

TRIALS OF RADIOGONIOMETRIC POSITION-FINDING

(Extract from the Report on the Hydrographic Mission of Indo-China 1929-30,
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We brought from France three direction finders of two different patterns.

One of them (small pattern) came from the Orly aircraft station (frame serial of "Radio-LL" type; 7-valve super-heterodyne of "Radio-LL" type; compensator, type 3325).

The other two (large pattern) came from the *Constructions navales* of Toulon (frame aerial with stand, Paris contract 2200 A, 1926, type 259; "Radio-LL" 8-valve super-heterodyne, type 3317; "Radio-LL" compensator, type 3325).

It was our duty to test their suitability for Hydrographical use and in particular to profit by these trials by taking some soundings in the Gulf of Tonkin. In this region, indeed, where the coast is lost sight of very quickly, where the currents are fairly strong and where mirage causes considerable errors in determining the height of heavenly bodies, the accuracy of dead reckoning and astronomical observations is somewhat precarious, and would presumably be inferior to that obtained by radiogoniometric fixes.

The principle was as follows: the transmitting vessel emitted wireless signals which were received by frame aerials installed in suitably chosen positions ashore; at these points the directions were noted in which there was a silent spot. The knowledge of these directions enabled the value of the bearings to be determined afterwards. This procedure appeared more convenient than that of transmitting signals from several stations ashore and receiving them on board; besides avoiding the long and complicated installation of three fairly powerful transmitting stations, it also avoided the "preliminary calibration" or study of the errors due to the frame which would have been fitted on board, this calibration depending in principle on the relative positions of the frame, the ship and perhaps the transmitting stations. At the same time it could be assumed that the deviation of the frames ashore, if not entirely non-existent, should be very simple to determine, the country being generally flat and destitute of mountainous and rocky irregularities. This was partly proved by experience.

The scheme we had mapped out for ourselves was as follows:

a) A comparison of bearings taken with a single frame with corresponding stations made by the transmitting vessel, steaming within sight of points ashore.

In cases where the bearings did not pass through the stations, the comparison would furnish a value of the deviations of this frame, valid at least for the time of day and for corresponding atmospheric conditions (1).

b) Out of sight of terrestrial points, a comparison of positions furnished by dead reckoning and astronomical observations with the bearings furnished by one, two or three radiogoniometric stations.

c) In the case of three radiogoniometric stations giving simultaneous readings, an appreciation of the cocked hat obtained.

The following results were obtained:

1. — In July, the *Lapérouse* steamed along a part of a circle of about 7 miles radius round a direction finding station set up at Quat-Lam. The comparison between the radiogoniometric bearings and those measured on the projection did not reveal any differences greater than a quarter of a degree (with exceptions). This remarkable result was due to the nature of the terrain, the proximity of the source of emission, the possibly exceptional quality of the apparatus in use, and finally the care and skill of the personnel who erected the installation and recorded the silences.

2. — In August, the *Octant* ran six lines of soundings to the East of Hon Né, their positions being based on points of land at the shore end; the parts in the offing were fixed by dead reckoning. The differences between the radiogoniometric bearings emanating from Quat-Lam reached a maximum of from 1° 30' to 2°.

3. — In September, the three stations were installed at Quat-Lam, at Phat-Diem and at the Norway Islands. Circumstances obliged us to adopt these sites in preference to theoretically more appropriate ones. The *Octant* ran a series of six lines to the south-

(1) This study should really have been repeated for each of the other two stations separately. The requirements of the mission did not allow of this being done.

ward of the Norway Islands on the 28th, 29th and 30th of September, transmitting every five minutes.

The Quat-Lam instrument continued to give quite regularly spaced bearings; the one at Phat-Diem gave much vaguer and more irregular results; finally the Norway Islands one gave no result at all. The silences were only evident on one side and reached a quite exaggerated magnitude. We were unable to discover whether this setback was due purely to the site or to the apparatus as well.

Having worked out the results furnished by Quat-Lam and the dead reckoning information, we concluded that the bearings from Quat-Lam passed within distances varying from two miles to one cable of the estimated points, a result which led us unhesitatingly to adopt the estimated positions for the soundings taken in this way.

For Phat-Diem, on the other hand, the divergences were much more considerable.

The position lines were not in satisfactory agreement. The positions deduced from them were in general from two to three miles from the estimated positions.

CONCLUSIONS.

We think we must reject, for hydrographic use, the large pattern direction finders which gave us trouble at Phat-Diem and the Norway Islands. On the other hand, the small pattern direction finder installed at Quat-Lam gave us every satisfaction, both from the point of view of precision and of being light and comparatively handy.

Three stations rigged with such direction finders, at any rate with such a serviceable installation as at Quat-Lam, would probably furnish bearings giving cocked hats of 1 or 2 miles for a ship working 40 or 50 miles from the receiving frames.

The control of the operation would be vested in the sounding vessel, and the reciprocal connection between this ship and the shore stations could be established with the minimum of material and installation work in the following manner:

From ship to shore stations: by the long waves used for ordinary transmission, received ashore by the direction finders themselves.

From shore stations to ship: by short-wave transmitting sets, on the lines of the very workmanlike one produced by Enseigne de Vaisseau COLAS DES FRANCS during the course of the mission; these sets are not expensive and are fed by the same batteries as the direction finders themselves. The sounding vessel must have a short-wave receiving set of a standard model.

