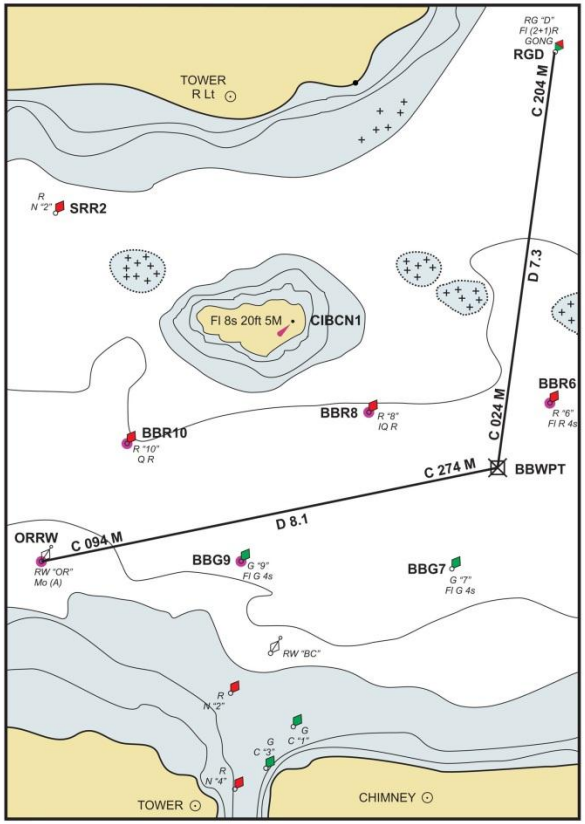
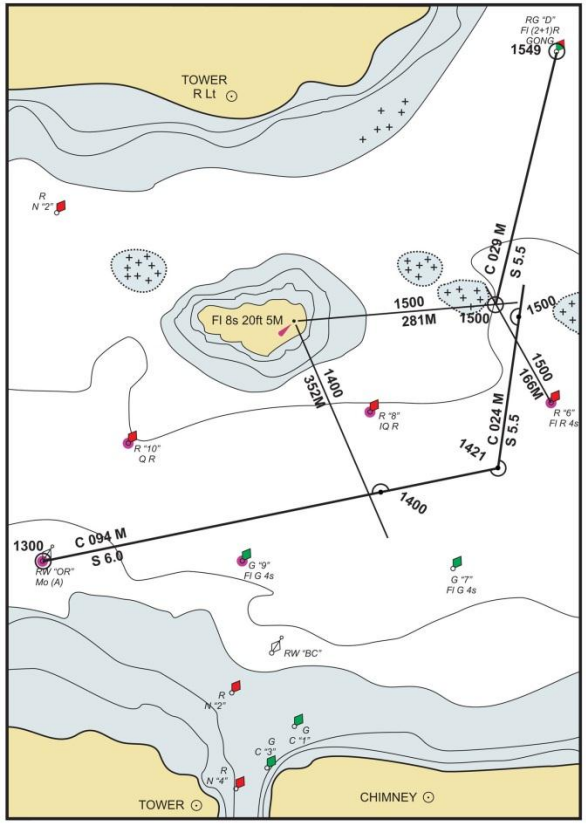
Piloting

Planning - Waypoint Navigation



Waypoints are identified, legs are plotted, course directions and distances are labeled with reciprocal courses shown. Where waypoints are navigation aids, only the waypoint name is labeled. Other waypoints are identified by the unique waypoint symbol.

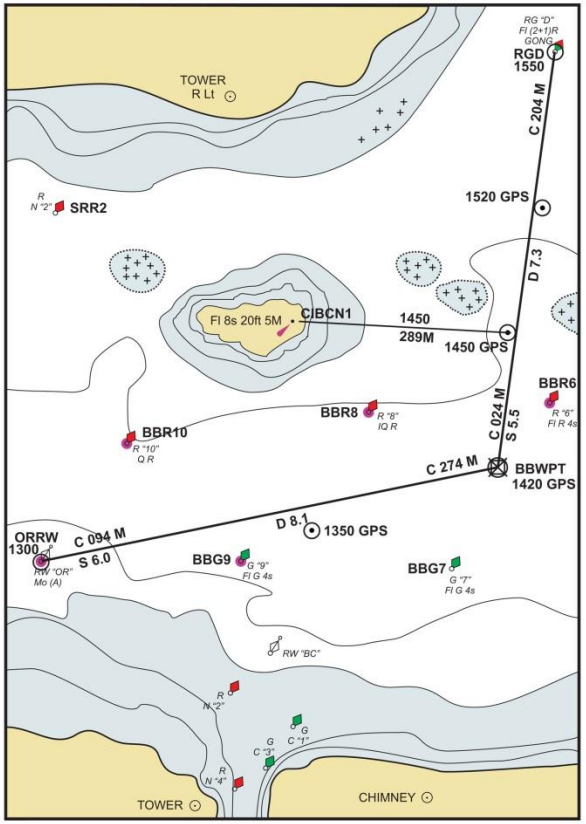
Underway - Dead Reckoning



Ranges are pre-plotted. Underway, Dead Reckoning courses are plotted (DR Track) and labeled with course direction and speed. DR positions are plotted at nominal intervals (approximately each hour) and labeled with time.

Bearings are plotted and labeled with bearing and direction. A DR is plotted on at the time of each bearing.

Underway - GPS Waypoint Navigation



Waypoints, and legs are pre-plotted. Underway, Speed is labeled for each leg. Periodically (nominally hourly or when needed) GPSposition is plotted. If possible, the GPS is checked with a bearing or other source.

If the GPS is suspect, determine current position from bearings or last known good position by reverse dead reckoning (reason for labeling speed and plotting GPS fixes). Proceed using dead reckoning, verify by bearings.

