THE AFRICAN COASTAL CHARTING PROGRAMME OF THE UNITED STATES OF AMERICA

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In the eyes of American chart makers, Africa in the 19th century was indeed the forgotten — albeit the second largest — continent of the world. By 1900, as shown in figure 1, the United States had published no coastal charts and only 12 general nautical charts of African waters. In the main, the latter, more commonly termed " sailing charts ", served only for ocean navigation. They were based on old British surveys dating back to 1819-1821, and were of extremely small scale. A few harbour charts had also been published by 1900, some from hydrographic surveys made by United States Navy ships such as the USS *Porpoise* (1844) and the USS *Ticonderoga* (1879).

It was 1930 before basic ocean or sailing chart coverage produced by the United States for the African area approached completion. By this time, a total of 32 such charts had been published, at scales ranging from 9 to 13 nautical miles per inch. This scale range is generally conceded to be the smallest practicable for purposes of ocean navigational planning, fixing position at sea, and plotting dead reckoning while on long voyages. Shoreline and topography on such charts are generalized, and only offshore soundings, principal navigational lights and landmarks visible at considerable distances are shown.

As shown in figure 2, the issue of these 32 sailing charts gave complete ocean and sea coverage except for small gaps off Algeria and what are now the Somali and the United Arab Republics. This figure also shows the progress that had been made in providing larger scale coastal charts, of which a total of 28 were on issue. These ranged in scale from slightly over 3 to slightly less than 5 nautical miles per inch (1/233 120 to 1/355 190), and provided coverage for coastwise navigation in the Mediterranean waters off what is now the United Arab Republic, the coastal zone from Tunisia to Tanger, the Cape Verde Islands, the Gulf of Suez, the Coast between Dakar and Douala, and the waters off Libreville. In addition, the

