

Waypoint Navigation

Waypoints

Since waypoints are the basis of almost all GPS navigation, let's take a moment to review the concept. A waypoint is a virtual position that a GPS Navigator stores in memory as if it were an *X* on an imaginary map of the earth. This virtual position represents a real location which your GPS Navigator treats as a landmark. Since the GPS Navigator continuously determines its own changing position, it can calculate the distance and direction (range and bearing) to the waypoint's co-ordinates. These calculations are made continuously and in real time, 24 hours per day. When added to the other fundamental GPS data (course, speed, and time), the range and bearing data provide the basis for all GPS navigation.

Waypoints can be used individually or in groups, or even for other purposes. As demonstrated in Chapter 1, an MOB position is a waypoint, as is a GOTO destination. A waypoint is thus an "address" which defines your starting point, a point you hope to go, a place to avoid, or some intermediate position along the way.

The Destination Waypoint

A destination waypoint is the waypoint toward which you are navigating at any particular time (i.e., the GPS's active waypoint). Remember: When you initiate navigation toward a new waypoint, that waypoint becomes the new destination waypoint. At any one time, there can never be more than one destination waypoint.

For a detailed discussion of waypoint selection criteria, see Chapter 5, in particular the sections titled *Selecting Waypoints* and *Curvilinear Legs*.

Routes

A route is a series of waypoints which, taken together, define all the courses required to complete a passage. When navigating along a route, the GPS Navigator directs the vessel to the first waypoint, then to the second, and so on. Once a waypoint has been passed, it is said to have been realized.

Cecil's Style of Navigation

Cecil Varney was a retired dairy farmer from New York State who settled near my home in the Gulf of Georgia in British Columbia. During the years of his retirement, he discovered that his favourite form of relaxation was fishing for salmon. Almost any early morning of spring or summer would find him puttering along in his small open boat, a fishing rod gripped between his knees, his hearing aid unplugged. He became an excellent fisherman and brought home many fine coho and chinook, but his greatest difficulty was in finding the exact spot where he had caught fish the last time. He was no navigator.

One day, while explaining this problem to me, he said, "I've thought of painting a large X on the surface of the water every time I catch a fish, but of course that wouldn't work!" He winked at me. "I've painted it on the side of the

boat instead." We both got a laugh and agreed that his solution would not find the fish. This conversation took place in the early 1970s and, sadly, a few years later Cecil died.

In the years Cecil was fishing, Loran A, although available, would have been no use to him. Its accuracy was not good enough for his purposes and the receivers were bulky and expensive. Even if he had used one of the cumbersome old units, obtaining a fix required the operator to match up two wave forms on an oscilloscope screen. It would have taken all the joy out of fishing for Cecil. I wonder now if the risk of getting lost in the fog was part of the fun of fishing for my dear friend. Access to a modern GPS Navigator would have ended Cecil's difficulties, but his own unique form of navigation appealed to him more; he never strayed too far and he always came home. K.M.

Once a route has been set up in memory and your GPS Navigator instructed to follow it, the process is automatic, reliable, and instantaneous. The GPS Navigator operates in real time—except for a few unimportant milliseconds—and when it displays a position or other navigational data, the information is completely up-to-date.

Manufacturers are constantly changing the way they display information in order to differentiate their products; unfortunately this means they have been unable to agree on similar procedures for storing and recalling waypoints and routes, and for navigating to a waypoint. *Note:* Be sure that you become familiar with the way your particular unit handles these procedures.

MOB (Man Over Board) Revisited

The MOB (Man OverBoard) waypoint is a special type of waypoint that is often activated by a specific MOB key. [Refer to Chapter 1.] If an emergency occurs, a single stroke on the special function key saves the present position as a waypoint and immediately calls up steering instructions to guide you back to the position where you pressed the key. When somebody or something goes over the side, time is crucial in effecting a safe recovery. The procedure is so simple that even if the captain falls overboard, an untrained operator can begin the process of navigating back to the MOB waypoint.

Once MOB is engaged, a steering diagram directs you back to the site of the emergency. If the recovery of the man overboard takes some time, a simple pro-

cedure allows you to view the co-ordinates of the boat at the time the MOB key was pressed. These co-ordinates are vitally important to the local coast guard or other rescue vessels in the area.