Symbols

- FIX position
- DR position
- Waypoint position (other than nav aid)

Units

DISTANCE	= nautical miles (nm)	nautical miles + tenths (e.g., D 12.4)
SPEED	= knots (kn)	knots + tenths (e.g., S 5.6, S 11.2)
COURSE	= degrees (°)	degrees: plot whole numbers ± 1° (three significant digits)

Coordinates

Latitude: L [degrees, minutes and tenths] N or S (e.g., L 41° 36.2′ N)

Longitude: Lo [degrees, minutes and tenths] E or W (e.g., Lo 72° 23.2′ W)

the above is default for USPS without leading zeros

——— Course line or bearing line

---------- Construction line or range line

Time

1030, 1345 Time: 24-hour clock, four digits

Labeling Horizontal for fixes, diagonal for DR's
Above the line for bearings

PILOTING - PLOTTING & LABELING STANDARDS

Rev 05-27-08

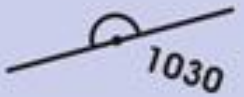
Symbol Summary

Plotting, Labeling, & Symbols - Summary

course line or bearing line

construction line or range line

position fix
time: XXXX (buoy or bearings)
XXXX GPS (GPS fix)
XXXX RFIX (Running Fix)
XXXX Radar (Radar fix)



DR (dead reckoning position)
time: XXXX (at angle)

⊠ FHRK2

GPS waypoint with waypoint name
(if no other symbol on chart)

course lines or bearing lines

label course above the line near start
C XXX (true direction)
C XXX M (magnetic direction*)
C XXX C (compass direction)

label speed below the line (DR plot)
S X.X or S XX.X (tenths of knots)

label distance below the line (mid-point)
D XX.X

label time of bearing above the line
XXXX

label bearing direction below the line
XXX M (magnetic bearing)

Distance: nearest 0.1 nm
Time: 24 hour clock (local time)
Lat & Lon: nearest 0.1'
Speed: Knots + tenths

* preferred method for P/AP

Precision versus Accuracy

- What you attempt to do
  - with charts, tools, plotting, compass, accuracy of L, Lo

Versus

- What you can expect to realize
  - helmsmanship, compass performance, effects of the sea and weather

- Helmsmanship
  - Largest factor in results vs attempts
    - Boat response to seas
    - Attention to the helm
    - Avoiding other boats

Typical Accuracy Factors

- –Plotting
  - 1° is achievable
- –Helmsmanship
  - 3° may be practical
- –Compass
  - 2° should be expected

Averages out to about 4°

4° error = 424 ft in a nm run
= .7 nm in 10 nm run

Good Piloting

- Maintain chart plot
  - Planned course (leg)
  - Speed
  - Plot GPS fix nominally at hourly intervals
    - Verify by other means (mariner's eye, bearings)
    - More frequent if conditions warrant

- THIS FIX MAY BE THE ONLY REFERENCE YOU HAVE IN THE EVENT OF A GPS FAILURE!

- Annotate any significant information
  - On the chart, log, or notepad
  - Include original data on bearings, GPS L/Lo, etc
  - Problems, emergency radio calls, etc.

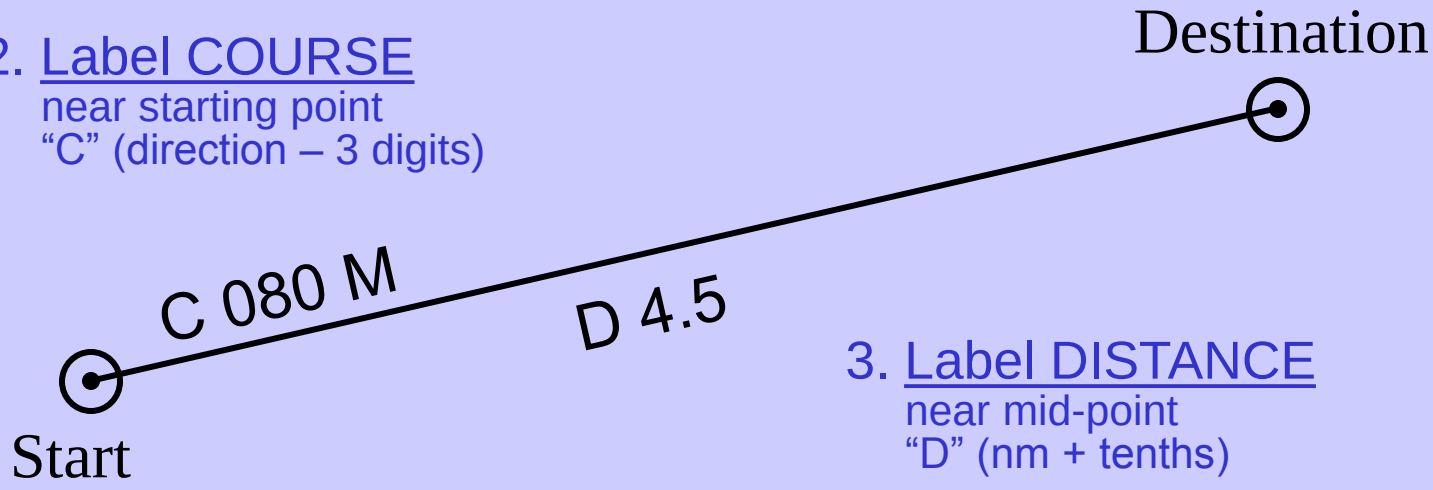
Plotting Standards

- Courses and bearings - plot to nearest degree
- Steer to within 2°
- Speed noted to nearest tenth knot
  - e.g., 4.5 Kn, 15.0 Kn
- Depth to nearest foot
- Distance to nearest 1/10 nm
- Fix time to nearest minute

