

MARINE SURVEY TECHNIQUES : A PRE-REQUISITE IN MARINE ARCHAEOLOGICAL EXPLORATION

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All the offshore exercises involve the use of floating craft of one sort or the other. These crafts have to be positioned at certain geographical points or their movement have to be known in between two geographical points. Ocean environment presents a different set of conditions wherein the observing station is not stationary as on land, but in motion. In the absence of easily distinguished mark at sea to which the position of the craft can be referred, the position have to tied up to a monumented control back onshore. The Marine Archaeological investigations demand a greater accuracy in positioning and mapping to delineate the features of interest. Thus a brief introduction of Marine surveying techniques specifically determination of horizontal and vertical (depth) positions, and its applications for Marine Archaeological exploration outlined herewith an aim to provide a tool of understanding and interpretation of data.

Horizontal Position:

1. Establishment of Geodetic Control:

Let us suppose we are dealing with an ancient shipwreck about which little is known except its probable position. Then the first thing to be done is to determine the ship's precise position and examine the topography relative to the established geodetic network to provide the horizontal control. Horizontal geodetic control networks are established us-

ing one or a combination of three basic surveying techniques:

- a) Triangulation
- b) Trilateration
- c) Traversing.

The positions thus obtained from these techniques are related to the national datum. Once the geodetic control is established along the shore the next step is to undertake offshore survey.

2. Offshore Positioning:

There is a requirement for more accurate relative navigation for the specialised operation of search and data collection before the selection of offshore positioning system. We should know about marine positioning accuracies.

There are two accuracy parameters:

- a) Relative accuracy
- b) Absolute accuracy

Some of the techniques used in positioning the offshore survey craft are tabulated below:

- 1) Visual Positioning System: (Sextant, Theodolite)
- 2) Radio Positioning System:

- i) Short Range (Miniranger, Trisponder)
- ii) Medium Range (Shoran, Loran c, Maxiran, Decca)
- iii) Long Range (Omega)
- 3) Satellite Positioning (NNSS, GPS)
- 4) Acoustic Navigation:

Topographic Data Collection:

To discover the hidden archaeological object and the bottom topography the area is to systematically sounded by using the dual channel echosounder which works on the following principle.

$$\text{Depth (d)} = 1/2 vt$$

Where t = Two way travel time

and v = Velocity of sound in water

Echosounders are used to make the depth measurement below the floating survey craft. Before starting the survey the Echosounder is calibrated by using a horizontal bar below the transducer. Simultaneous recording of depth and position is done by using a Fiducial marker.

The depth recorded by the echosounder is to be affected by local rise and fall of tide. This is necessary because all the soundings, which obviously must be taken at all states of tide have to be reduced to the lowest astronomical low water which is known as chart datum.

All this information (position, depth, tidal correction, etc.) has been unified and the result is a bathymetric chart.

Uses of Marine Survey for Marine Archaeological Investigation:

1. As a tool for exploration of relict features.
2. The reconstruction of past morphological maps from geological and historical evidence.
3. The investigation of changing morphology through time.
4. These maps may be studied as primary document used as evidence in reconstructing the past.