Never delay activating MOB—lives depend on speed. If your vessel travels any distance before you activate MOB, its value can be compromised since the steering diagram directs you back to the point where you activated MOB, not necessarily to the person in the water. Once you reach the MOB position and recover your man overboard, deactivate MOB; this erases the MOB waypoint from memory and the GPS Navigator can revert to non-navigating mode.

It's always a good idea to stage a MOB drill by dropping a float in the water and practice returning to it using the MOB feature. Repeat the process until your crew understands how to carry it out correctly and speedily. A successful practice reduces the potential for making mistakes under stress, and it gives the crew confidence in the equipment. Remember: You, as skipper, should ensure that your crew and guests are familiar with the procedure for activating the MOB function. Record the MOB procedure on the Quick Reference page and in The Workbook if you have not already done so.

Authors' note: One particular model of GPS has a dual-function MOB/Save key requiring that the key be pressed for three seconds to invoke MOB. If your GPS Navigator has this type of key, be sure that you press it for the required time, and verify that your crew are fully aware of the procedures for activating MOB.

Navigating to a Single Waypoint (GOTO)

The simplest method of navigating is toward a single waypoint—a GOTO waypoint or one selected from a waypoint list. Many GPS Navigators have a special key for activating GOTO with a single keystroke so that all you have to do is enter the co-ordinates of the destination waypoint and press GOTO. GOTO is a real time-saver and the simplest method of navigating to a specific location. Each time you engage a new GOTO waypoint it becomes the new destination waypoint.

In an effort to make GPS easier to use, manufacturers have used different names for GOTO. In some units, it is called Quick Waypoint; in others, something else. Read your GPS manual to determine if your set has this feature and what it is called. In this book, we always refer to it as GOTO.

A typical GOTO procedure goes something like this:

1. Activate the GOTO display and enter the latitude and longitude of the new destination in the space provided. (Verify that the default latitude and longitude are correct for the hemisphere in which you are navigating.)
2. Press ENTER (or NAV or GOTO). The steering diagram should automatically pop up and give you instructions for navigating to the destination.

[See the section "Following the Steering Diagram" later in this chapter.]

3. Once you arrive at the GOTO waypoint, you can activate GOTO again to proceed to the next in a series of waypoints. Each time you engage a new GOTO waypoint, it becomes the new destination waypoint.

Most GPS sets allow you to select any waypoint from a waypoint list or choose a GOTO waypoint by entering a range or bearing from your present position. By setting the GOTO destination at a pre-existing waypoint, you can make a quick choice from all the waypoints in memory. In fact, in some sets, this may be the only way of activating navigation toward a single waypoint. (Each software package is unique, so check your GPS owner's manual for the section dealing with navigation to a single waypoint.)

When the GPS computer navigates to a single waypoint, your present position automatically becomes the departure waypoint of the Course Line. (If your unit asks you to select two waypoints, read the section of your GPS manual that describes routes. When you select two waypoints, you are actually setting up a route—a subject we cover later.)

