

# USE OF LORAC ALPHA IN SUBMARINE CABLE LAYING

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## Introduction

During the years 1952 to 1959, Lorac Alpha systems were used for guidance in laying a submarine cable and for hydrographic surveying preparatory to laying certain sections of the cable. As illustrated in figure 1, this positioning service was provided over the entire route from Cape Canaveral, Florida, to Antigua with the exception of short runs along the coasts of Hispanola, Puerto Rico and Eleuthera Island. The various operations described here were performed, at intervals, under the direction of the United States Hydrographic Office, the Bell Telephone Laboratories, and the Pan American World Airways Incorporated.

## First hydrographic survey

In preparation for laying the submarine cable, depth soundings were made over a considerable portion of the proposed route through the Bahama Islands using Lorac for position control and navigation. The first surveying project was undertaken by the U.S.S. *Tanner*, a hydrographic survey ship. In surveying the cable route, it was of the utmost importance not only to obtain accurate data as to ocean depth but also to maintain good position control of each depth sounding. In this manner, within a given general area, the most desirable bottom conditions could be selected and the cable could be laid along the selected course at a later date. An additional requirement was to determine the length of cable required between the various terminating stations along the route, which again called for close position control.

## Laying cable

About one year after the beginning of the first hydrographic surveying project, H.M.S. *Monarch* began laying the submarine cable, using Lorac for guidance. The value of an accurate positioning system was very obvious

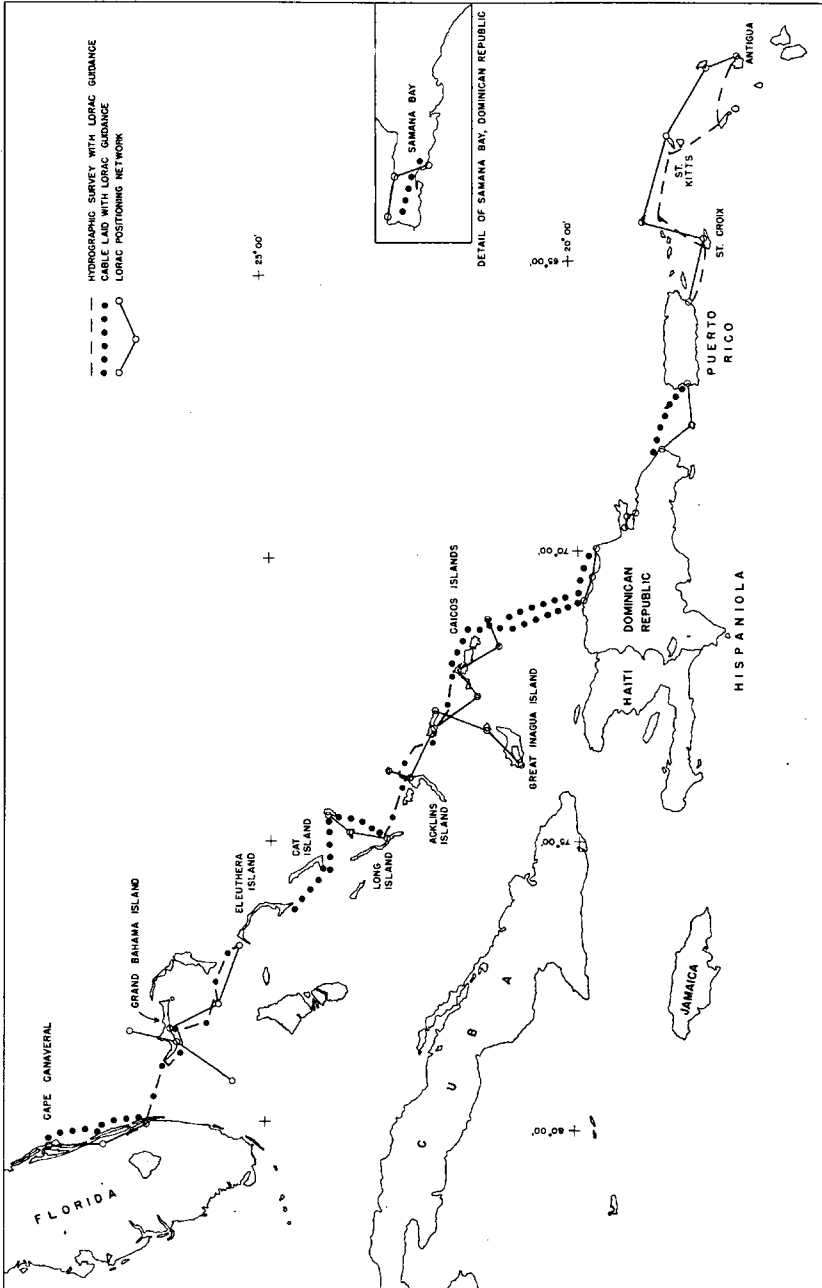


FIGURE 1

during the crossing from the coast of Florida to Grand Bahama Island. Currents were so strong in this area that the *Monarch* had to steer as much as forty degrees off heading in order to maintain a straight course by Lorac coordinates.

Along the cable route, the locations of the Lorac shore stations varied from low coral islands to inland mountain sites. In some areas the lack of survey control points on the coastline made it necessary to move the stations a considerable distance inland. In such cases the reduced ground conductivity and the dense tropical foliage caused attenuation of the positioning signals; however, the coverage was still adequate even with low-power transmitters.

During the cable-laying operations, percentage slack in the cable was calculated by both the taut-wire method and Lorac position. In comparing the results of the two methods with mile-marker readings on the cable itself, the inaccuracies of the taut-wire method were easily detected.

In Samana Bay, on the east coast of Hispanola, visibility was so poor that visual navigation methods were not reliable. A positioning network was installed here for guidance in laying a section of cable in the bay. This operation is illustrated in the detail map of figure 1.

### Second hydrographic survey

In 1959 a second hydrographic survey was performed along the proposed subcable route from Puerto Rico to Antigua. Three positioning networks were installed operating on frequencies of 1 772 kilocycles to 1 798 kilocycles. For operations in each network, the position indicator on the ship was calibrated by crossing the baseline extensions. Immediately after calibration, a lane-check buoy was installed at a convenient ship anchorage, and these buoys were used to check the indicator coordinates at the beginning and end of each day's work.

The primary procedure used for navigation was to lay out the proposed day's route on the Lorac chart. A position fix was recorded every five minutes and was plotted at the time of observation. If the fix plotted on the chart showed the vessel to be off the intended route, a correction to the ship's course was made to bring it back on track.

A second navigation procedure employed lines which were graphically preplotted for small detailed areas. These lines were run by making course corrections directly from the Lorac indicator rather than from position plots. A smoother, straighter track was maintained by this method.