Labeling Magnetic Planned Courses

1. Draw & Measure COURSE LINE
   carefully between points

2. Label COURSE
   near starting point
   “C” (direction – 3 digits)

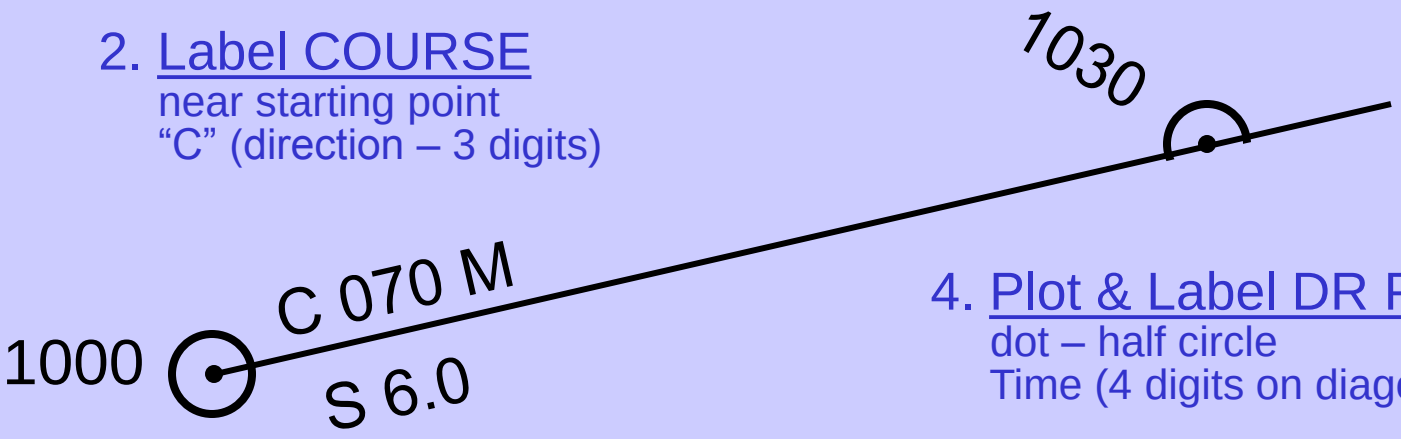


3. Label DISTANCE
   near mid-point
   “D” (nm + tenths)

Labeling DR Courses

1. Draw & Measure COURSE LINE
   carefully between points

