

RADAR CERTIFICATION STANDARDS

Outcome: To demonstrate an understanding of the principles and operation of radar for recreational boating.

Recommended Equipment: This course may be taught in a classroom, or on a boat (or both), and tested in a classroom utilizing a radar simulator, or on a boat equipped with radar.

Knowledge

1.0 Introduction to Radar and How It Works

- 1.1 Understand the basics of radar.
 - 1.1.1 Understand that the radar is aligned with the ship's head and how a radar works.
- 1.2 Understand how radar can be used for navigation, collision avoidance, and weather monitoring.

2.0 Radar Equipment and Operation

- 2.1 Understand the differences between broadband and pulse radar systems, including the power requirements of various radar units, broadband and pulse systems, the need for warm-up time (pulse system), and how resolution is affected when zooming in.
- 2.2 Understand the function of the radar components, including the antenna and display.
- 2.3 Understand how the following affect radar: antennas (closed radome and open array), antenna length (horizontal beam width), installation height, vertical beam width (gimbaled vs. fixed mount), WIFI vs. cable connections.
- 2.4 Understand the relative accuracy of target range vs. bearing returns on a small boat vs. a ship.

3.0 Radar Controls

- 3.1 Understand controls of a radar system, including range (zoom), gain, sea and rain clutter, VRM, EBL, range rings, cursor, day and night mode and interference rejection.
 - 3.1.1 Recognize the importance of adjusting the range to capture poor or distant targets.
- 3.2 Understand the various display modes such as true motion, relative motion, heads up, north up, course up.
- 3.3 Understand the pros and cons of overlaying radar on a MFD.
- 3.4 Understand the setup and use of guard zones.

4.0 Weather

- 4.1 Understand how range and bearing on a radar can be used to track the relative motion of localized weather phenomena such as squalls, rain showers, and thunderstorms.
- 4.2 Understand how a radar display can be used to determine the intensity of localized weather phenomena such as squalls, rain showers, and thunderstorms.

5.0 Radar Limitations and Capabilities

- 5.1 Understand the limitations of radar, including blind spots, shadow sectors, and false echoes.
- 5.2 Understand how the size, shape and composition of targets (i.e., small vessels, geographic features) influence the quality of returns.
- 5.3 Understand your vessel's quality of radar image and how to enhance it (i.e., radar reflector).
- 5.4 Understand a radar's potential to interfere with other electronic devices and the importance of proper shielding and installation.
- 5.5 Know when to rely on radar and when to use alternative methods for navigation and collision avoidance.
- 5.6 Describe the importance of using safe speed in restricted visibility as radar may not capture all targets.

6.0 Collision Avoidance

- 6.1 Understand the actions to be taken to avoid collision utilizing radar based on the relative positions of the vessels.
- 6.2 Understand the use of bridge-to-bridge communications to clarify collision avoidance actions.

Practical Skills

1.0 Radar Controls

- 1.1 Demonstrate the use of controls of a radar system, including range (zoom), gain, sea and rain clutter, VRM, EBL, range rings, cursor, day and night mode and interference rejection.
 - 1.1.1 Demonstrate the ability to adjust the range to capture poor or distant targets

2.0 Navigation

- 2.1 Interpret radar returns such as land, buoys, and other vessels.
- 2.2 Utilize available radar tools (EBL, VRM, range rings) to determine range and bearing of an object.
 - 2.2.1 Determine whether there is constant bearing and decreasing range and a risk of allision.
- 2.3 Use variable range markers (VRM) to measure distance between objects.
- 2.4 Convert a relative bearing to a true bearing.
- 2.5 Interpret natural and man-made features (i.e., breakwaters, bridges, headlands).
- 2.6 Demonstrate the use of a radar overlay on a MFD and distinguish differences between boats and buoys.

3.0 Collision Avoidance

- 3.1 Determine the risk of collision by analyzing target motion and calculating closest point of approach (CPA), and time to closest point of approach (TCPA).
 - 3.1.1 Determine whether there is constant bearing and decreasing range and a risk of collision.
- 3.2 Demonstrate the ability to track multiple targets and prioritize collision risks.
- 3.3 Apply appropriate actions to avoid collision, considering both maneuverability and the limitations of radar.
- 3.4 Demonstrate creating a guard zone.
- 3.5 Demonstrate activating and utilizing Mini-Automatic Radar Plotting Aid (MARPA), including acquiring targets.

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