

Marine Radar: Beyond Collision Avoidance, Radar Can Be A Useful Navigational Tool

By Captain Bernie Weiss

Does your boat need radar? Do YOU need radar? Well, why not? Radar technology has matured, the data it provides are valuable, modern radars are user-friendly and reliable, and they are reasonably priced. Moreover, let's acknowledge, in the hands of a competent operator, radar is fun to use and adds a new dimension to the full boating experience.

The primary function of radar (RADIO Detection And Ranging) is to help the skipper "see" in fog, rain, and other conditions (including darkness) that restrict visibility. That's why radar is principally considered a remarkable aid to collision avoidance. For this purpose, most experienced mariners operate their radar in the "Head Up" or "Course Up" mode. This means that the top of the radar display is oriented with the bow of the boat, and radar targets on the display are shown relative to the boat's heading. "Head Up" or "Course Up" mode facilitates collision avoidance because it's easy to glance at the radar display and visualize other vessels in the vicinity, as well as their relative positions and relative movement.

But radar has a useful secondary function: Navigation. This is not widely appreciated, mainly because nearly every boat with radar also has GPS capability, and as we all know, GPS navigation today is extremely reliable and accurate. With WAAS-enabled (Wide Area Augmentation System) receivers, GPS is dependably accurate to within about 10 feet 95% of the time. Even older GPS receivers (those marketed prior to the advent of WAAS in 2003) yield amazing accuracy, usually less than one boat-length. GPS has become, therefore, the default navigational instrument.

Radar as a navigational tool

Radar, nonetheless, can supplement GPS navigation, or even substitute for it should the GPS receiver fail. And radar is a great navigational back-up when visibility is so occluded that a buoy or other GPS waypoint cannot be observed during an approach. Keep this in mind: Whereas your GPS or GPS/chart-plotter will describe what should be there, and where to look for it, your radar will probably find it.

For navigation, most mariners set the radar in the "North Up" mode so that the radar display correlates with integrated chart-plotters and printed charts. When visibility is poor, radar will help you find that elusive waypoint. Also, if you and your radar can positively identify even a single prominent aid to navigation, the range and bearing of that aid, as determined by radar, fixes your position. A "prominent aid to navigation" is one that creates a strong echo on the radar display, such as:

1. A large metal buoy, or even a smaller buoy if equipped with a radar reflector. (Most small harbor buoys, especially the plastic ones, are not reliable for navigating with radar because they usually do not provide good radar echoes unless fitted with metal reflectors.)

2. The end of a stone or steel breakwater, especially when



This young navigator works with the radar while plotting his route.

marked by a tall latticework structure - The 30-foot structure at the end of the Kelsey Point Breakwater, near Clinton Harbor, is an excellent example. Other good examples include the breakwaters at the entrance to Stamford Harbor, New Haven Harbor, and Port Jefferson Harbor.

3. An offshore lighthouse, such as the Stratford Shoal lighthouse and the Texas tower guarding the entrance to Buzzards Bay and Vineyard Sound.

4. A peninsula, especially one with tall buildings and other structures. The high bluffs and lighthouse at Montauk Point are an excellent radar target for navigation.

5. A tangent of land, coastlines, or even small islands with prominent cliffs or man-made structures along the shore (rather than low-lying beaches, marshes, or flat land, which do not provide good radar echoes) - Excellent examples include the New Jersey Palisades in the Hudson River, and the Calvert Cliffs on the Maryland shore of the Chesapeake Bay. Charles Island, guarding the entrance to Milford Harbor, is an unmistakable radar target.

6. Bridges- Again, a radar range and bearing to any of these prominent aids to navigation will provide a reliable fix of your position.

Racons (radar beacons)

Racons are particularly useful for radar navigation. Racons - also called radar beacons, radar responders, or radar transponder beacons - are receiver/transmitter devices installed on important navigational aids such as prominent buoys and lighthouses near the entrances to busy harbors and along heavily traveled commercial routes.

A racon, upon receiving a radar pulse, responds by transmitting a unique Morse code character (series of dots and dashes) back to the originating radar set. This identifying code is displayed on your radar monitor as part of the echo, or in a pop-up window or

highlighted area near the echo. You can match this code to that on your chart or chart-plotter, thus making a positive ID on the nav aid. On your chart or chart-plotter, each buoy or lighthouse fitted with a racon is marked with a magenta circle and the word RACON. The dot-dash code for that particular racon is in parenthesis. A radar range and bearing to a racon-equipped nav aid fixes your position with great accuracy.

