Assessment and Future Prospects for Hydrography in Western and Central Africa; Maritime Safety and Coastal Global Development

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SUMMARY

This lecture provides some information collected by a team of international hydrographic experts representing the International Hydrographic Organisation (IHO) Eastern Atlantic Hydrographic Commission (EAtHC). Goals of this initiative were to audit and advice in West and Central African countries, in order to determine what could be done to improve maritime charting not only for safety of navigation but also for sustainable coastal development in the area.

Conclusions of this international assessment can be reported through three kinds of proposals:
- proposals for co-ordination and capability building
- proposals for technical assistance
- proposals for agreement (SOLAS).

Three main phases for developing hydrographic surveying and nautical charting capabilities are given.
A international definition study for "maritime highways" from Gibraltar to Congo, called CHARMER[1] is going to be carried out. It will be an opportunity to protect coastal sensitive areas and also simultaneously to develop hydrographic capabilities for coastal states.
At the same time, the project COAST CHART intends to determinate an exact coast line from Senegal to Congo.
Lessons learned this experiment could be applied to other maritime areas of the world.

[1] Cooperation in Hydrography for African Reliable Maritime Electronic Routes

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1. THE NEW SOLAS CONVENTION AND THE WEST AFRICAN NEEDS

The International Maritime Organization (IMO) has revised the 'Convention on Safety of Life at Sea' (SOLAS). A newly revised chapter V was adopted in December 2000, entering into force on 1 July 2002. This revision details the obligation of maritime states to provide hydrographic services. Rules 4, 9 and 31 chapter V (appendix1) are the most significant and respectively describe navigational warnings, hydrographic services and danger messages. Taken as a whole, governments of maritime nations are now obliged to take all necessary steps to collect, handle, disseminate, and keep up to date nautical information and hydrographic services necessary for safe navigation in their waters.

In many African states, such "hydrographic services" are provided by European countries with which strong institutional links have been established. Countries like Spain, France, Portugal and the United Kingdom keep nautical charts and publications updated, based on data collected by the African states concerned. Unfortunately, much of the data displayed on these charts go back more than 40 years and, therefore is inadequate for the current requirements of international maritime navigation, protection of the environment or exploitation of resources.

At the sixth and seventh meetings of the Eastern Atlantic Hydrographic Commission (EAtHC), in June 2000 and October 2002, the present situation was deemed worrying by the participating Member States of the IHO, Associate Members of the Commission and Observers. As a result it was decided to create a team of experts in hydrography, marine cartography and nautical information, tasked to visit countries where a lack of surveys, charts and nautical information has been identified, provided that the countries concerned would welcome such a visit. This team became known as the West African Action Team (WAAT). The aim of the visit would be to assess national hydrographic capacity with a view to offering advice to the relevant national authorities on how to improve the collection and dissemination of nautical information in the region and engender progress through regional co-operation.

2. THE THREE PHASES OF HYDROGRAPHIC CAPABILITY DEVELOPMENT AND THE OBLIGATION TO FORMALIZE THE PROCESS WITH BILATERAL AGREEMENTS

Generally, the development of a national capability can be examined in three phases (appendix2):

The first phase, the most urgent and easiest to implement, consists of organizing the collection and circulation of nautical information, necessary to maintain and update existing charts and publications. Such an organisation brings together all the institutions involved in maritime activities. It provides an immediate advantage to international shipping and allows for real integration of the country into the World-Wide Navigational Warning Service (WWNWS).

Logically, the second phase is the creation of a hydrographic survey capability, first to collect data in the coastal zone where the needs are usually the most pressing. Generally, a small structure is sufficient to collect the data required for most coastal projects e.g. surveys to assure port access. Cartographic exploitation of such new surveys can often best be handled by the historical charting authority.

The third phase consists of the acquisition of the means to produce charts and publications independently. This phase cannot be achieved hastily, and will be facilitated by close co-ordination with the historical charting authority. This phase requires not only human and financial resources, but also a capacity to distribute world-wide the documents and the capability to keep them up to date.

While the first phase is relatively inexpensive and the most easily implemented, phase two requires longer term planning because training and equipment acquisition are required. The cost of implementing phase two is low compared to total harbour revenues. On the other hand, the third phase, requires more human and financial investments, and takes longer to implement. This phase can usually be subcontracted to an existing hydrographic office, at least during the transition period.