2. Label COURSE
   near starting point
   “C” (direction – 3 digits)



4. Plot & Label DR Position
   dot – half circle
   Time (4 digits on diagonal)

3. Label SPEED
   near starting point
   “S” (Kn – units.tenths)

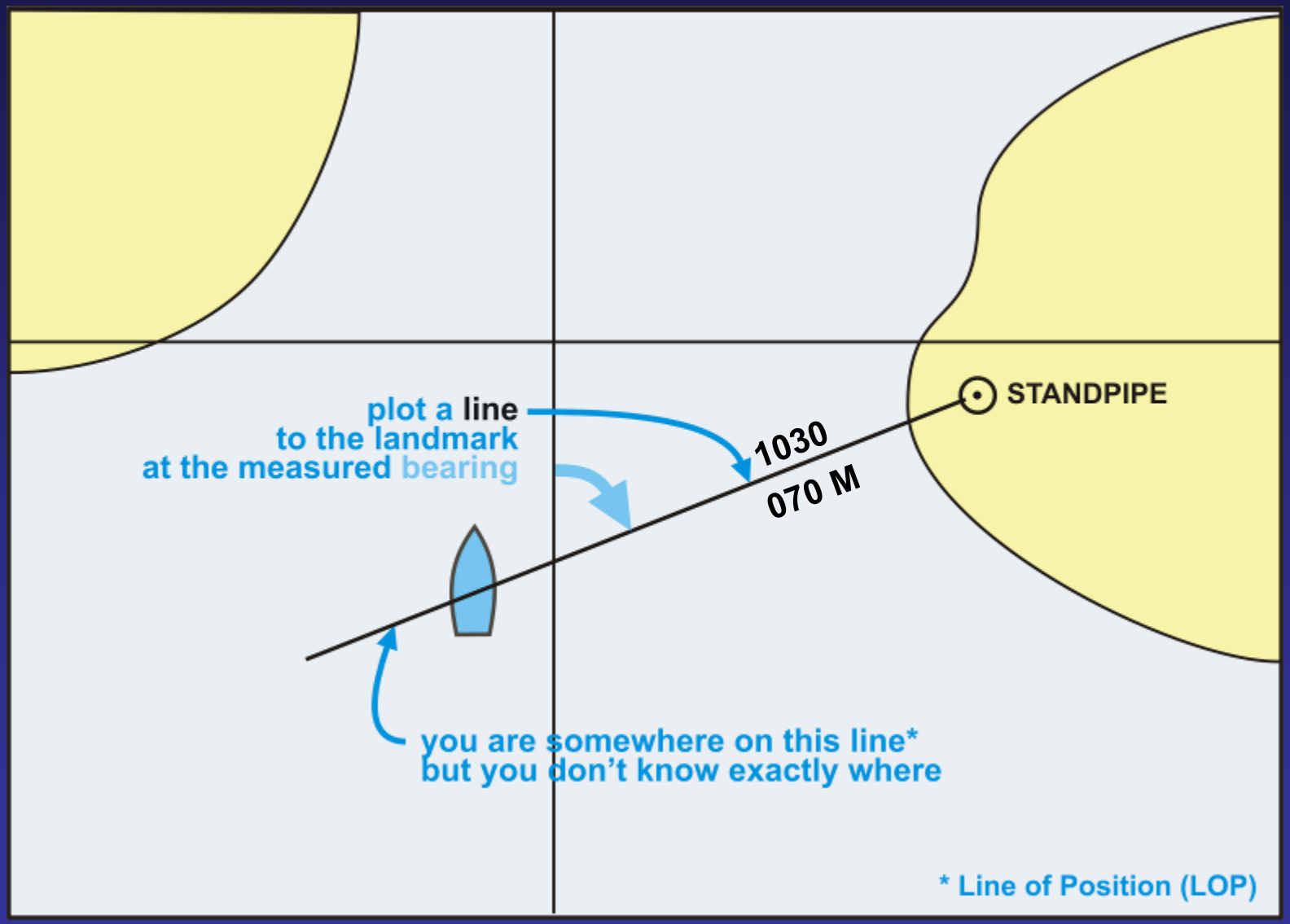
D = (S x T) / 60

D = (6.0 X 30) / 60