In order to conserve battery power, racons installed on buoys are programmed to operate 50% of the time. These racons are normally active for 20 seconds, and then not active for the next 20 seconds. Racons installed on shore, where battery life is not a factor, are normally programmed to operate 75% of the time. Racons do not operate 100% of the time in order to ensure that the racon code never completely masks the echo of the radar target itself.

Racons are used routinely as navigational aids by professional mariners, but racons have not (until now) been widely appreciated by recreational boaters. Indeed, racons are now regarded by recreational boaters as important aids to navigation, and many racons have been positioned in Long Island Sound and adjacent waters where boaters will find them useful as navigation aids (see Table 1).

Some precautions

One must be cautious when navigating with radar and interpreting

echoes. A small highly reflective radar target may appear bigger than a large poorly reflective target (on-screen intensity and size are not reliable indicators). Also, water in the air absorbs transmitted radar energy, so rain or heavy fog may obscure the radar echo of a navigational aid or even another vessel as displayed on your scope.

Also, as reliable as modern radar has become, it is not fail-safe, and you should not become wholly dependent upon it. Have back-up systems in place: Your GPS receiver should be on the line, and also your loran receiver if you've got one. As important, you or your navigator should be maintaining a back-up plot on the paper chart and in the log.

Finally, of course, do not be seduced by radar. You MUST post a lookout - not only when visibility is obscured, but at all times. With or without radar, there's no excuse for not knowing your position at sea. ♦

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Not So Friendly Fog

By Pamela Mormino

You'd think that living in New England most of my life, I'd be accustomed to the fog. But here's the thing: it terrifies me! And, of course, I am married to a perfectly fearless man. Mat is happy on the water whether he can see 30 feet in front of him or not.

Our dream when we retired was to take our Hunter Legend 37.5 *Just Ducky* to the Keys for the winter, and we did that last year. Our travels took us from our homeport, Brewer Yacht Yard in Mystic, CT, to Marathon, FL and back. As we left New England, we also left my old friend fog behind. It was heavenly - nine months on the water with clear visibility. Traveling home in May 2006, one of our final legs took us through Hell Gate in New York City into Long Island Sound to City Island, NY for the night. We anchored on the east side of City Island, in front of a radio tower and behind an outcropping of rocks (my next favorite thing to fog).

Westbrook, CT was the next day's intended destination, so we planned an early start. Little did we know my old friend fog was to turn up, so dense that we could see neither the radio tower nor the rocks. NOAA weather was predicting fog throughout the morning, so we stayed until we could start to see our way out of the anchorage. My use of the word "we" is used loosely, as Mat did all of the maneuvering. Thank goodness for radar and chartplotter! Since it was so late, we decided on Port Jefferson, NY instead.

Our luck (bad luck, that is) was still holding as we awoke to fog again in Port Jeff. The fog started to lift around 1000 so we took off for home. As we approached the narrow entrance to Port

Jeff, the fog socked us in again. Simultaneously we heard on the VHF that the ferry was approaching AND we started to have engine trouble and stalled out. Mat got the engine started again and contacted the ferry captain to let him know we were there as I sounded the foghorn every minute. We maneuvered to starboard and the ferry maneuvered to port as much as he could and we managed to pass within kissing distance. The engine was still giving us trouble and we knew it was a clogged fuel filter.

As we came out into Long Island Sound we put the headsail up in little to no wind, turned off the motor and I grabbed the foghorn as Mat went below to change the filter. This was my nightmare come true. I was at the helm, alone, sounding the foghorn as I could hear boats around me, but couldn't see them. The radar, chartplotter and compass offered assistance, but I could not tell how fast the boats were moving around me. As the boat started drifting, I had to oversteer in each direction to try to keep away from shore. No one was as happy as I when Mat returned to the cockpit to start the engine and take over the helm. While the fog persisted for most of the day, we finished our journey safely and I for one was ecstatic!

Mat now has another dream: sailing along the coast of Maine. With both fog and rocks to contend with, I'm not planning that trip anytime soon. I have to contend with fog if I want to live in New England, but I don't have to like it!

Pamela & Mat Mormino of Ledyard, CT started sailing 15 years ago as "empty-nesters" on the Potomac River and Chesapeake Bay in Virginia. They're cruising up the Hudson River this summer, and perhaps downeast one day. Says Pamela, "Mat is still trying to get me to face the fog in Maine!"