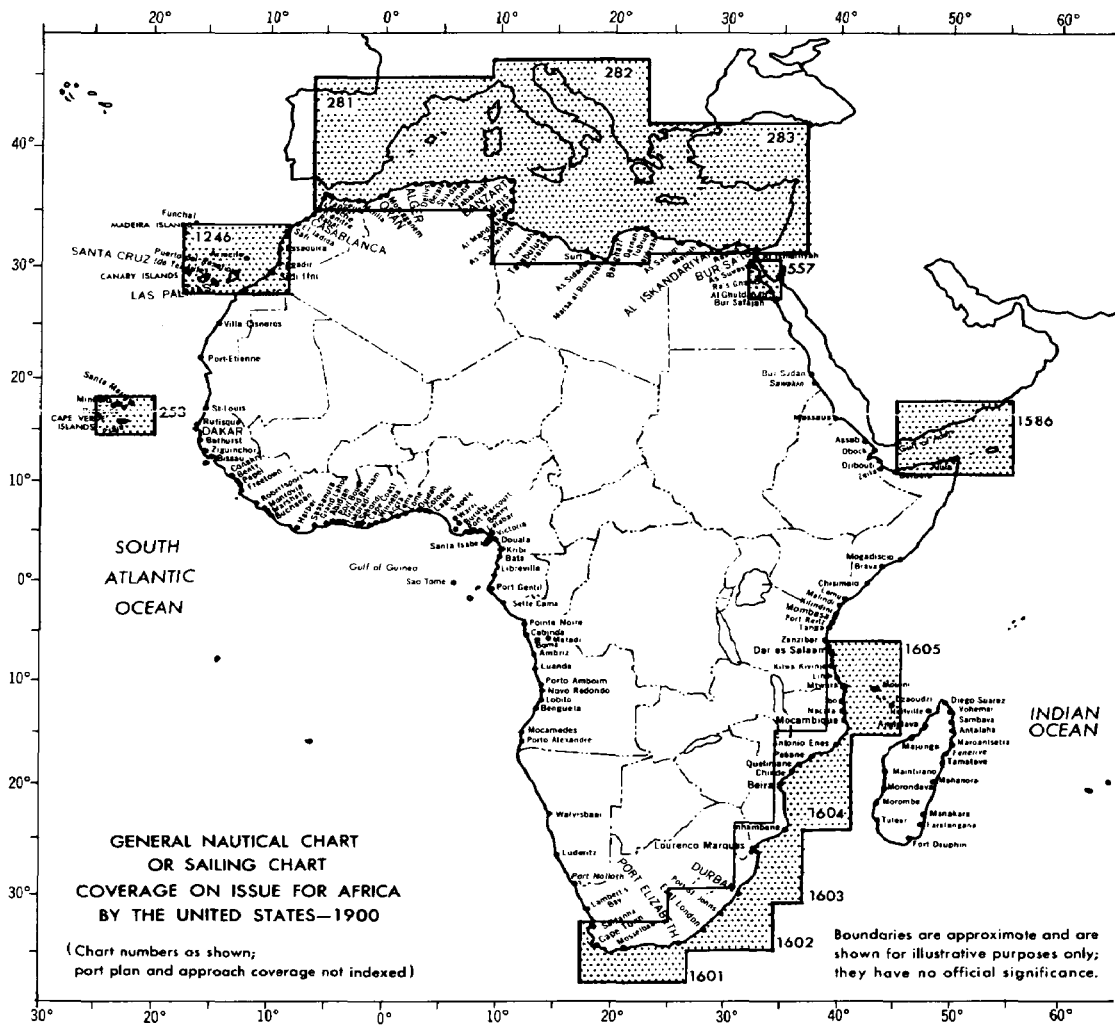

FIG. 1

United States also had on issue several large scale plans of various African ports, and a limited number of large scale harbour approach charts. The type and extent of coverage, in view of geographic and economic considerations, left much to be desired, but little of significant value was done in the next twenty-eight years insofar as major improvement was concerned.

Requirements which led to producing many of the charts issued prior to 1958 were established by the U.S. Navy Hydrographic Office (now the U.S. Naval Oceanographic Office) on the basis of occasional reports and requests submitted by individual U.S. mariners. With an increase in the tempo of these reports from all quarters of the globe, in the late 1940's and the 1950's, it was decided early in 1958 to query the major U.S. shipping companies on their chart needs and their assessment of the quality, and scale and geographic coverage adequacy, of United States charts of foreign waters.