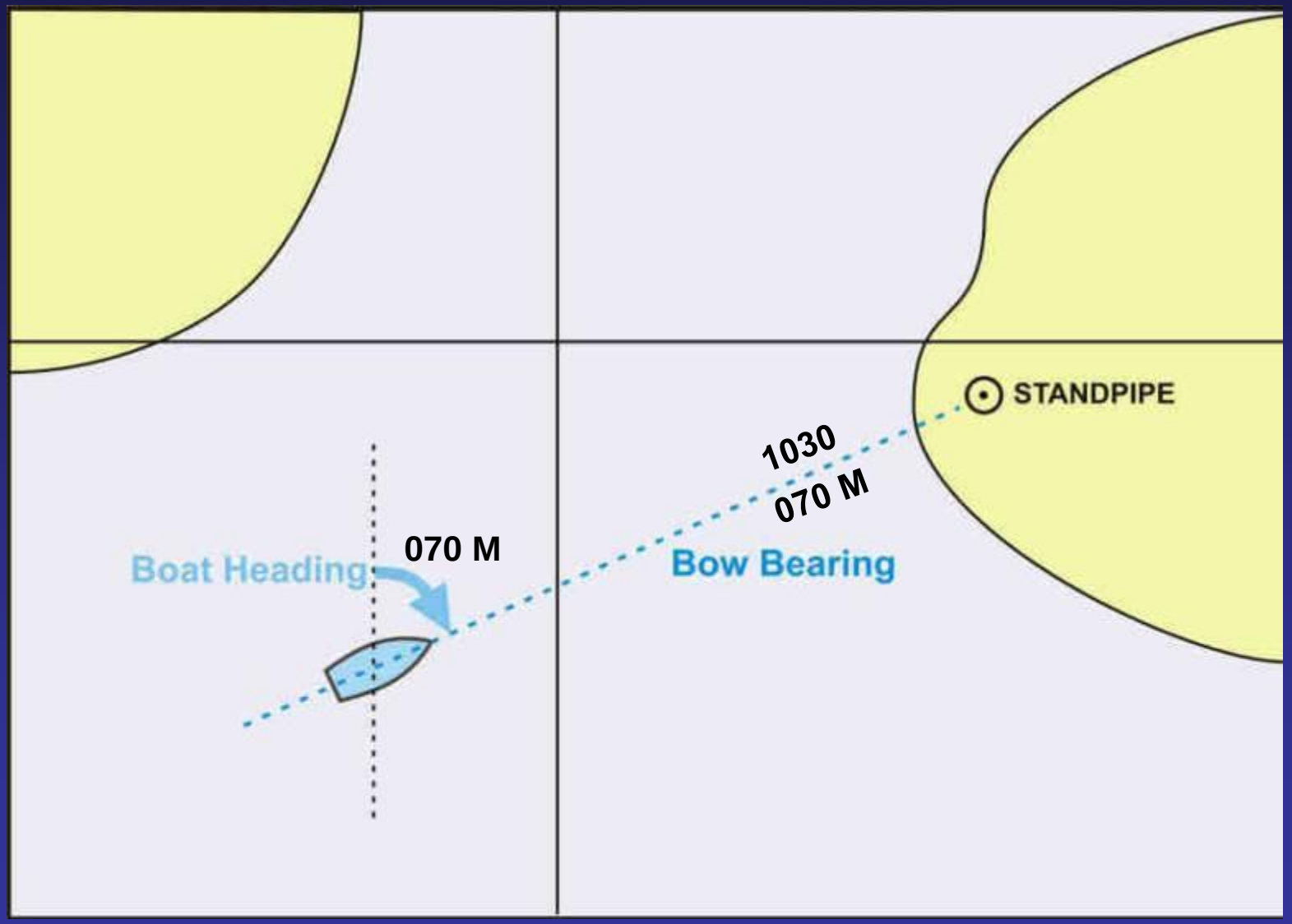
D = 3.0 nm

Plot while navigating

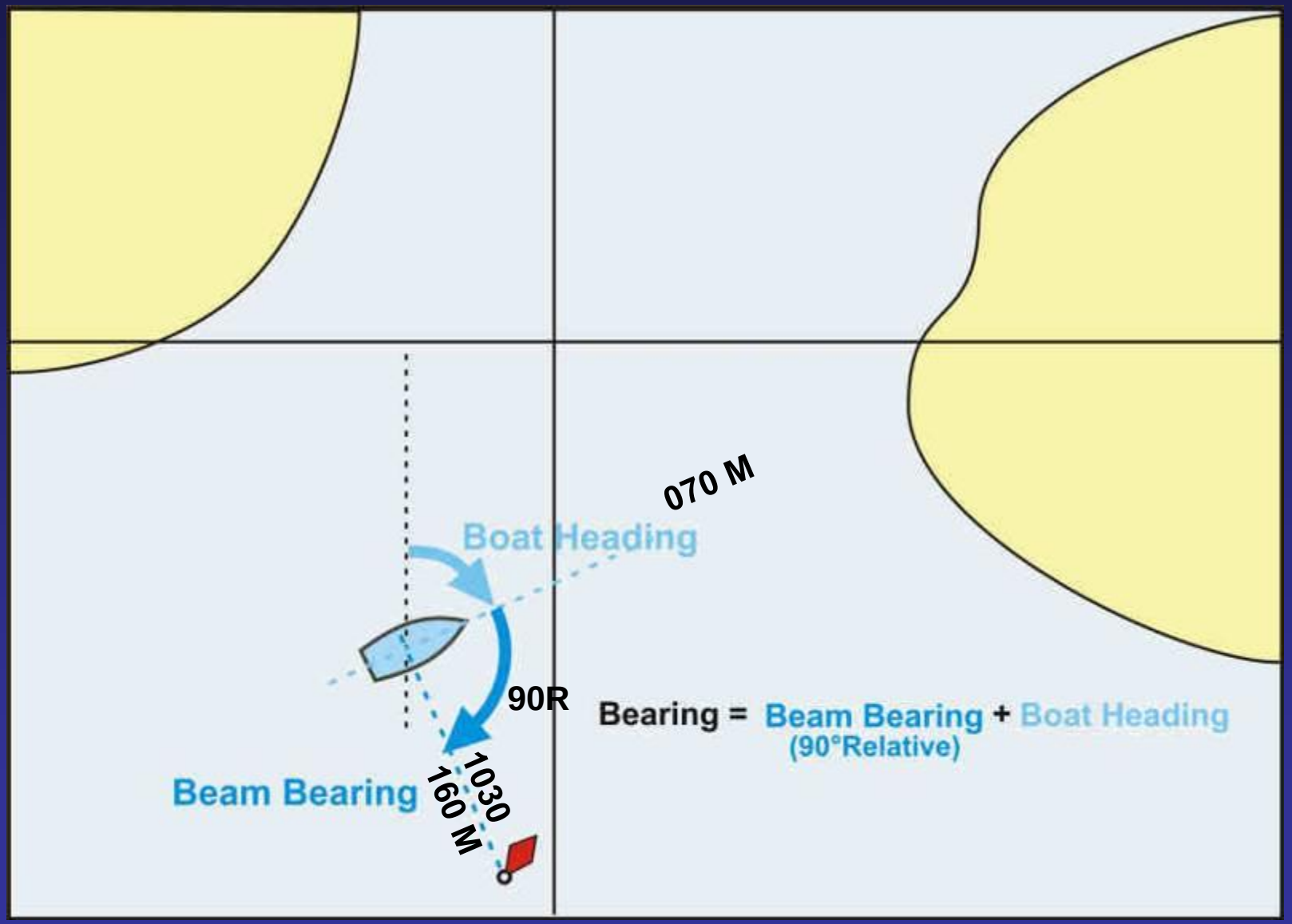
Plot & Label Bearing



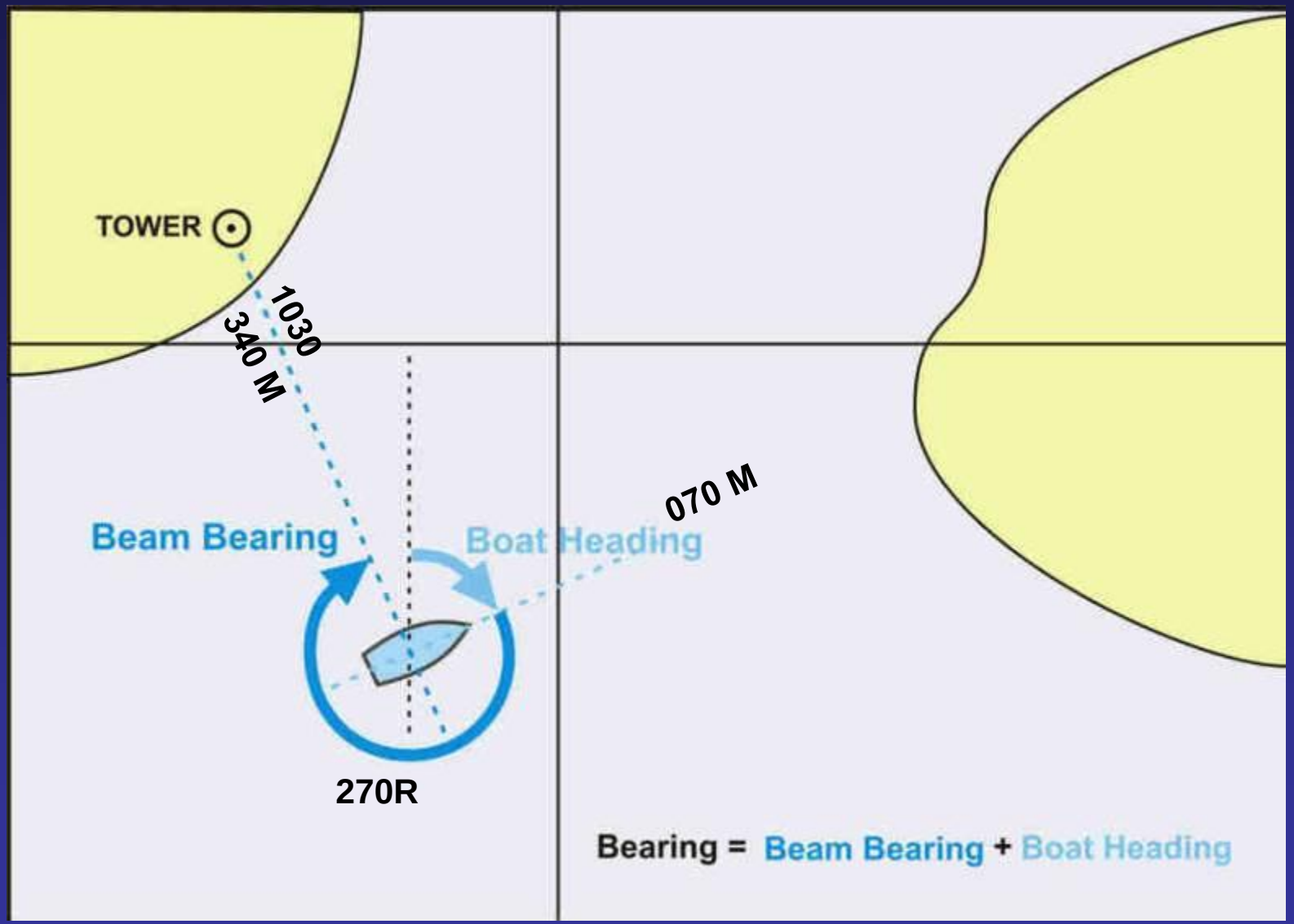
Bow Bearing

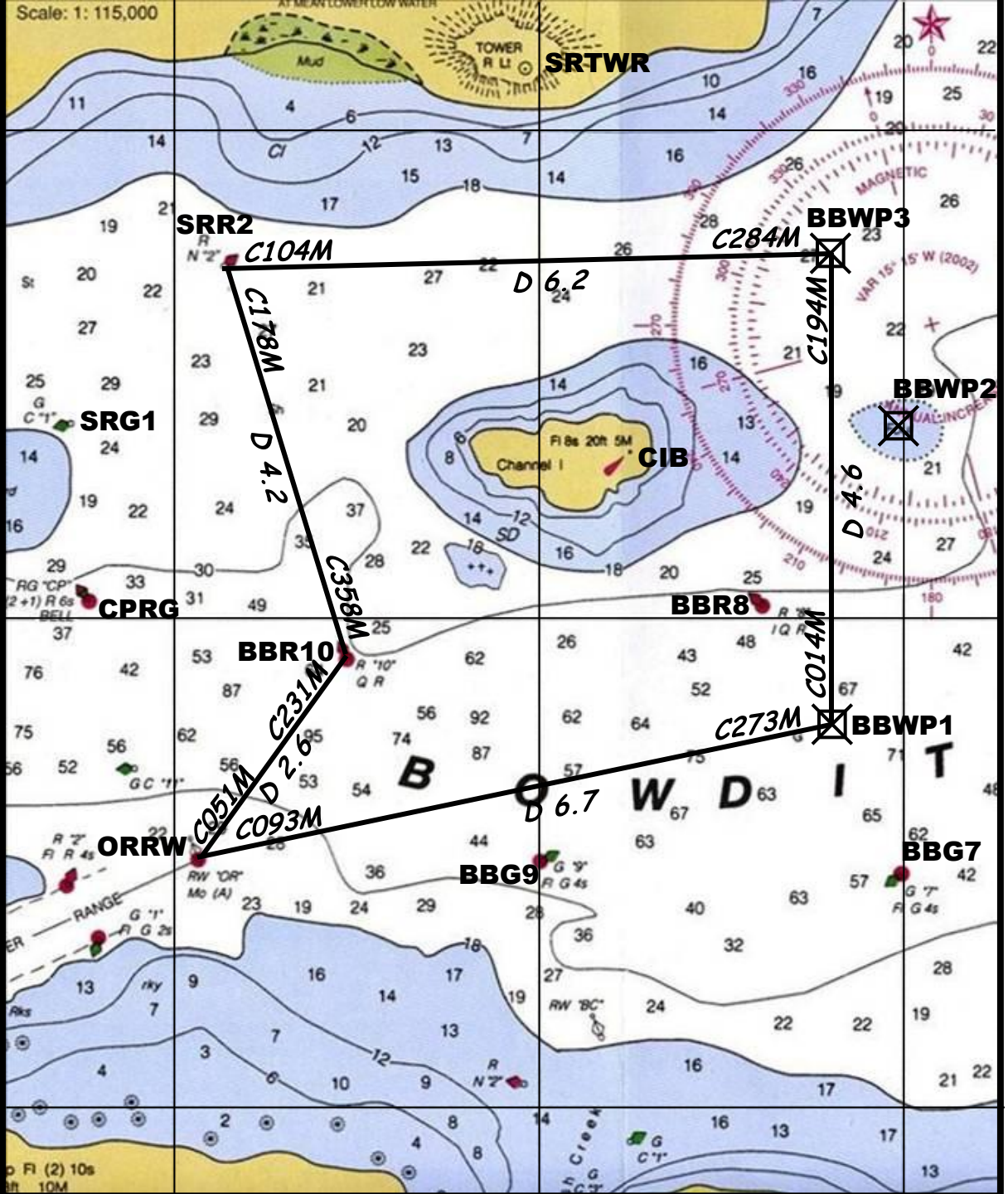


Beam Bearing



Beam Bearing





Plotting & Labeling Standards

Waypoint Planning

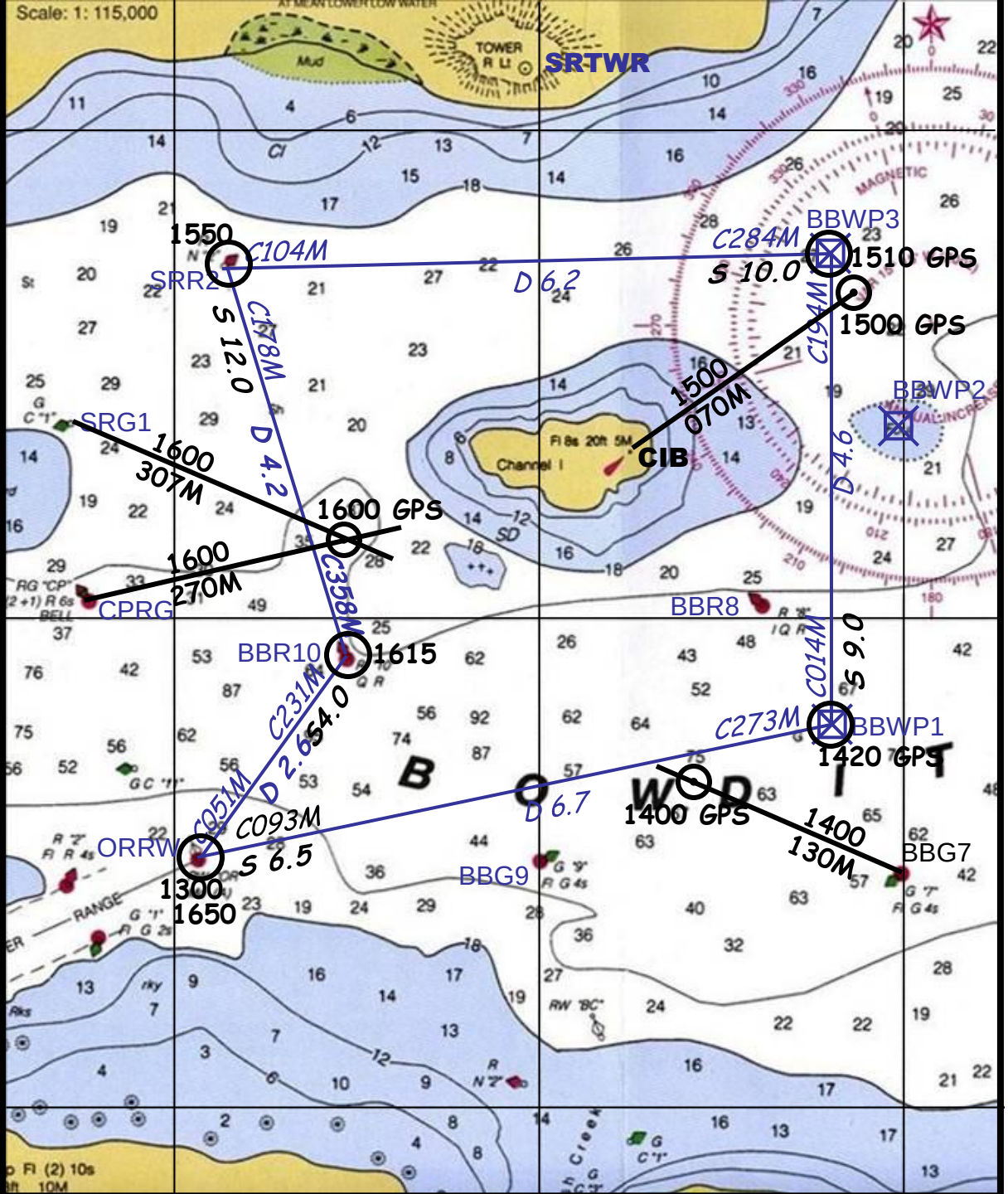