While not specifically spelled out in Chapter V of the new SOLAS convention, contracting governments are by default required to formalize the process, due to their new responsibilities. Writing and signing technical arrangements at the national level is necessary to clearly define the disposition of data, especially national holdings that are to be made available to a foreign government.

3. THE VISITS

The French Naval Hydrographic and Oceanographic Service (SHOM), in charge of co-ordinating the project, invited all the littoral states in West Africa, from Morocco to the Democratic Republic of Congo, to consider accepting a visit from the team of hydrographic experts. Seventeen nations responded positively, and sixteen have been visited in four trips made between the Fall of 2002 and the Spring of 2004 (table 1). The team comprised of members from those nations which have charting responsibility in the region (France, UK and Portugal) and a representative from the US.

All the visited countries are members of IMO and many of them are members of Maritime Organisation of West and Central Africa (MOWCA) and Port Management Association of West and Central Africa (PMAWCA).

In most cases, the team was able to meet local people at three different levels :

- at the highest level, with Ministers or Permanent Secretaries, where it was possible to sensitize the government to their responsibilities and highlight the important contribution that can be made by hydrography to development of the maritime arena.
- at the management level, with officials and managers of the government or port authorities who play a key role in planning, funding and overseeing maritime affairs. It is this level of management that will play a key role in implementing most of the follow-on actions provided in the Country Reports.
- at the practical level, with those individuals (Port Surveyors and Harbour Masters) who appreciated encouragement, advice and support in their work.

4. GENERAL OVERVIEW

The team was struck by how different the maritime situation of each country visited was from another (table 1). In many cases the authority with overall responsibility for safety of navigation had not been long established, and often division of areas of responsibility between Port Authorities, National Maritime Authorities and Naval Forces were not entirely clear.

Table 1: Assessment of National Hydrographic Capability

Country	IHO Member	IMO Member	IALA Member	EAtHC Member[2]	NHC[3] Proposed	Phase 1 Capacity	Phase 2 Capacity	Phase 3 Capacity
Cap Verde	No	Yes	No	Assoc M	Yes	Partial	No	No
Mauritania[4]	Pending	Yes	No	Assoc M	No	No	No	No
Senegal	No	Yes	Yes	Assoc M	Yes	Partial	Yes	Partial
The Gambia	No	Yes	No	No	Yes	Partial	No	No
Guinea-Bissau	No	Yes	No	No	Yes	No	No	No
Guinea	No	Yes	No	Assoc M	Yes	Partial	Partial	No
Sierra Leone	No	Yes	Yes	No	No	No	No	No
Ghana	No	Yes	Yes	Assoc M	Yes	Partial	Partial	No
Togo	No	Yes	No	No	Yes	Partial	No	No
Benin	No	Yes	Yes	Assoc M	Yes	In process	Yes	No
Nigeria	Yes	Yes	No	Member	Yes	Partial	Partial	Partial

[2] Eastern Atlantic Hydrographic Commission
[3] National Hydrographic Committee
[4] Mauritania membership pending deposit of adhesion

Country	IHO Member	IMO Member	IALA Member	EAtHC Member[2]	NHC[3] Proposed	Phase 1 Capacity	Phase 2 Capacity	Phase 3 Capacity
Cameroon	In progress	Yes	Yes	Assoc M	Yes	Partial	Yes	No
Équatorial Guinea	No	Yes	Yes	No	Yes	No	No	No
Gabon	No	Yes	No	No	Yes	Partial	Partial	No
Congo	No	Yes	No	No	Yes	Partial	No	No
D.R.C	No	Yes	No	No	Yes	No	No ?	No

In many of the countries visited, the determination of maritime borders is still ongoing. Discussions with authorities of the various countries gave the WAAT the opportunity to explain the importance of modern hydrographic surveys and subsequent marine charts. Unlike land borders, which can be marked with such things as boundary stones or a barbed wire fence, the delimitation of maritime borders is not so easy. The marine chart is the only instrument that can be used to depict marine boundaries. This is true from a practical as well as a legal point of view. Additionally, this also applies to the EEZ delimitation, which is determined from baselines drawn from the coastline.

Maritime defense and security arrangements were generally considered to be a weak area in most of the countries visited. Concerns were often expressed about piracy and other criminal activity at sea. Naval and Coast Guard forces were often found to be under-funded and under-resourced to carry out their tasks and there is a lack of infrastructure to enable adequate coastal surveillance and communications. Hence these forces are generally not in a position to play a strong role in co-ordination of Maritime Safety Information (MSI) broadcasts and Search and Rescue (SAR).

