern; immediately puts you on diverging courses

- Same tack: boat to windward is the Give Way
- If on port tack and can't determine other sailboat's tack, assume Give Way
- When engine is running and in gear, now a power driven vessel

### **Rule 13: Overtaking**

- Overtaking vessel must remain clear, is the Give Way
- this includes sailboats passing a power driven vessel
- overtaking when within arc of 22.5 degrees abaft abeam on either side
- when being overtaken, maintain course and speed
- Overtaking rule applies before sail on sail rules

### **Rule 14: Head on**

- power driven vessels meeting on virtually reciprocal course both turn to starboard, pass port to port

### **Rule 15: Crossing**

- if two power driven vessels are neither meeting or overtaking, they are crossing
- vessels that has other on starboard side is the Give Way (see red port sidelight)

## **Vessels driven by oars**

- give them room. Kind of restricted in ability to maneuver in comparison because they are very slow

## **Rule 18: Responsibility between vessels**

- "hierarchy of privilege"

1. not under command (lost steering or propulsion)

2. restricted in ability to maneuver

Day shape: ball, diamond, ball

Night: red over white, over red

See a tugboat, look for tow and the cable between them!

3. Constrained by Draft

Shipping in a channel

4. Engaged in fishing

Day shape: two triangles apex together (looks like an hour glass)

Night: Green over White or Red over White

This is not a sport fisherman trolling with lines and poles

5. Under Sail

6. Power Driven

## **Security Zones**

- marked by buoys and security boats

- U.S. Navy: no vessel may approach within 100 yards of naval vessel longer than 100'

- All vessels within 500 yards operate at minimum safe speed

## Traffic Separation Schemes

- maritime equivalent of divided highways
  - marked on chart with dashed magenta lines and separation zone solid magenta
  - may have yellow buoys and yellow flashing lights
  - vessel operating in scheme required to use designated lane, slower traffic keeps right in lane
  - vessels must not operate within separation schemes; when crossing, cross as close to perpendicular as possible (rule 10)
  - Sailboats and other smaller craft not required to use if an inshore zone is available
- TIP: big ships move surprisingly fast and require large distances to stop, keep clear

## Danger Signal

- 5 short - "I am unsure of your intentions"

## Actions Signals (international)

- 3 short = operating astern propulsion (Int and Inland)
- 1 short = I am altering course to starboard
- 2 short = I am altering course to port

Notice the verbiage is slightly different but same result.  
Action vs. Intent

## Signals of Intent (Inland)

- **required** when in sight **and** within ½ nm
- 1 short = I intend to leave you on my port side
- 2 short = I intend to leave you on my starboard side
- vessel to which signal is directed must reply
  - agreement with same signal
  - disagreement with danger signal
- vessels under sail not required to use signals of intent **but**
- when sailboat is power driven you need to understand and respond

Channel 13 is bridge to bridge

## Sound Signals

- vessels under 12m (40') not obliged to produce sounds required by large vessels; however Rule 35(g) requires “make some other efficient sound” i.e. Air horn
- under sail signal is 1 long, 2 short repeated at intervals of not more than 2 minutes  
(prolong is 4 – 6 seconds, short is 1 second)
- power driven vessels underway is 1 long not more than 2 minutes apart (sailboat motoring)

## Listen

- when motoring, have a lookout forward to hear

## Safe Speed (this is just motherhood)

- proceed at safe speed
- take into account
  - visibility
  - density and type of traffic
  - time and space needed to maneuver
    - i.e. jibe moving at 6 kts and takes one minutes to jibe
    - = 600 feet of distance traveled during the jibe
    - So, need 600+ feet of visibility for a safe speed to execute the jibe

## **Navigation Lights**

- sunset to sunrise

- during restricted visibility

## **Sidelights**

Red = port side

Green = starboard side

112.5 degrees, from bow to 22.5 degrees abaft abeam

## **Stern Light**

- white

- 135 degrees, from 22.5 degrees abaft abeam on either side

- this is the “overtaking zone”

Sailboats under 20m (65') may carry sidelights and stern light in single lantern at the masthead

## **Masthead Light**

- power driven vessel must show white masthead light, arc covered by red and green sidelights

- power driven vessel 50m (164') or larger must show 2 masthead lights with stern light higher than forward light

- sailboat when motoring shows white masthead light, “Steaming light”

- sailboats under 7m (23') not required to carry nav lights but must have a flashlight to shine (onto sails is best way to be seen)

## **Anchor light**

- white 360 degree where can best be seen.

