

ELECTRONIC NAVIGATION



REMBER RULE 7: RISK OF COLLISION?

- A vessel is required to use ALL available means to determine whether risk of collision exists!
- Do not **over** rely on electronic navigation, especially Radar!



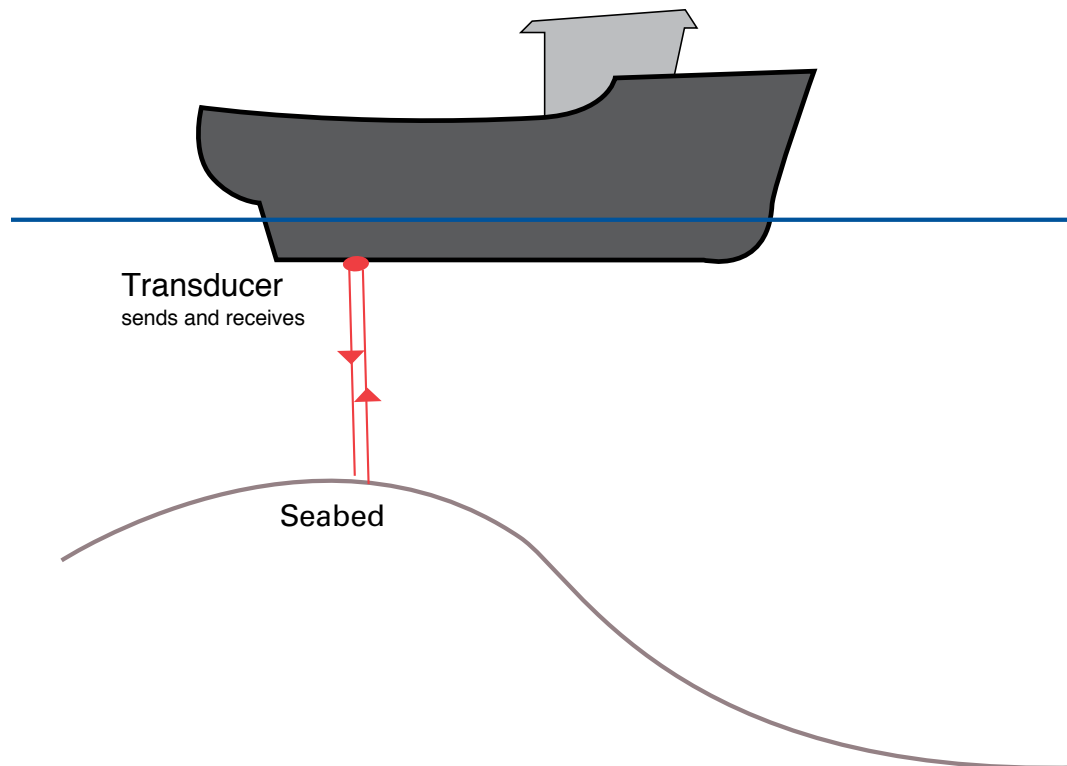
FATHOMETER

- Depth sounder
- Very simple but useful tool
- Easy to follow depth contours while navigating, especially during times of Restricted Visibility
- They are a great source of backup information to confirm a location
- Single Bearing Fix is possible with a reliable depth reading



DEPTH SOUNDS USE SOUND WAVES TO DETERMINE DEPTH

- Reflection
- Delay
- Strength of sound on return
- Transducers/transponders - send & receive



DEPTH SOUNDER

- Understand the settings on your depth sounder and allow for the transducer offset to the keel and waterline
- Depth alarms can be very useful
 - shallow water alarm
 - deep water alarm
 - specific depth alarm
- Variations in salinity may give false readings, with actual depths being greater than indicated
- Soft mud bottoms may return a double echo, one for the mud and a second showing the hard underlayer.
- Heavy masses of marine life, often microscopic, may return false bottom readings or show as a mid layer.

FISH FINDERS

- Fish finders are common on recreational vessels
- They function the same as a depth sounder, but have a screen to display the sonar returns, often showing the texture of the bottom and marine life
- Many use different or multiple sounding frequencies to provide a very detailed image



RADAR

- A radar system sends out high frequency electronic pulses from its rotating antenna.
- When these pulses strike an object, the signal is reflected back to the antenna.
- The radar system then calculates the range and bearing of the object and displays it on the screen in a position relative to the center dot of the sweep.
- Keep in mind not all materials reflect these signals. Wood and plastic vessels require a radar reflector to be visible to the system.
- **DO NOT RELY SOLELY ON RADAR:** it may not show all traffic!

