USE OF TELLUROMETER FOR CALIBRATION OF ELECTRONIC NAVIGATION AIDS

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For the past several years, the U.S. Naval Oceanographic Office has used two-range systems of electronic navigation aids to control hydrographic and bathymetric surveys. Specifically, such systems as two-range Decca and Lambda have been employed. Such systems, however, must be calibrated before operations commence in order to remove the fixed errors inherent in each pattern. To eliminate these errors, a line distance must be measured from the electrical centre of a slave station to the electrical centre aboard the ship. Until two years ago, this was done optically; that is, three theodolites were set up over known points on shore and a series of angles were measured to the ship. This procedure required about one hour for each ship position calibrated. Since a minimum of four ship positions were used, and often six, it can be seen that it required one day just to observe angles; computing the raw data and making adjustments required, normally, 48 hours more. Therefore, to calibrate one ship at both slave stations would take four to six days.

To eliminate this excessive use of non-productive time, it was necessary to develop another method of calibration. After some consideration, it was decided to try measuring the line distance by tellurometer. This method has worked very satisfactorily and, in addition to the elapsed time saved, it was also possible to reduce the number of men in the calibration party from four to two. There are also other advantages : calibration can be carried on in fog or haze that precludes visual work; also, the system can be calibrated with the vessel farther out to sea, which reduces inaccuracies from the induction field.

To calibrate these navigational aids with tellurometer, new techniques needed to be developed. First, since distances need be measured only to the nearest metre, only the coarse readings are observed. To compensate for any movement of the vessel during observation the A+ crystal may be

read twice. It is normally read first and a second reading can be made after the D crystal is read. Any difference between the two A+ crystal readings is then pro-rated throughout the series of readings. Secondly, meteorological readings need be taken at one end of the line only or, in fact, can be disregarded altogether.

While there is a considerable saving in time during the period of observation, the real saving is effected when the true distance is computed. Instead of the cumbersome computations previously required, the telluro-meter system makes use of a table which converts millimicroseconds directly to metres. From metres, it is a simple matter to compute the Decca lanes. It is also possible to set up a table with which millimicro-seconds may be converted directly to lanes; however, a different table would have to be computed for each frequency.