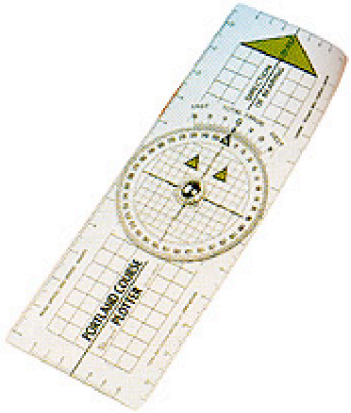
Chartwork

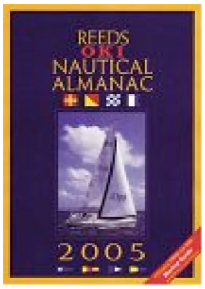
Learn the basics for position fixing using a number of techniques and a simple equation for speed, distance and time.

Chartwork

Chartwork Tools

Accurate chart work is the basis for good navigation. Some charting instruments will be required, these include the Breton or Portland plotter dividers, pencil and rubber

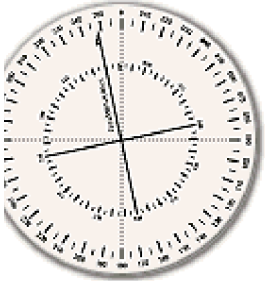




Before going to sea, a course is plotted on a chart noting bearings, distances and expected times for each leg of the trip. While at sea, position is fixed at regular intervals and the course adjusted when necessary. This is safe, sensible practice. It is a 'general safety obligation' of the person in control of the vessel and applies to both large ships and smaller recreational craft.

Some important points to note about working with charts are:

1. Latitude and longitude scales are divided into minutes and then tenths of minutes (seconds are not used on charts). So a latitude may be given as 34°28.5' and this should be able to be determined from the scale on the side of the chart.
2. When determining distances on the chart use only the latitude scale on the side of the chart.
3. Remember one minute of latitude equals one nautical mile, i.e., 1.852 Kilometres



4. Transfer distances to the latitude scale directly beside the chart area from which the distance was lifted. Make this a habit. It is good practice as the latitude scale is not constant. The effect of the Mercator projection, from which most nautical charts are produced, is to stretch the scale slightly at higher latitudes. This is because the angle at the centre of the earth increases towards the poles and the cylinder of the projection, when unwrapped from around the spherical earth, distorts the latitude scale.
5. Take care to read the chart details carefully and note whether soundings are in fathoms or metres.
6. A chart is always true. A compass course is always magnetic. Be sure to take account of these two facts in your chart and navigation work. Conversions must be done correctly.
7. Some charts will have more than one compass rose displayed. This is because variation is not constant. It is changing continuously and it varies from place to place. Always use the compass rose closest to the area you are working in and be sure to note the variation details on that compass rose and apply them consistently to your bearings.
8. For formal chart work the following symbols and lines are used:

Fixed Position (FP)
Estimated Position (EP)
Dead Reckoning Position (DR)

Heading

Course over Ground

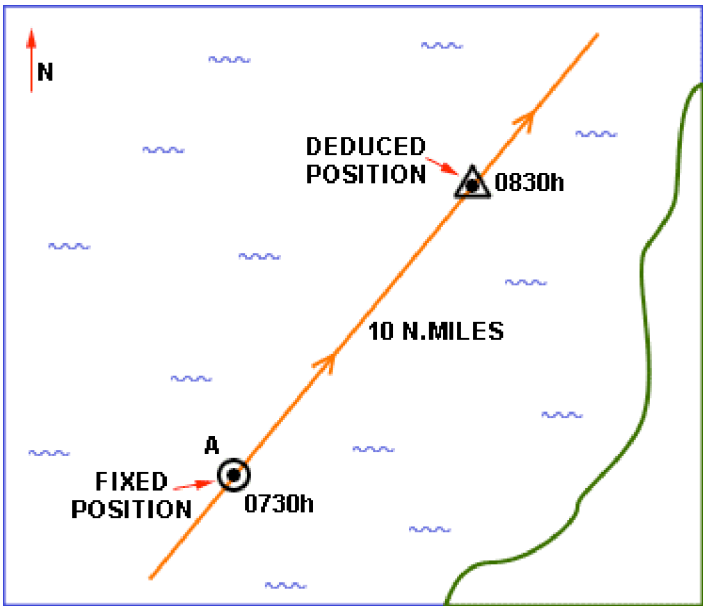
Tidal Drift

There are a number of ways to fix the position of a vessel at sea depending on the circumstances. For coastal fixes the selected features for bearing observations must also be marked on the chart being used.

