OBTAINING A SHIP'S POSITION

BASIC TERMS

**ship's position * coastal navigation *pilotage *navigator *compass bearings *point of intersection *fix *true course * variation *position *deviation *gyro error *Line of Position *dead reckoning *peep vane * observer *sextant angle *bearing and distance *landmark *accurate fixing *radio signals *radar *hyperbolic navigation *phase comparison *exact/accurate *azimuth circle *bearing circle *observation *estimated position *track *leg*

When a ship is proceeding in sight of a coastline, her navigator will normally never be in doubt of her exact position, for the largest scale chart of the area gives him the exact position of all landmarks, lighthouses, lightships, buoys, etc. By taking compass bearings of suitable objects on the shore and transferring these bearings on to the chart, the point of intersection of the bearings, called a fix, gives the ship's position. Since all courses and bearings laid down on a chart are true, the bearings taken with the compass must be corrected before being drawn in on the chart, by the application of variation and deviation in the case of a magnetic compass, and of any gyro error in the case of a gyroscopic compass.

Other methods of fixing a ship's position when in sight of land are by sextant angles. If the height above sea level of an object on land, such as a lighthouse or church tower, is known, a vertical sextant angle, by means of simple mathematics, will give the distance between the observer and the object, and when combined with a compass bearing, will provide a position on the chart by bearing and distance. The most common device for obtaining bearings is the bearing or azimuth circle. To observe a bearing an observer looks through the peep vane towards the object to be "shot".

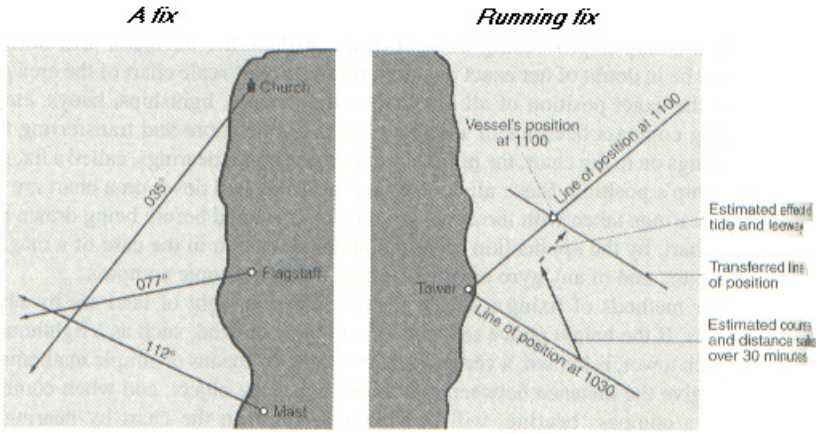
Modern aids to navigation make the task of the coastal navigator even easier. Radar is a means of providing the navigator with vital information in darkness or in fog, enabling him to see the land and in many cases providing him with an accurate bearing and distance of landmarks which are marked on his chart. Hyperbolic navigation, such as the Decca Navigator system, is another means of accurate fixing, using the principle of phase comparison of continuous wave radio signals.

A wise navigator, unless he has no alternative, does not use buoys as marks to fix his ship's position. Buoys can drag their moorings and thus be out of position and, being unmanned, can give no warning of any error.

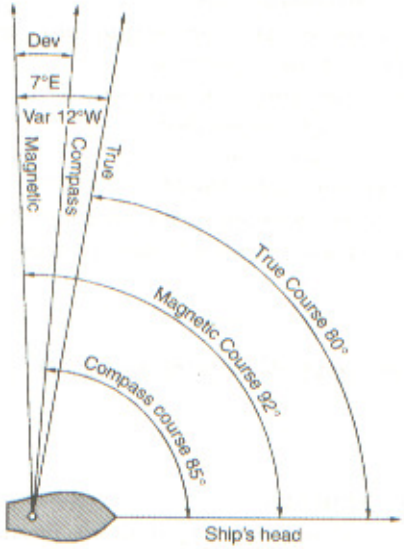
In such circumstances as when piloting in fog, at night, or in foul weather the navigator is forced to determine an estimated position (EP) based on incomplete positioning information.

Whenever his ship is to get under way, the navigator always lays down on his chart a kind of *preplanned DR plot* called a track, which is the intended path that the ship should follow over the ground. This track is in fact a form of DR plot, with its course and speed vectors representing the intended course and planned speed, rather than the ordered true course and speed. The direction of each of the vectors or "legs" of the track are labelled with the abbreviation TR above the intended track line, and the intended speed, called the speed of advance, is labelled by the letters SOA below the line. If the navigator knows the time at which the ship will get underway, he can compute in advance the times at which the ship should reach each junction point on the track.

In addition to plotting an exit track from a port or anchorage, the navigator also plots a track to show the planned course across open water, or through the entrance to a port or approach to an anchorage.



Compass Error with Westerly (Variation) and Easterly Deviation



IMO STANDARD MARINE COMMUNICATION PHRASES

III/6.2.2.2 – *Position*
You are entering …
Your position ...
Your position ... degrees/... kilometres/nautical miles from ...
You are passing ...
You are in centre / middle of fairway.
You are (not) on reference line (of fairway).
You are on ... side of fairway
You are approching starboard / port limit of fairway
You are approaching reference line of fairway.
Your position buoy number ... distance ... metres/cables to starboard/port side of ref. line.