PPI

- Plan Position Indicator
- Most common type of radar display
- Antenna in center
- Concentric circles represent distance to the vessel and can be set with the range function

PILOTING BY RADAR

- Fog & low visibility

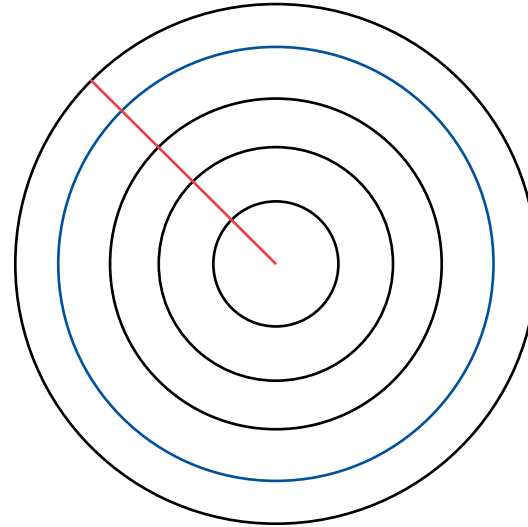


RADAR TERMS

- Range: distance something is from your vessel
 - Range rings on radar set by the user
- Target: any object detected in your vicinity
- Relative motion: target is displayed relative to your vessel
- Head up: always heading to the top of the screen
 - Heading mark

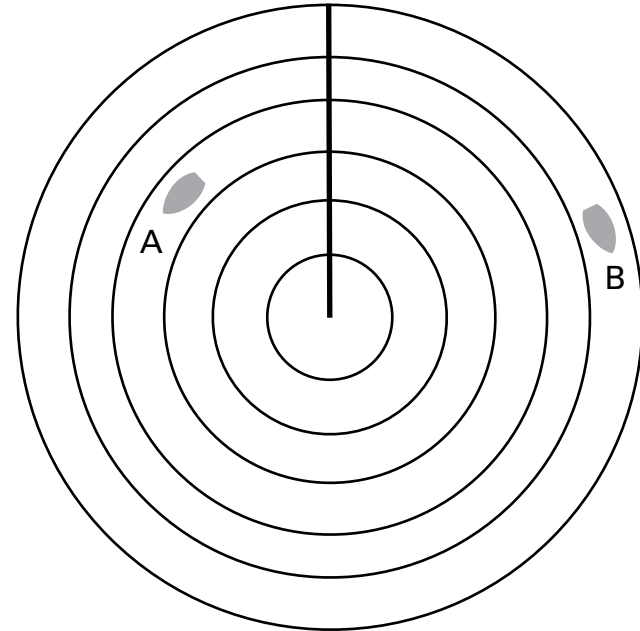
RADAR TERMS

- Variable Range Marker
- Electronic Bearing Line



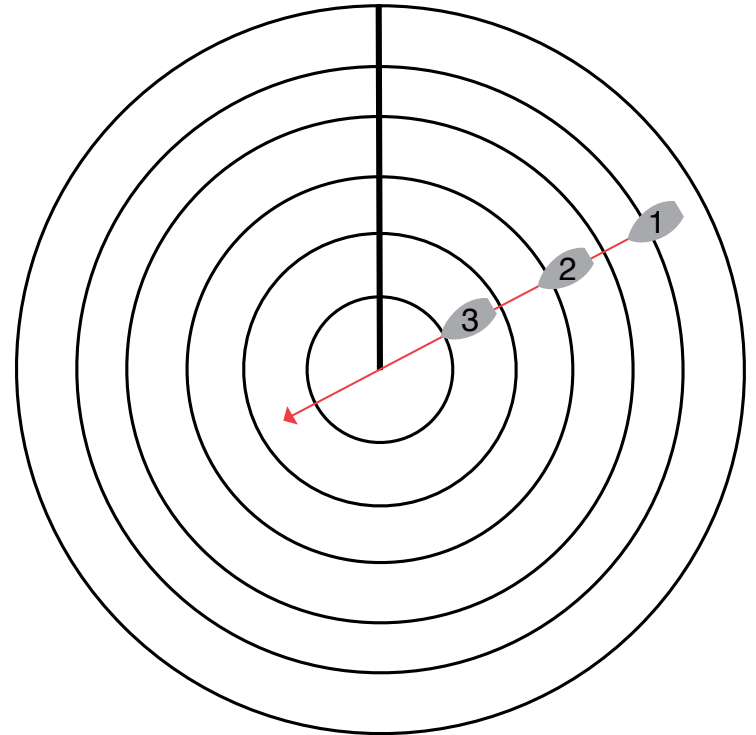
TARGETS

- Radar set to 6nm
- Rings 1nm
- A: Bearing 330ft; 3.5nm
- B: Bearing 60ft; 5.5nm