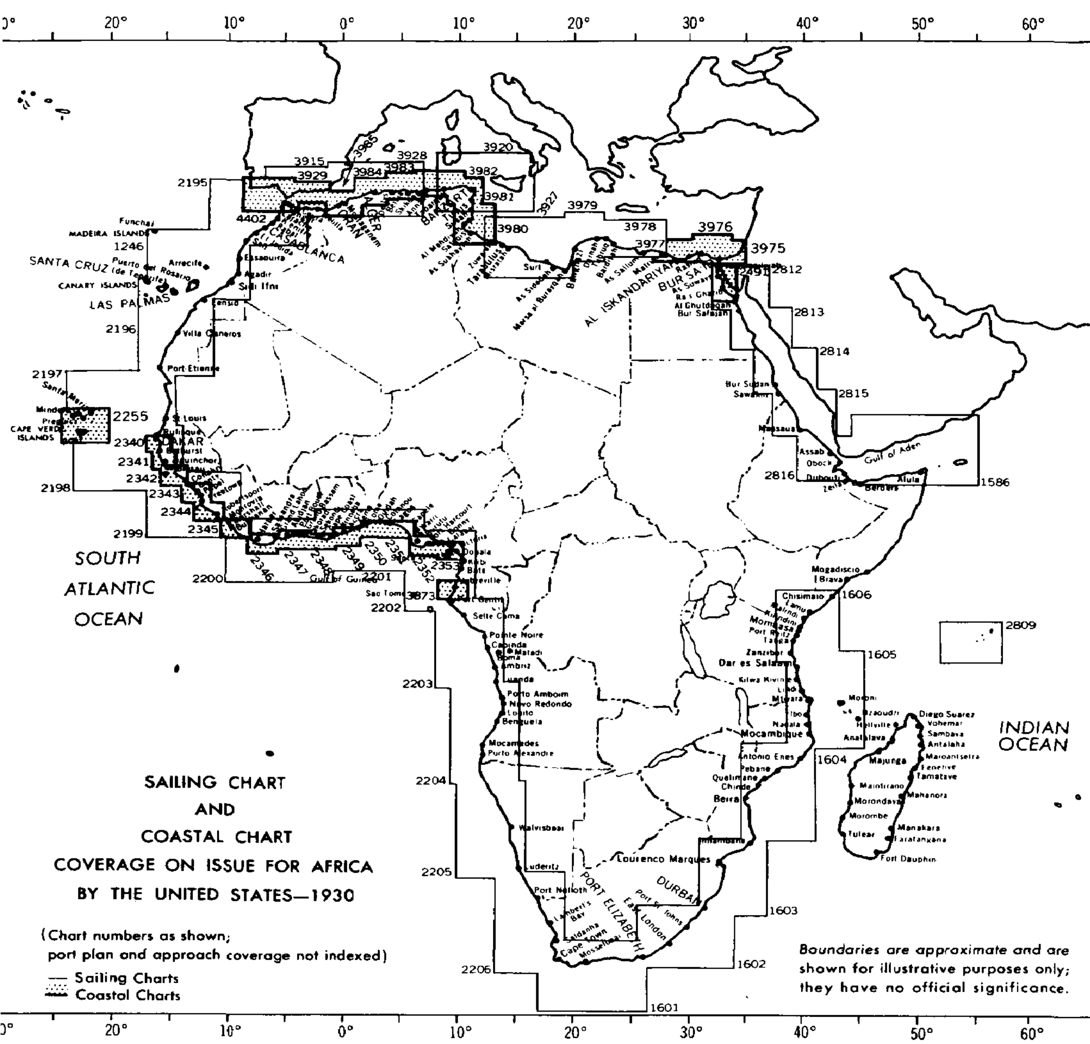

Fig. 2

In July 1958, specially designed survey questionnaires were mailed by the Hydrographic Office to major U.S. shipping companies. As expected the company reports substantiated and even broadened the recommendations previously submitted by individual ship captains and navigators. As a result, a general Nautical Chart Review was undertaken by the Hydrographic Office.

During this review, which was world-wide in scope, all reports on hand from shipping companies and individuals were considered along with official Fleet requirements and other pertinent information. Existing U.S. chart coverage was thoroughly scrutinized by selected study-groups made up of geographic area specialists.

On the basis of the review, it was found that over 1 000 charts of various areas throughout the world could be withdrawn from issue without jeopardizing service to chart users. At the same time, it was found

that nearly 700 new charts and new editions of existing charts would be required to meet new and changed merchant marine and Fleet needs throughout the world.

That portion of the Nautical Chart Review concerning the African mainland was most revealing. For the first time, it was found essential to conduct chart evaluation and planning on a continental basis. Existing U.S. coverage was examined in the light of that continent's economic potential and mushrooming development. Particular attention had to be paid to the geography and hydrography of the coastal regions involved, the nature and pattern of U.S.-African trade and trade routes, and the nature, number, and location of ports of possible interest to U.S. shipping.

The coast of Africa is largely inhospitable, with few good large harbours. Many of the ports were found to be either open roadsteads or artificial harbours developed at great expense. There appeared to be relatively little trade between the countries of Africa as compared with foreign trade, and the core of the economy was found to be the production for export of minerals, timber and agricultural and animal products.

Most of the principal African ports are located at railheads, with the railroads serving as links with resource-rich hinterlands. There is little cabotage, or inter-territorial coasting trade. This, in turn, forces cargo liners to call at most ports.