All charted navigation aid (ATON's) used as waypoints or possible position checks are identified.

Waypoint symbol ⊠ used when not charted navigation aid.

Legs of planned cruise are plotted.

MAGNETIC course direction labeled above line with reciprocal shown, to nearest whole degree, in three digits, using prefix "C".

Distance labeled below line midway between waypoints, to nearest tenth, using prefix "D".



Plotting & Labeling Standards

Waypoint Navigation

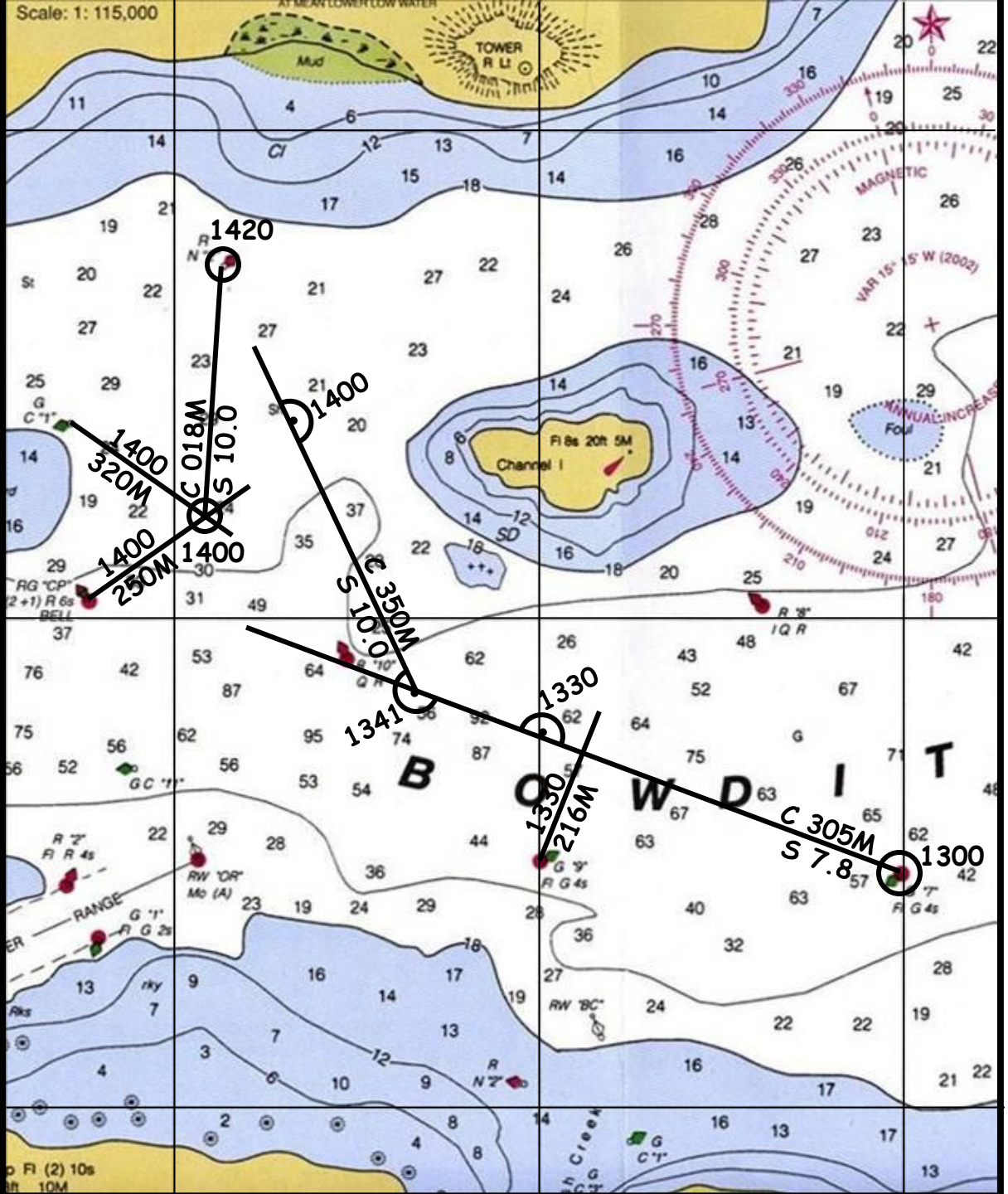
Underway, as you depart/arrive at each waypoint, circle point and label times parallel to bottom of chart in 4 digits using 24-hour clock.