Dead reckoning:

This is a method of fixing position which is, at best, an estimate of the vessel's position based on information gathered earlier. It is a deduced position used when navigators are unable to sight visible features due to distance from the coastline. A known fixed position (a circle with a dot in it) at a recorded time, the intended course and distance traveled in a given time period are used to determine the deduced position (a triangle with a dot in it).

Example: A vessel traveling at 10 knots on a course of 035°T is at point A at 0730h. Estimate its position at 0830h.



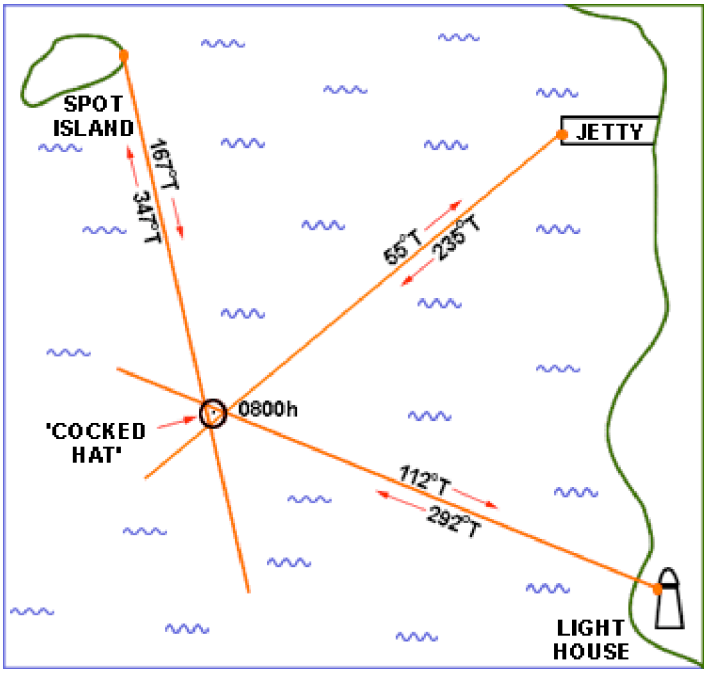
Fix by cross bearings

This fix requires visible landmarks (at least two but three is better) from which to take bearings. The back-bearings are calculated and adjusted for variation (and deviation if necessary). Lines are drawn on the chart from the landmarks so that they intersect at a common point. It is more usual for there to be a small error and the resulting intersection to form a small triangle called a 'cocked hat'. Position can be taken to be the centre of the cocked hat. The time of this position fix is noted on the chart.

Example: At 8.00a.m. the eastern tip of an Island is sighted at 354°M, a lighthouse is at 119°M and the end of a jetty at 062°M. Variation is 7° westerly. Fix the position of the vessel on the chart.

First convert the bearings to true bearings before plotting them on the chart. Always remember the compass reads magnetic but the chart maps true.

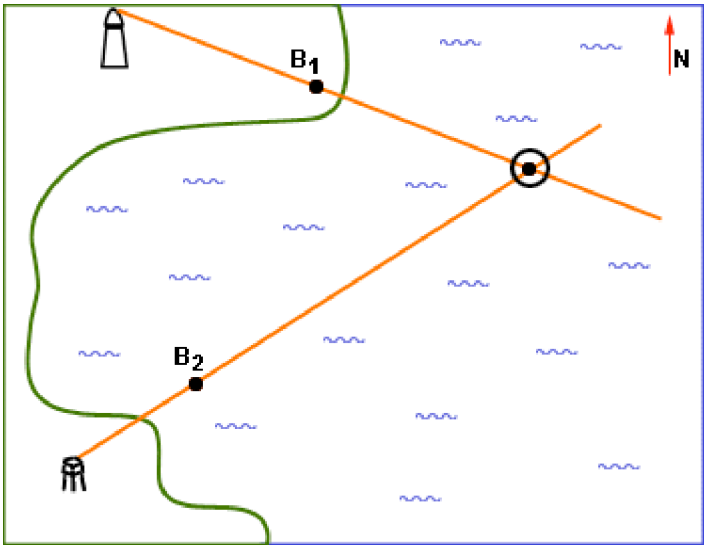
354°M = 347°T
119°M = 112°T
062°M = 055°T



Transit Fix:
This method of fixing position relies on the fact that if a vessel observes two features directly in line then the vessel must also lie on that same line, called a transit line. It is possible to have a two-transit fix when the vessel is able to observe yet another two features on a direct line with itself. The two-transit fix will fix the position of the vessel at that time.