Of the thirty essential United States foreign trade routes determined by the Maritime Administration (*) of the United States Department of Commerce, eight routes (Nos. 10, 13, 14, 15A, 15B, 17, 18 and 34) have calls at, or pass through, African ports. As shown in figure 3, these routes require U.S.-flag line ship operations and service to ports around the entire continent of Africa. The routes are determined and continually reviewed for possible revision under the authority of Section 211 of the Merchant Marine Act of 1936, as amended. This act specifically directs the Maritime Administration to determine the " ocean services, routes, and lines from ports in the United States... to foreign markets which are, or may be, essential for the promotion, development, expansion, and maintenance of the foreign commerce of the United States. "

Although sailing requirements for each route vary as to number or sailings per month and type of service required, freight service is specified without exception. The essentiality of these routes is readily apparent from the fact that dry cargo alone on these routes in 1960 had a value of 4.5 billion and a weight of 25.2 million tons. The nature of the cargo carried by U.S.-flag operators on these routes includes almost every conceivable type of finished goods and raw materials, from automobiles to zinc ore, and animal products to logs, with ship calls at a large majority of African ports.

The third edition of Hydrographic Office Pub. No. 150, *World Port Index*, published by the U.S. Naval Oceanographic Office in 1963, lists 272 ports in Africa and the off-lying islands. Based on a size classification assigned on the basis of several applicable factors including area, facilities,

(*) Maritime Administration, U.S. Department of Commerce, *Essential United States Foreign Trade Routes*, Washington, 1963.