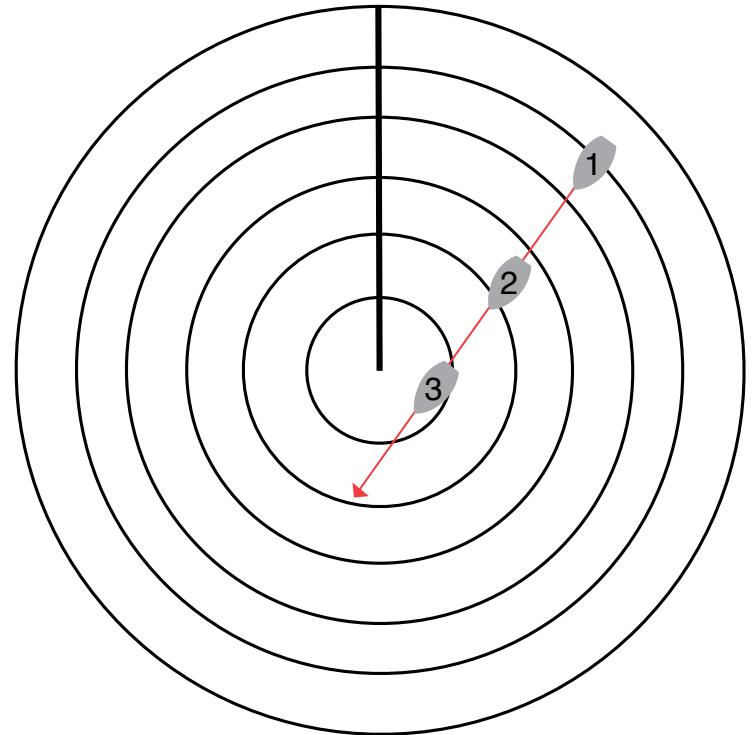
RISK OF COLLISION?

- This sequence of reflections indicate constant bearing and decreasing range.
- YES, there is a risk of collision!



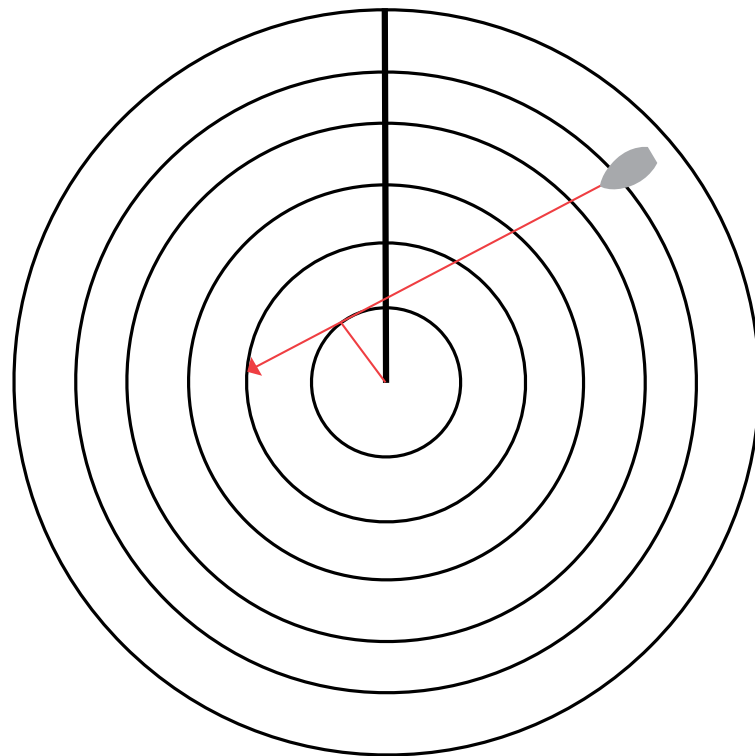
RISK OF COLLISION?

- This sequence of reflections indicate changing bearing and decreasing range.
- There is not a risk of collision at this time, but beware if the target is large, there may still be risk



CLOSEST POINT OF APPROACH

- This function shows you the closest point of approach and enables you to tell the range when you will cross.



RESOLUTION

-clouds, waves, rain all must be accounted for when using radar.....



GPS

- Global Positioning System



SATELLITES

- GPS utilizes a series of satellites that are in geosynchronous (fixed) orbit. The GPS unit knows precisely where these satellites are.
- These satellites send a timed signal to the GPS unit, which calculates the distance to the satellite based on the time shift in the signal. With multiple signals, a "fix" is generated with varying degrees of accuracy.
- Only need 3 clear signals for a fix; greater accuracy with more.
- 21 active satellites around the globe
- 5 satellites available at one time
- You can track the location and signal strength of visible satellites within the unit's functions and display screens.

GPS ACCURACY

- Standard Positioning Service (SPS)
- Commercially accurate to 328ft (100m)
- Precision Positioning Service (PPS)
- Military accurate to 58.4 ft (17.8m)
- Use only North American Datum (NAD-1983) or World Geodetic System (WGS-1984)

GPS RECEIVER CAPABILITIES

- Modern GPS units have tremendous capabilities, most with color screens and very high resolution of the local charts.
- Determines position
- Elapsed time and distance between points
- Range and Bearing to Waypoints or Cursor
- Course and Speed Over Ground (COG & SOG)
- Waypoints and routes
- May be interfaced with Radar, electronic mapping systems and auto-pilot