MV ... has reported at way point ...
You are getting closer to vessel ahead.
Vessel on opposite course passing your part / starboard side.
MV ... metres/cables ahead of you on your port / starboard bow.
MV ... ahead of you on opposite course
MV ...following you will overtake you on your port / starboard side.
Vessel anchored ahead of you in position ...
Vessel ***ahead of you obstructing your movements.***
You will meet crossing traffic in position ...
Vessel entering / leaving fairway at ...
Buoy ... distance ... metres/cables ahead.
Vessel ahead/astern/part/starboard of you turning/anchoring/increasing speed/ decreasing speed/overtaking you/not under command.

A. Comprehension & vocabulary

A.1 *Fill in the required terms:*

True and relative bearings

The horizontal direction of one terrestrial point from another, expressed in degrees, is termed a 1._____ There are three different types of bearings, depending on which direction is used as a basic reference or 000 degrees direction. If a bearing is measured with reference to the ship's longitudinal axis, it is termed a 2._____. If it is measured with respect to a magnetic compass needle aligned with the magnetic north, it is a 3._____ . If a bearing is measured with respect to a gyrocompass repeater having zero gyro error, or a magnetic compass corrected to the true north, the angle is called a 4._____. The instrument for obtaining the azimuth or bearing is called the 5._____ or 6._____ circle.

A.2 *Complete the text below with the appropriate terms:*

**intersection *LOP * observation *landmarks *error *fix *surface *position*

The initial element of the ship's dead reckoning (DR) is the 1._____ A fix is the ship's 2._____ on the Earth's 3._____ at some given point in time. A fix is determined by the 4._____ of at least two simultaneous lines of position (LOP).
The 5._____ is a line along which a ship's position must lie. To avoid position 6._____ at least three simultaneous LOP's are required in determining a fix. These LOP's may be determined by visual observation of 7._____ or seamarks, by the use of electronic equipment and 8._____ of celestial bodies.

A.3 *Say which of the navigating terms are defined below:*

1._____: a device on a magnetic or gyro-compass for taking bearings or azimuths.
2._____: the direction or position in which an object lies if viewed from an observer (ship).
3._____: the angle between the magnetic and true meridians at any position.
4._____: a line drawn through all positions at which a ship may be situated.

5._____: the position of a ship when found by the intersection of two or more LOP's.
6._____: the angle that a compass needle makes with the magnetic meridian, due to the attracting forces of the ship or cargo.

A.4 *Give short definitions for the following terms:*

Piloting _____

Navigating aids *(two meaning.s)* _____ _____

Navigational instruments:
- for distance _____
- direction _____
- speed _____
- depth _____
- plotting _____

Azimuth _____
Bearing _____
Dead reckoning _____
True bearing _____
Magnetic bearing _____
Relative bearing _____
Running fix (see *Fig. p. 232)*

B. Grammar

B.1 *Study the sentences where the following words appear, and find out the verb that takes those nouns either as the subject or the object:*
****position * bearing *course *fix***

EXAMPLE
give the position
take the bearing

B.2 *Study the word* ***bearing*** *and write down the combinations (compounds) where this word is a noun or adjective:*
EXAMPLE
noun: compass ***bearing***
adjective: ***bearing*** circle

B.3 *Give the opposites to:*
1. In position _____
2. Unmanned _____
3. Be in doubt _____
4. Landmark _____
5. Accurate bearing _____

B.4 *Match each term on the left with its synonymn on the right:*

a	vessel's position	1	navaids
b	bearing	2	precise
c	piloting	3	take the bearing
d	error	4	coastal navigation
e	navigational aids	5	fix
f	shoot (the object)	6	azimuth
g	accurate	7	mistake

a	**b**	**c**	**d**	**e**	**f**	**g**
5						

B.5 *Supply the correct form of the following verbs:*
**** lay down *be *take * fix *transfer * correct * give *intersect***

1. When a ship _____ in sight of a coastline, the chart of the area _____ the navigator the exact position of all landmarks, , lighthouses, buoys, etc.
2. He must _____ the bearings of suitable and reliable objects on the shore.
3. He then _____ these bearings on to the chart.
4. The point where these bearings _____ gives the ship's position or the fix.
5. All the courses and all the bearings which _____ on the chart are true.
6. The bearings taken by the magnetic compass must _____ for variation and deviation.
7. The ship's position when in sight of land can also _____ by sextant angles.

C. Writing skills

C.1 *Summarize the reading text using the answers to the following questions as a guide:*
1. Which condition must be fulfilled for sailing in coastal navigation?
2. What does a navigator need in pilotage?
3. What is a fix?
4. What must the compass bearings be corrected for?
5. How can the ship's sextant be used in coastal navigation?
6. Why has radar made coastal navigation much easier?
7. How is a fix made in hyperbolic navigation?
8. Why should buoys be avoided in fixing the ship's position?

Path of light through sextant