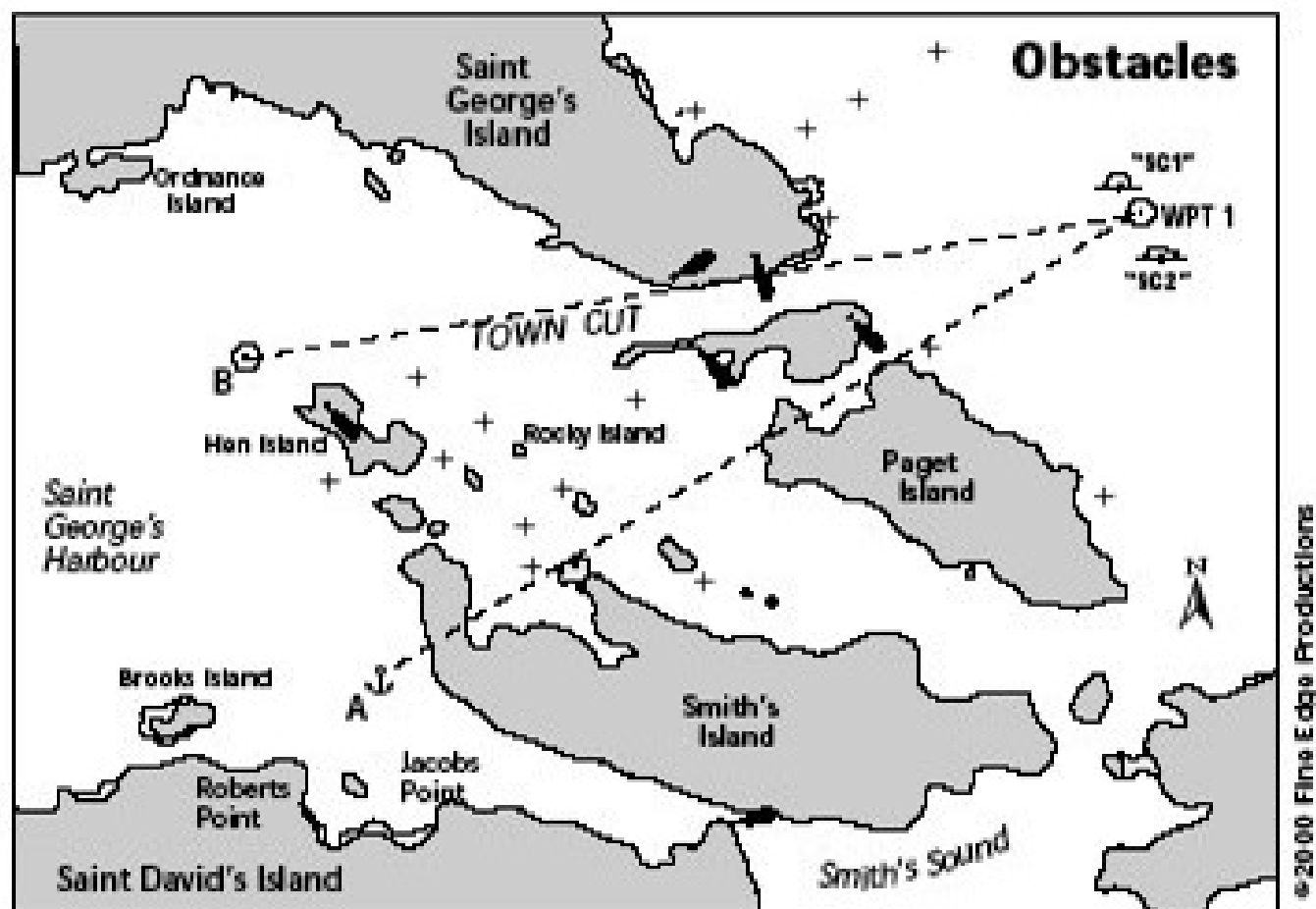
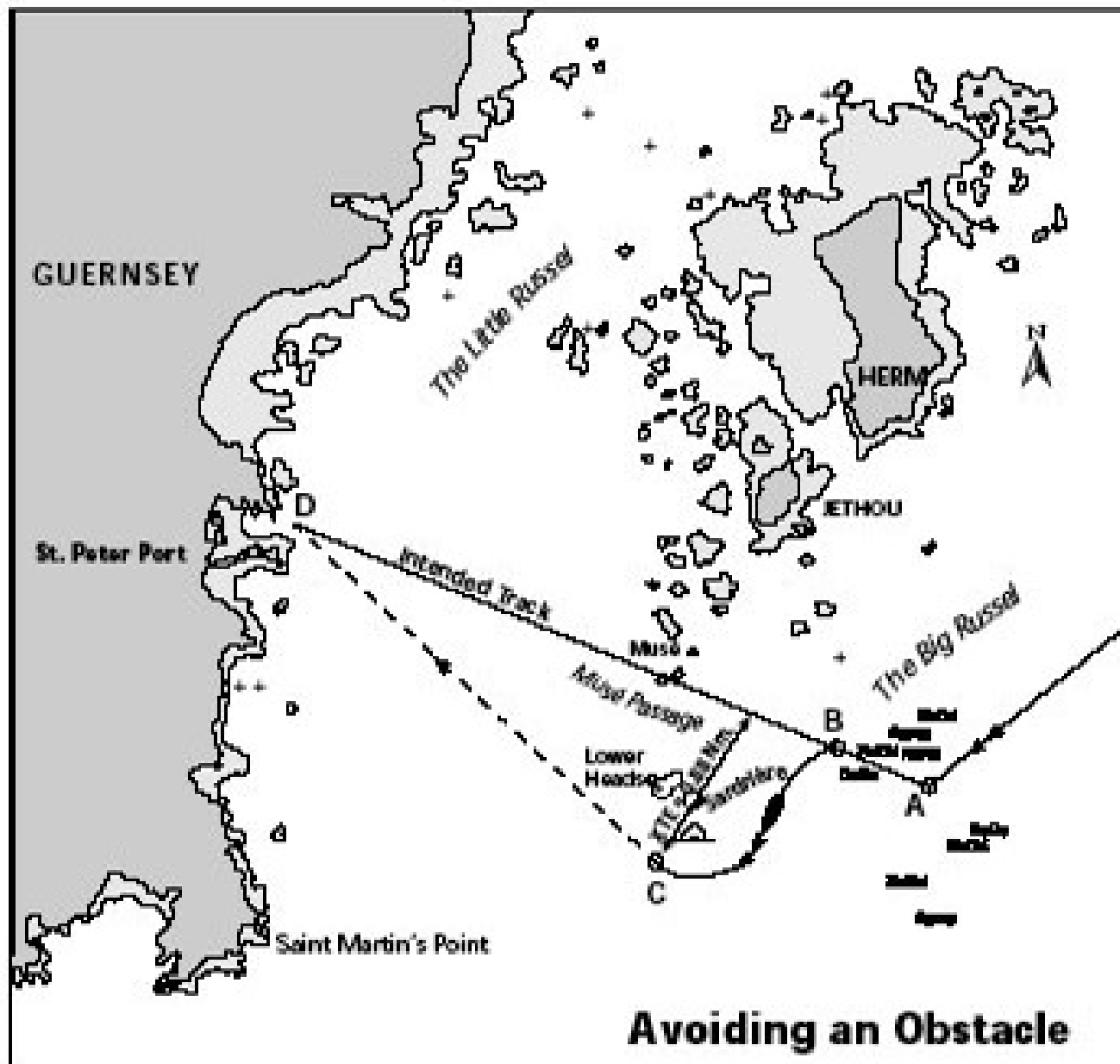