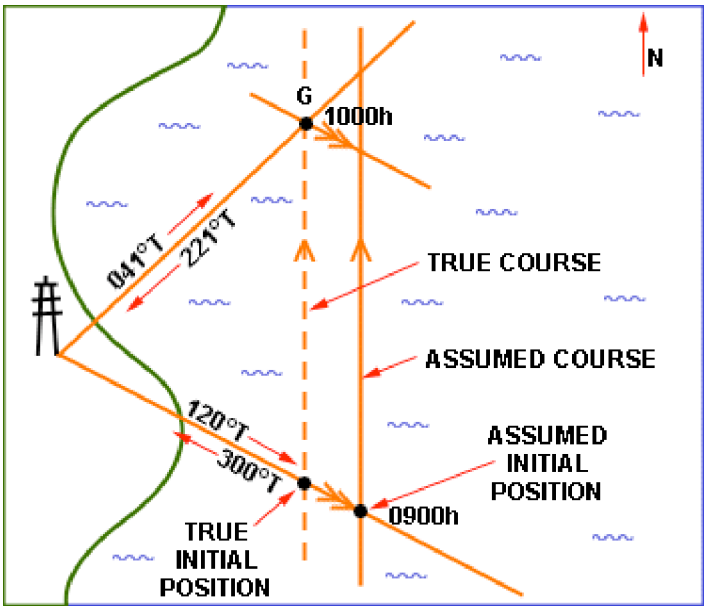
Example: A yacht observes a beacon (B1) and the lighthouse in line at 12.30p.m. At this time a second beacon (B2) and a lookout tower on the coast are also observed to be in line. Use this information to fix the position of the yacht on the chart at 12.30p.m.

A TWO-TRANSIT FIX.



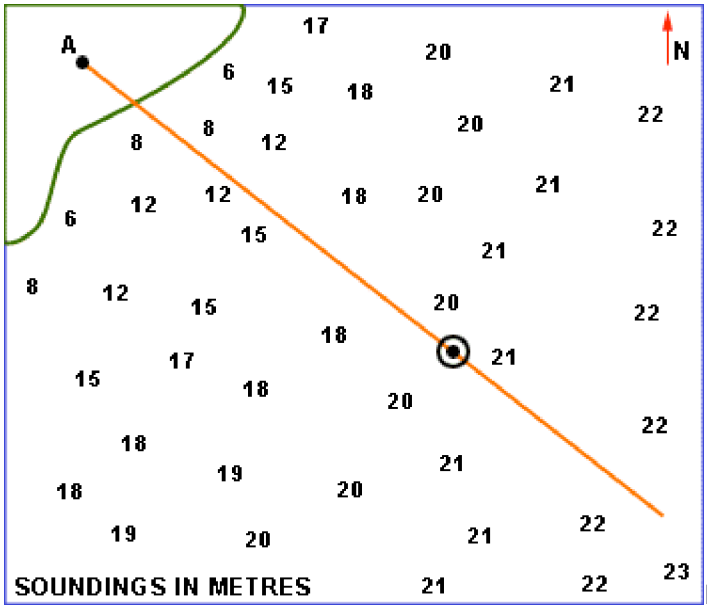
Running Fix
This method of fixing position is used when there is only one visible feature to be observed. Bearings are taken to the feature at two separate times (perhaps an hour apart). These bearings and an assumed course are plotted on the chart. The distance traveled in the hour between readings is marked on this assumed course line. By transferring the original bearing line to this marked point, a true position (point G on the diagram) is determined.

Example: The cox'n notes that the bearing of his RIB to the base of a radio tower is 289°M at 0900h. He is traveling due north at 12 knots. At 1000h the bearing to the radio tower is 210°M. Use the given information to fix the position of the boat at 10:00 a.m. What was the true position of the boat at 9:00 a.m.?



Fix by a Bearing and Soundings
This method of fixing position requires one bearing to be taken and a position line plotted on the chart at that bearing. Assuming the ocean floor is not too rugged or too uniform, a sounding can be taken and compared to those shown on the chart. The vessel will lie on the position line at the recorded sounding.

Example: Fix the position of a vessel in 20.5 metres of water that has taken a bearing of 318°M to feature A on the coast.



Measuring Speed

Speed is often very important in calculations for navigation. Speed is measured in knots. 1 knot = 1 nautical mile per hour. Speed, Distance and time can be calculated easily from the following:

$$\frac{\text{Distance}}{\text{Speed x Time}}$$

1. To calculate **Speed** use: Distance / Time
2. To calculate **Distance** use: Speed x Time
3. To calculate **Time** use: Distance / Speed