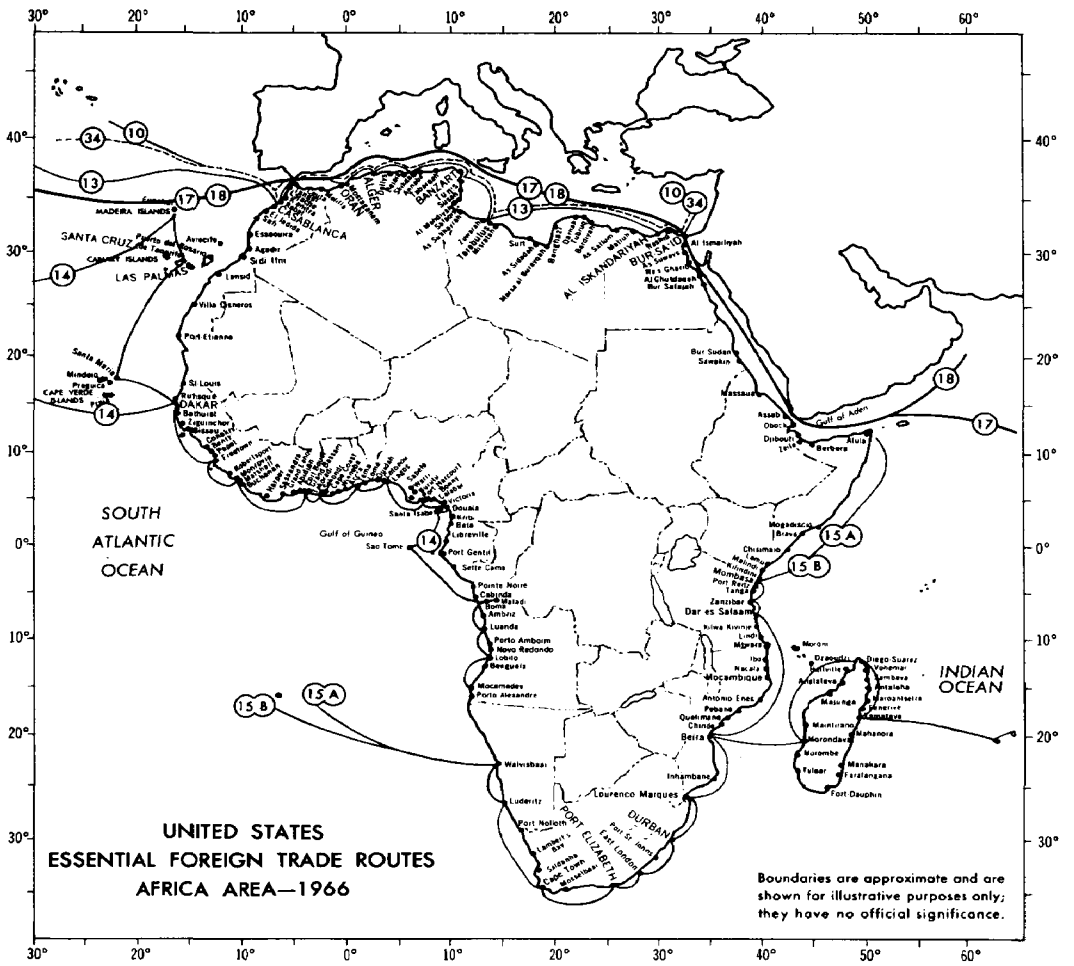

FIG. 3

and wharf space, 9 ports are listed as being in the " large " category, 22 " medium ", 60 " small ", and the remainder " very small ".

On the basis of size classification alone, it would appear that there would be little United States merchant marine interest in most African ports. A further study of these ports, however, shows that 108 can accommodate ships with a draft of over 40 feet, 33 ports have a least anchorage depth of 30 to 35 feet at low water, 37 ports a least depth of 25 to 30 feet, and 30 ports a least depth of 20 to 25 feet. In other words, the large majority of the African ports listed can accommodate ocean-going ships of the United States and other nations, despite cargo handling problems which may arise from other considerations.

Of the total number of ports, only 117, or about two-fifths, are classed as providing from good to excellent shelter for the area where normal port operations are conducted, viz., the wharf area, or the anchorage area for ports where cargo is handled by lighter. This is due to the fact that a large number of ports (70) are of the open roadstead type — ports which have no natural or artificial barriers to provide shelter from wind, sea and

swell. There are a total of 54 coastal breakwater ports — coastal harbours lying behind man-made barriers constructed to provide shelter or to supplement inadequate shelter provided by natural sources. There are 50 natural river ports — harbours located on rivers the waters of which are not retained by any artificial