Figure 4.1

From the anchorage at Position A, it would not make sense to navigate directly to a destination waypoint at the east end of Town Cut (WPT 1). Even from position B at the west end of Town Cut, it would not be safe to choose WPT 1 as a destination waypoint.

Caution: The GPS computer navigates from your present position to the destination waypoint, oblivious to any intervening danger such as twenty miles of solid rock, so be sure that your Intended Track passes through safe water [Figure 4.1].

If you find that the Intended Track will indeed take your vessel into a rock pile, you can ignore the steering diagram or turn off the navigation function and proceed visually, engaging it later when no further dangers lie in the way. When



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Figure 4.2

While heading southeast through The Big Russel (position A), you instruct the GPS Navigator to begin navigating toward the destination waypoint D. Suddenly, at position B, you realize your intended Track crosses Muse rock which is covered by tide at the present time, with only its beacon visible. You must alter course to pass south of the buoy at Sardriere. By the time you reach position C, XTE on the steering diagram has reached 0.88 Nm.

If you restart navigation to the same destination waypoint, a new Course Line is established with the vessel's present position designated as the new point of departure. XTE is reset to zero because your vessel is heading in navigation to the same destination completely unaffected

you re-engage navigation, your GPS Navigator will most likely draw the new Course Line from your present position. As shown in Figure 4.2, this new Course Line will differ significantly from the previous one.

Author's Note: The difference between the GOTO function and MOB is that GOTO places a waypoint at a distance from the present position and directs the operator to that waypoint; MOB places a waypoint at the present position, allowing the operator to return to that position.

Keeping a Waypoint Log

It is essential that you record the relevant details of your waypoints in a Waypoint Log. In addition to allowing you to refer quickly to the waypoints, the log permits you to record information not in the GPS Navigator's memory. (Some of this additional information is extremely useful!)