Speed is labeled for each leg, near the beginning of each course line, in knots + tenths, using prefix "S".

Hourly or when needed unless you are off-course outside your pre-qualified distance, a GPS position is plotted using fix ⊙ symbol and labeled. It is not necessary to plot a new course line to next waypoint unless you are seriously off-course.

If possible cross-check GPS with visual bearing and plot, labeling with time above bearing line and magnetic direction below.

If the GPS is suspect, determine current position from bearings or last known good position by dead reckoning.



Plotting & Labeling Standards

Dead Reckoning Navigation

Underway, dead reckoning courses (DR Track) are plotted from a known position in the direction of travel and labeled with course direction above the line and speed below.

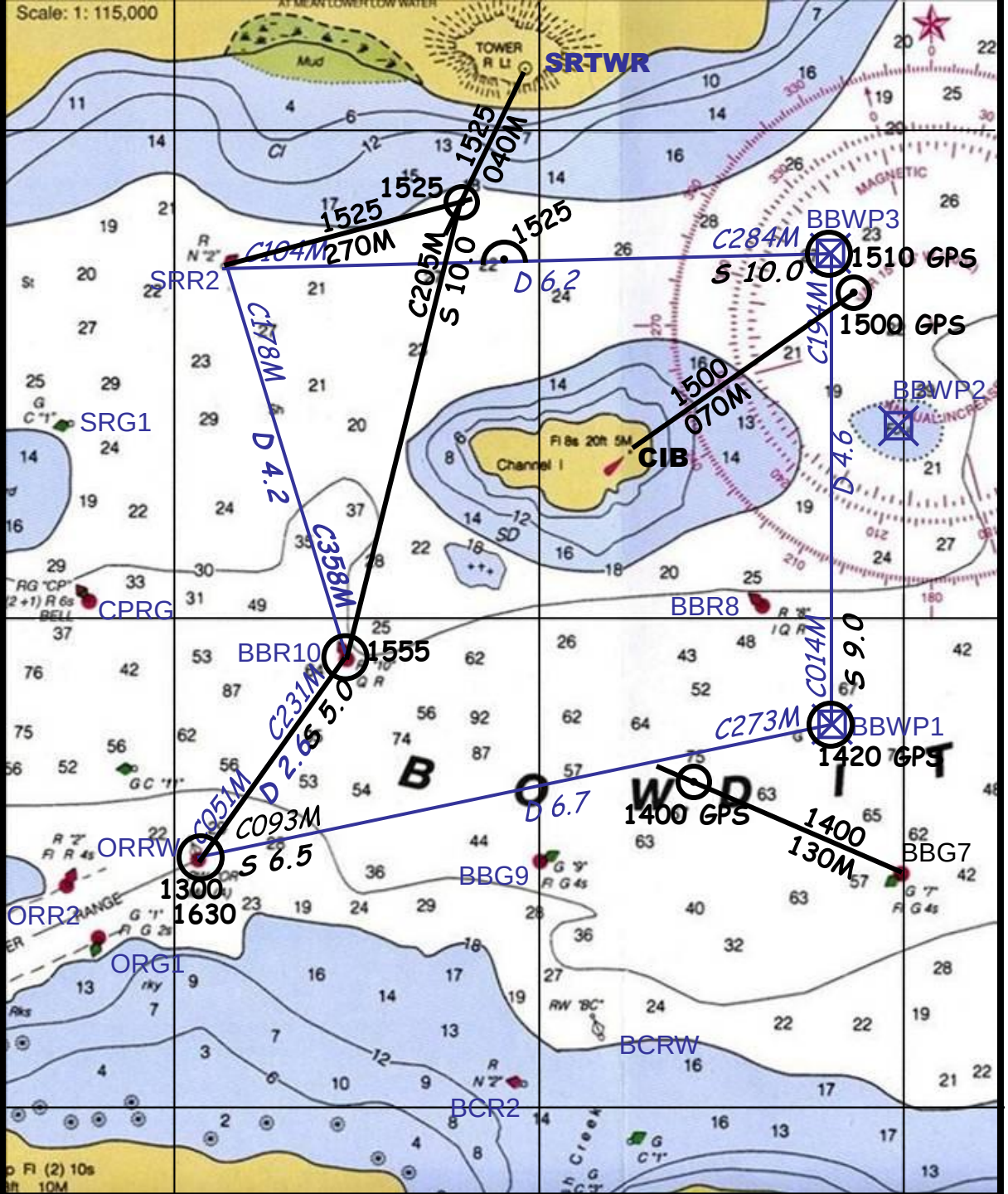
Visual bearing are plotted and labeled with time above bearing line and magnetic direction below.

A DR position is plotted at the time of each bearing using the symbol ⊙ and labeled with time diagonally.

A DR position is plotted at the time of each course or speed change using the symbol ⊙ and labeled with time diagonally.

Fix positions are determined by multiple bearings or arrival at charted navigation aids and indicated with the symbol ⊙ labeled with time parallel to the bottom of the chart.

New DR tracks are begun only from fix positions.



Plotting & Labeling Standards

Waypoint/DR Navigation

Should your electronics fail, you must be ready to revert to DR methods.

Shortly after departing BBWP3 your GPS begins to display sporadic readings and completely fails at 1525.

Determine current position from bearings or last known good position.

Proceed using dead reckoning, verify by bearings.