means such as locks or other mechanical devices to provide sufficient water to float ships at all stages of the tide. Nevertheless, the majority of the ports (90) are natural coastal ports — harbours that are sheltered from wind and sea by virtue of their location within natural coastal indentations or in the protective lee of islands, capes, reefs or other natural barriers.

The large-scale development of Africa's mineral resources, including iron, bauxite, chrome, coal, copper, manganese, phosphate, lead, uranium, cobalt, zinc, asbestos, and petroleum since 1925 has led to an enormous increase in trade between the United States and Africa, as shown in figure 4. This development has been, and will continue to be, responsible for an expansion of old ports and the development of new ones. Among the new or newly expanded ports resulting from the growth of the African economy in recent years may be listed As Sukhayrah and Bejaia (Algeria); Marsa al Burayqah and As Sidadah (Libya); Assab (Ethiopia); Chisimaio in the Somali Republic; Port Reitz and Kilindini (Kenya); Nacala and Beira (Mozambique); Lobito (Angola); Port Gentil (Gabon); Bonny (Nigeria); Kpeme (Dahomey); Tema and Takoradi (Ghana); Abidjan (Ivory Coast); Buchanan and Monrovia (Liberia); Pepel (Sierra Leone); Conakry (Guinea); Bathurst (Gambia); and Port Etienne (Mauritania).

U.S. - Africa Trade (*) (Millions of Dollars)

	U.S. Imports	U.S. Exports
1925	92.0	89.0
1935	41.1	96.0
1945	296.0	523.1
1955	677.7	622.8
1965	859.0	1067.0

Source : U.S. Department of Commerce, Trade Analysis Division.

