What radar can do for you

These are notes on a radar seminar we did once. They serve as an introduction and overview of what we will be covering in the course. Marine radar has several, more or less independent applications to safe, efficient navigation. One is collision avoidance, for which it is the undisputed king of the electronics dashboard, another is actual position fixing, for which it competes with GPS (favorably in many cases) and in any event is always a very convenient way to verify a GPS position, and finally radar offers a unique and powerful aid to what might be called general vessel piloting. Specific procedures within each of these applications are listed below. For background and elaboration, please see *Radar for Mariners* by David Burch

Position fixing or verification

• The electronic range line (EBL) and variable range marker (VRM) allow quick measurements of range and bearing to vessels and landmasses within radar range. Ranges to radar targets are very accurate; precise bearings require more care because they are dependent upon knowledge of your vessel's heading.

• Radar range and bearing to a charted landmark offers a quick position fix providing a convenient verification of the GPS position. The fix is quick to plot on paper or e-chart.

• An accurate position fix can be obtained by radar alone using the intersection of circles of position measured from several radar ranges to charted features. With an e-chart program on a PC or PDA, the range fixes are especially quick to plot by assigning range rings to marks placed on each of the targets.

• Approximate positions often can be made by just looking at the radar screen: "I am in the middle of the channel, just off this point", or use the EBL to identify natural ranges you are on which lay out an accurate LOPs on the chart. Once we enter confined waterways, it is the radar position that we rely on most often. A glance at the radar and a glance at the electronic trail on an e-chart is a modern means of efficient navigation.

Piloting

• The ship's heading line on the radar screen projects forward showing where you are headed relative to the land images seen on the radar. You may think you are running parallel to the coast, but the radar tells in an instant if you are angled slightly in. Or knowing what island pass you wish to make or headland you need to round, you can read the right heading off of the radar once the SHL crosses your destination as you turn. An excellent corroboration of your chart work. There are numerous applications.

• The VRM can be used in countless ways to guide your course. If your goal is to stay 0.2 mi off the shore, for example, set the VRM to 0.2 and then don't let that circle touch the shore as you proceed. This is a very useful technique for rounding hazardous points, or transiting narrow channels with hazardous sides.

• For more security, set a guard ring sector on top of the VRM, from dead ahead to abeam on the landward side. Then if you get too close an alarm will go off. The neat sector option on modern guard rings, let vessels pass you on the other side without setting off the alarm.

• With a GPS input to the radar (usually a very simple connection), modern radars will mark the active waypoint on the radar screen in a "lollipop" display—a dotted line extending out from the center of the screen terminated with a circle at the Lat- Lon of the active waypoint. If that waypoint happened to be a buoy, you want to see a nice little radar target inside the lollipop for confirmation of your navigation. If there is no target there, something is wrong that needs sorted out — assuming you are close enough to see the buoy on radar.

• The lollipop feature is also valuable when the waypoint is on or just off any prominent radar target. Consequently—even if your radar does not have lollipops—it is best to place waypoints near what you might guess will be prominent radar targets. The interplay between GPS and radar is the key to safe efficient navigation. GPS offers continuous read out of range and bearing to the active waypoint, and with radar these are very easy to monitor. A thoughtful selection of waypoints in light of radar applications will be most rewarding.

• Modern radars allow the reference point of the EBL and VRM to be offset from your own position at the center of the radar screen. This powerful feature allows you to measure the distance and bearing between any two points on the radar screen. There are unlimited applications in identifying radar targets amongst a complex display, as well as applications in collision avoidance. A floating or offset EBL can also be used to estimate how close you will pass a headland far ahead if you proceed on the same course made good.

Collision avoidance

• The EBL is a basic tool for collision avoidance. Place it on a suspected vessel target when it first appears. If the target moves forward of the EBL, it will pass in front of you; if the target moves aft of the EBL it will pass behind of you. If the target tracks straight down the EBL, you are on a collision course.

• The radar's "wake" or "trail" function, however, tells much more about the approaching target. With a 3-minute trail engaged, you have a complete picture of how every target on the screen has moved during the past 3 minutes. It is the key feature of radar when it comes to evaluating risk of collision. The length of the trail tells the speed of the target relative to you. If you are moving at 7 kts, an anchored buoy will move 0.35 miles on your radar screen in 3 minutes, because that is how fast you are moving. Likewise, all land will have 3-min trails that long. Any target with a trail longer than that is moving faster than you; any one with a shorter trail is moving slower than you. This is the way you tell if the target coming straight toward you is traveling at 20 kts, or if it is something dead in the water you are about to run into.

• To measure the closest point of approach (CPA) for targets approaching diagonally on the screen use the floating EBL to project its trail past your vessel (center of the screen), then use a centered VRM to measure the CPA.

• To estimate the time of CPA, measure or estimate how many trail lengths fit between where the target is now and the CPA, and multiply by 3 minutes.

• Using the trail display and the floating EBL, you can figure the true course and speed of any approaching target. The procedure is straight forward and mastered with little practice. Once you know the target's true course, you can, for example, determine what lights you should look for at night. You might guess red and green from a cursory look at the radar screen, but with analysis, the real answer is red only, or even white only. It all depends on relative motion.