- sailboat is usually on the masthead

- day shape is a black ball in forward part of vessel

## ATONs (Aids to Navigation)

- U.S. Aids to Navigation System is made up of lateral aids
- buoys and beacons to mark sides of channel and limit of navigable water
  
- Buoys float on the water
- beacons attached to ground (pilings with nav mark) or land
- red buoys and beacons mark the right side of channel when entering port from seaward
  - even numbered
  - ascending as the channel leads inland
  - triangle shape
  - nun buoys (unlighted)
  - TIP: Red, right, returning
- green buoys and beacons mark the left side of channel when entering port from seaward
  - odd numbers
  - ascending
  - square shape
  - can buoys (unlighted)
- lighted buoys are not distinguished by their shapes
- junction mark (buoy): top color (light) marks side of preferred channel
- safe water buoy: red/white vertical striped, red ball on top
- IALA A and B regions
- North America uses IALA B, rest of the world IALA A
- IALA B means red, right, returning, IALA A is reversed
- ICW (Intracoastal Waterway): heading from New Jersey to Texas, yellow triangle left to starboard
  - yellow squares left to port

## Regulatory markers

- white cylindrical buoy with orange strip above and below one of four shapes
  - Circle: Controlled area. Speed limit or no wake
  - Square: Information. Direction or distances
  - Danger: Diamond.
  - Exclusion: Diamond with cross

## Chart No. 1









- legend for all charts
- Charts of U.S. waters are published by NOAA
- print on demand sources – updated with NOTAMs
- up to date charts in electronic form on NOAA website & can be downloaded
- chart books

## Chart orientation

- north is “up”
- graduations in degrees and minutes of latitude along sides
- longitude along the top and bottom

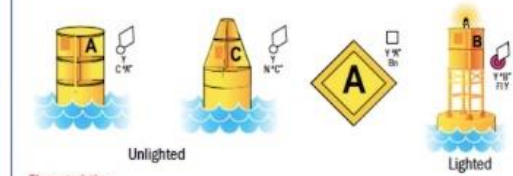
## Chart Datum

- NOAA uses WGS-84
  - soundings – depth of water
  - “mean lower low water” is what is printed on charts
    - except during particularly low tides, that is the least depth you would expect (but it can be lower)
- TIP: soundings printed from last survey. Could be 20 years or even 100 years
- Also, depths do change, erosion, silting, etc.



Symbol	Meaning	Examples
	<b>Danger</b> A diamond shape alerts boaters to hazards	
	<b>Restricted Operations</b> Marks with a circle indicate areas with regulated operations	
	<b>Exclusion</b> A diamond shape with a cross means boats are prohibited from the area	
	<b>Information</b> Marks with a square provide helpful information such as directions, distances, and locations	

### Special Aids

These Aids indicate special areas or features such as anchoring, traffic separation, fishnet area, cables or pipelines, military exercise areas, and jetties.



#### Characteristics

- All-yellow.
- Come in a variety of shapes.
- May have one black letter.
- If lit:  or 

### State Waters Obstruction Mark

The State Water Obstruction Mark indicates to a vessel operator that an obstruction to navigation extends from the nearest shore to the buoy. Do not pass between the buoy and the shore.



#### Characteristics

- Black-and-white vertically striped buoy.
- May show a white reflector or display a quick-flashing white light.

Mean Lower Low Water (MLLW) is the lowest of the two low tides per day (or the one low tide) averaged over a 19-year period.



## Chart notes

- i.e. “restricted area, see note A” read the notes, may affect your sail

## Compass terms

- magnetic needle attached to disk compass card
  - marked in degrees, usually 5 degree increments
  - rotates freely in a compass bowl filled with special oil
  - needle points to magnetic north
  - fixed to forward side of bowl is a “lubber’s line”, direction boat is pointing
- TIP: magnets, ferrous metal, and electric currents affect the compass
- avoid placing these items within 3 feet
  - includes flashlights, certain deck knives, portable radios

## Compass rose

- printed on every chart
- outer ring is True heading
- inner ring is magnetic headings (offset for magnetic variation)

## Variation

- difference between magnetic north and true north
- variation different around the globe
- wanders over time so there is a published drift rate in center of compass rose

## Deviation

- compass error pointing to magnetic north
- compass error from iron and magnetic fields
- “deviation card” is the corrections for a compass that has been swung to determine compass error

Kind of nerdy but I have swung a compass with a buddy on his boat. I have never used deviation, even when flying, but it is a factor on long range Dead Reckoning navigation. GPS has made this irrelevant for most scenarios.