FIG. 4. — U.S. - Africa Trade (*)

Perhaps the single most significant finding resulting from the Nautical Chart Review for Africa was that complete United States coverage was needed for the West, South, and East coasts at a scale sufficiently large for safe coastwise navigation. Many of the reports received from both individual mariners and the shipping companies (*) noted the excellent charts produced by other nations for portions of the area, but also pointed out that American use of such charts is not very practical because of difficulties in obtaining and applying the necessary foreign notices to mariners for chart correction purposes.

(*) Included were reports from American Export Lines, Farrell Lines, Isthmian Lines, Isbrandtsen Lines, Lykes Brothers Steamship Co., Moore-McCormack Lines, and the Mississippi Shipping Company.

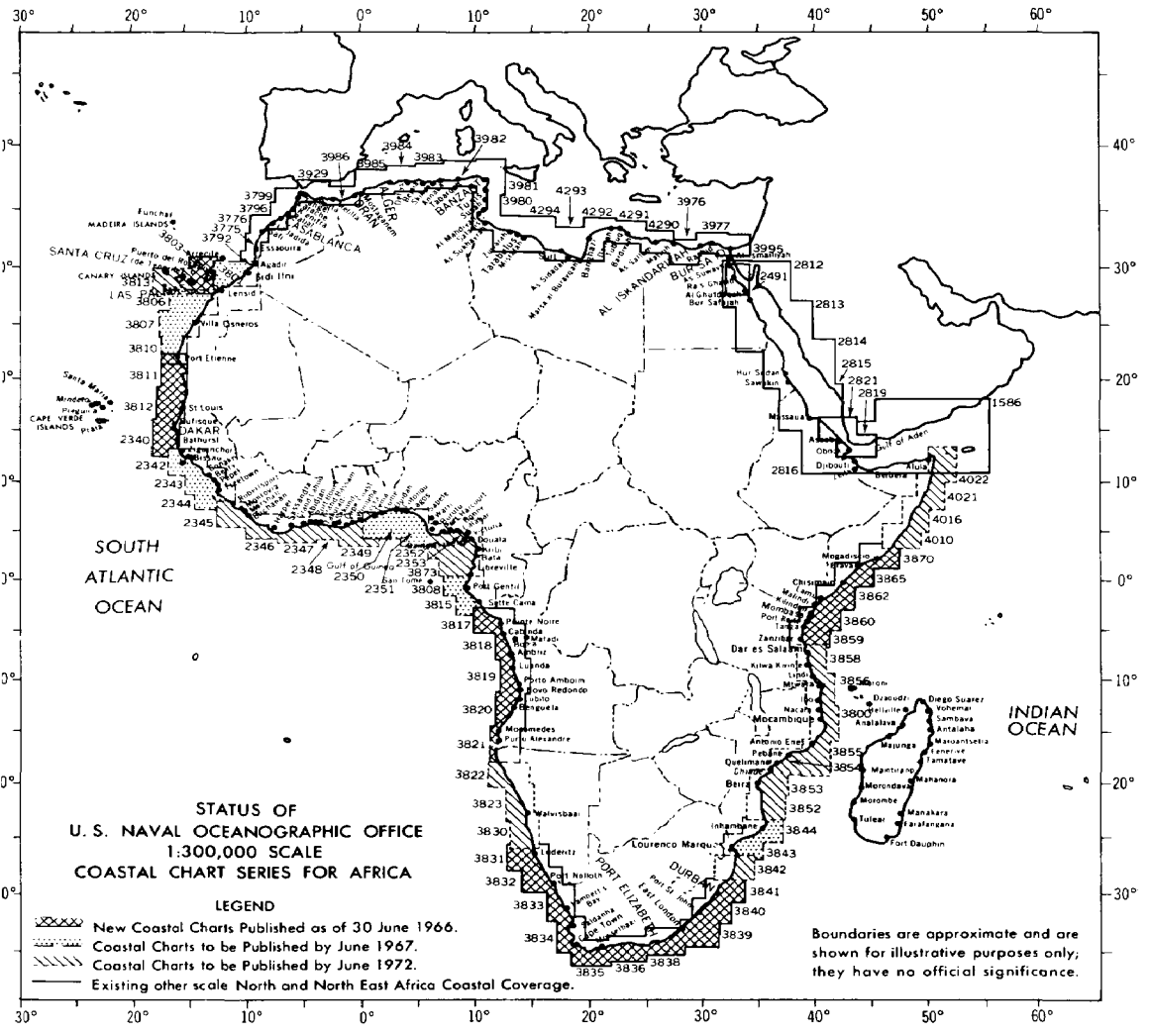

FIG. 5

On the basis of the review for Africa, plans were made for a new African coastal series comprised of 61 charts at a scale of 1/300 000, or slightly over 4.1 nautical miles per inch, at the Equator. The new series was designed to complement coastal coverage already on issue for North Africa and the Red Sea — Gulf of Aden area, and to provide continuous coastal coverage on a matching longitude scale all the way from Ifni and the Canary Islands southward around the continent to the Horn of Africa. The matching scale feature was specified to enable the mariner to transfer his navigational plot readily from one chart to the next. In addition to the matching scale, the charts are designed to give a minimum of 12 to 15 miles of coastal interior detail, and a land tint, a light blue water tint to the 6 or 10-fathom curve, and isobaths at 3, 6, 10, 30 and 100 fathoms. Magnetic compass roses, navigational light and beacon symbols and necessary Caution Notices are overprinted in magenta.