Group the waypoints according to their general location and include obvious details such as latitude and longitude, chart number, chart

datum, and even sketch-maps of the area. If your GPS Navigator should fail, whatever details you choose to include in your Waypoint Log will be easily accessible. The process of taking positions and converting them to waypoints in memory is a tedious process; if you don't record the waypoints on paper or download them to a PC, you may be forced to recalculate them. [See Figure 4.3 and Appendix E for a suggested Waypoint Log.]

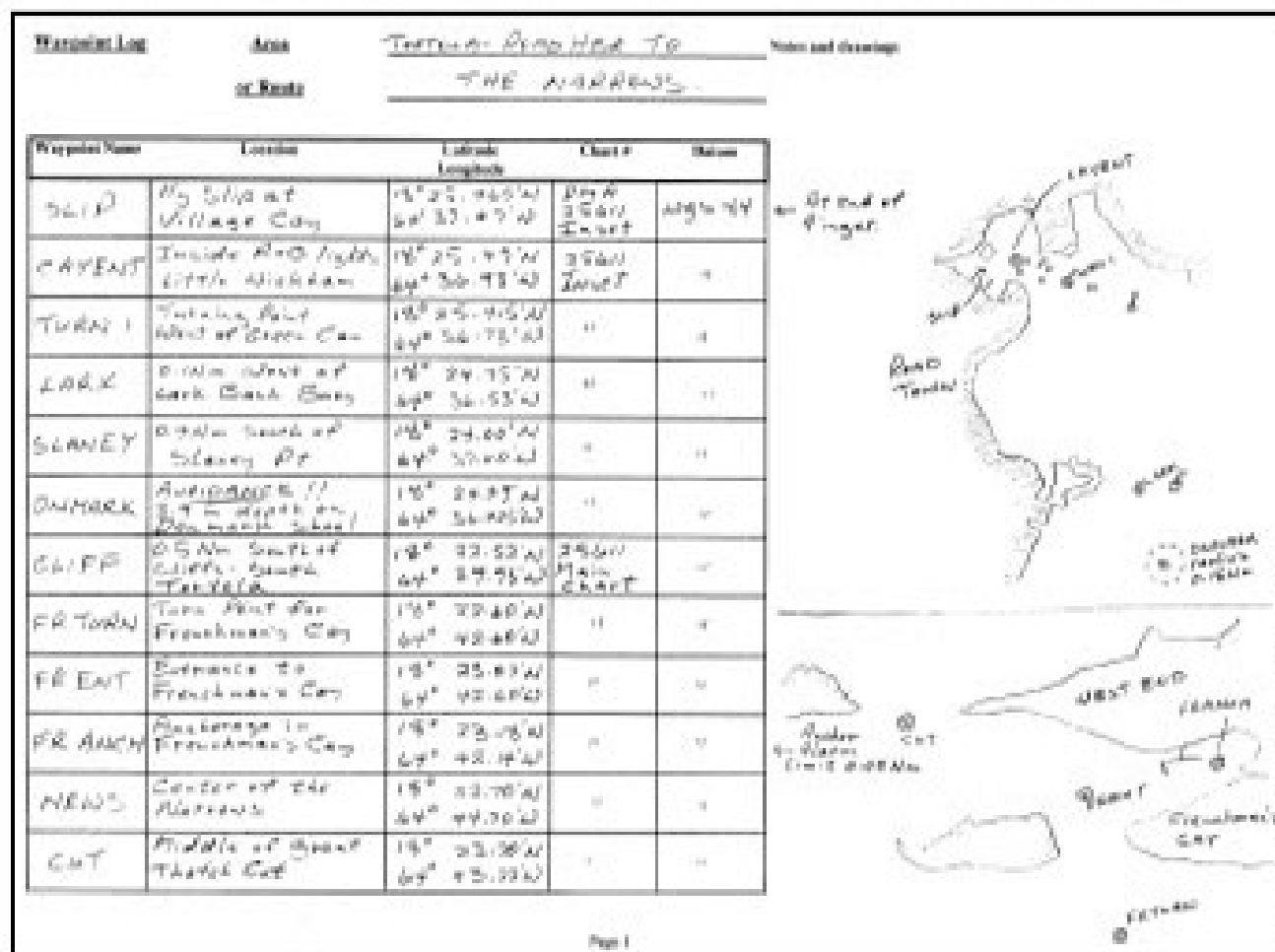


Figure 4.3 A Sample Waypoint Log