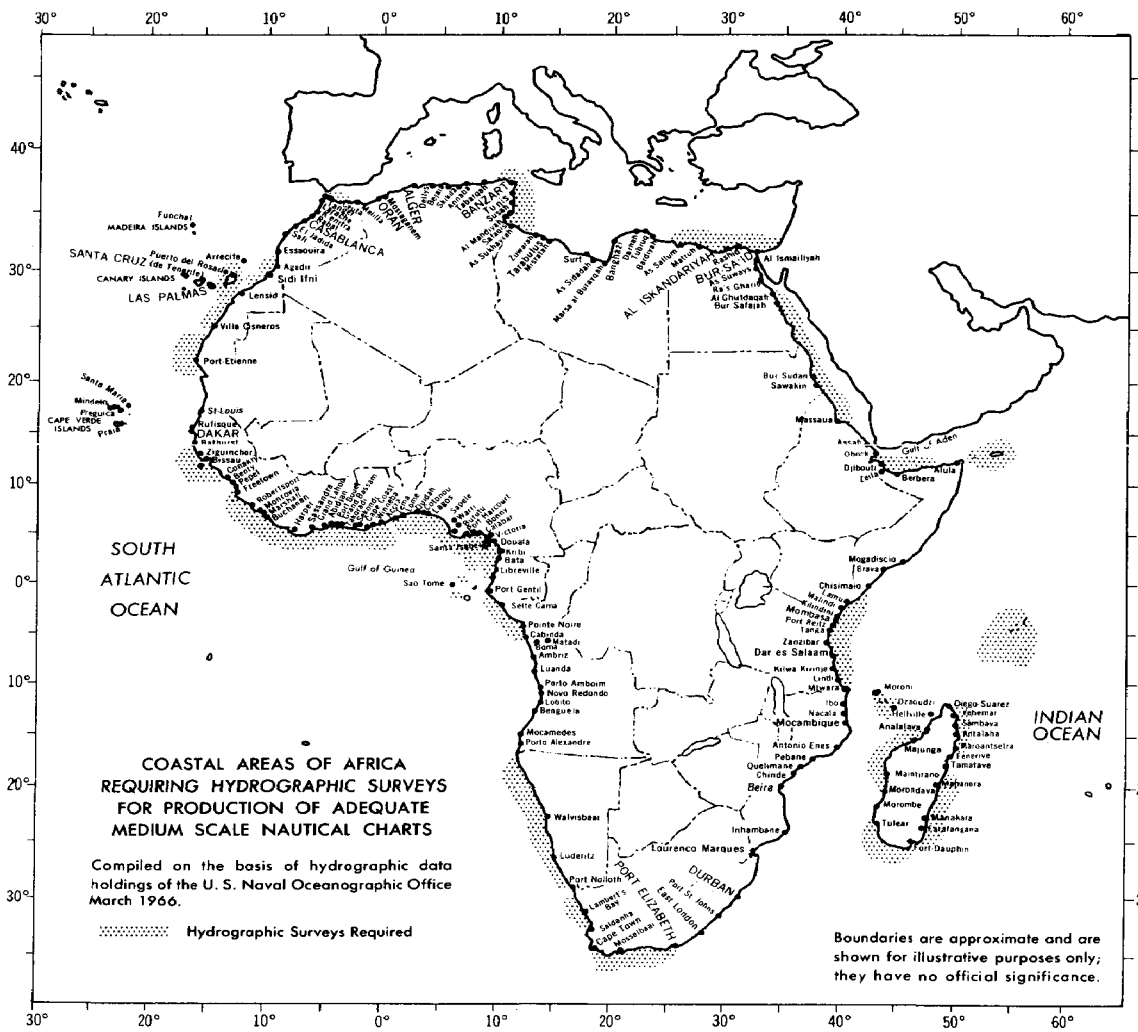

FIG. 6

Of the 61 charts in the 1/300 000 scale series, 46 were to be entirely new, while 15 were to be recompilations, i.e. essentially new replacements for older existing charts of comparable scale (thirteen for the coast between Bathurst and Douala, one for the coast off Libreville, and one for the coast off Mozambique).

The new charting programme also provided for supplementing the charts of the coastal series with new and improved charts of the various ports, as required. Harbour chart requirements were thoroughly investigated by means of a further survey of 91 U.S. shipping companies in 1964. This study showed that of 74 principal ports surveyed, U.S. ships called frequently at 57 ports and occasionally at 66 ports. Only 4 of the ports were found to have had no recent visits by U.S. ships.

Figure 5 shows the substantial progress which has been made by the U.S. Naval Oceanographic Office in producing charts of the new African

coastal series. As of 30 June 1966, 24 of the charts had been published. All of these were new charts, providing 1/300 000 scale coverage for areas for which no comparable U.S. coverage was previously available. Of the remaining 37 charts, 13 have been scheduled for publication by 30 June 1967, and the other 24 by June of 1972 or sooner, depending on source material availability.

Despite early expected completion of the new charts, and their vast improvement over earlier U.S. charts of comparable scale, certain deficiencies in the hydrographic information shown are recognized to exist. Although all available soundings are used in the compilation of these charts, there are considerable areas for which the hydrographic information is of doubtful reliability or for which far too little hydrographic information is available.

Where charts such as those of the new African series fail to show adequate soundings near the coast, shipmasters are forced in the interest of safety to navigate courses well offshore, thus adding to distances run and greater fuel consumption. Accordingly the United States looks forward to increased hydrographic activity on the part of the African nations as the principal means of improving the charts after their initial issue.

Figure 6, which was compiled on the basis of hydrographic information on hand in the archives of the U.S. Naval Oceanographic Office as of March 1966, shows that modern hydrographic surveys are required for much of the African coast before truly adequate charts in the medium-scale range (1/75 000 to 1/600 000) can be produced. Pending completion and availability of such surveys, the new 1/300 000 scale coastal series should meet minimum United States merchant marine needs for African coastal trade and transit. Hopefully, the nations of Africa will undertake new or expanded hydrographic data collection and international data exchange programmes whereby benefit will accrue to the maritime world generally.