Therefore priority must be given to implement phase 1 of hydrographic development, which could clarify tasks and responsibilities of the various involved players and identify a focal point for collecting and disseminating Maritime Safety Information (MSI)

5. DETAILED SITUATION AND PROPOSALS FOR CAPACITY BUILDING

5.1 National Hydrographic Commitee or Maritime Safety Committee

The visits helped draw attention to the importance of hydrography to the development of a maritime state. It was well understood at all levels that a high-level group could easily be created to study hydrographic matters within the broader context of maritime safety and security issues. Besides problems of coastal erosion in many countries, as well as offshore oil production in others, it was noted that maritime security, particularly in response to the threat posed by piracy and criminal activity, was a major concern and appeared to dominate the

agenda. The team drew attention to the new SOLAS regulation regarding the government's responsibility to provide hydrographic services, noting that the only hydrographic capability very often resided in the Port Authority. This emphasized the need for high-level co-ordination and planning in order to make the most of limited resources in developing a national hydrographic service. The defense forces invariably have a role to play in this high-level body; always as expert users of hydrographic data, and sometimes as qualified surveyors. In countries with offshore oil production, it appears that the collection of hydrographic and other MSI data from the private oil companies is not effective. Participation by an expert of the main petroleum companies to the National Hydrographic Committee and/or Maritime Safety Committee is advised. A suggested Terms of Reference and tasks for a national maritime safety committee is suggested (appendix 3).

5.2 Potential for Development of National Capability, or for Improved Liaison with Co-ordinating Authorities

Countries generally expressed a desire to improve the safety of navigation in their waters and to build a national hydrographic capability to serve their needs into the future. The team was careful to emphasise that the development of a national capability must proceed in logical steps, the first of which is to have an organisation that can deal with the collection and dissemination of nautical information. In most cases there was a great deal of important safety information that was known locally but not transmitted to the correct authority for navigational warnings or charting action. The most logical focal point was normally the Harbour Master's organisation, however, information in the coastal waters was often gathered by other agencies such as the Navy or Fisheries Department or the Energy Department in case of oil producing nations. Hence the need for improved co-ordination between these types of authorities clearly exists.

In some of the countries Port Surveyors represented the only national hydrographic experts and were generally identified as the logical base upon which to build a national Hydrographic Service. In the some countries, having several trained hydrographers to monitor subcontracted hydrographic surveys seems to be a pragmatic and practical approach. Tasks beyond the port limits need to be identified and prioritised before considering what additional trained personnel are needed and what equipment should be purchased. Several issues arise that need close co-ordination between authorities. For example, wrecks outside of the port limits are usually the responsibility of the National Maritime Authority, but the Port Authority, or the Navy, might have the only means to find and position them. Once again, co-ordination and communication is the key to building an effective organisation.

5.3 Regional Co-Operative Opportunities

The differences between each country (language, political situation, capabilities…) seem to outweigh a regional approach. Except in very few cases this regional concept has not been successfully explored.

Equally, there must be a degree of political and economic stability within a region before joint initiatives can be launched between neighbouring countries. Nevertheless some cooperation exists and more should be developed :

- one example is Mauritania, Senegal, and The Gambia using complementary and unique means, i.e., the sharing of a buoy tender and a dredger
- the Tema radio coastal station, could broadcast information towards neighbouring countries and mariners.

Developing the first phase of hydrographic services could be an opportunity for regional co-operation between the identified agencies, for instance under the aegis of EAtHC.

5.4 Training

The team provided information, whenever appropriate, on training which is available in North America and Europe, including the International Maritime Academy in Trieste. The Regional Maritime Academy in Accra, Ghana, is one example of a potential location for regional hydrographic training in the future.

5.5 Funding

In general, some of the revenues from the port fees could and should be reinvested in the maintenance of the fairways and buoys.

Moreover, many sources of incomes from maritime activities could be made available (for example fishing and off-shore exploration) and some financial aid might be found which could be linked to those activities. Funding for the pursuit of hydrography and charting in and of itself is not attractive to donor organizations. However hydrography is a necessary first step for many needed maritime projects, (eg buoyage, environmental protection, fishing, aquaculture, etc. and of course infrastructure development).

5.6 Examples Of Propositions And First Results

The seventeen visit reports show more than 120 proposals which can be listed in three categories:

- *Proposals for co-ordination and capacity building* ; they can in general be conducted at national level. The main items are : National Hydrographic Committee, MSI organisation and GMDSS, reversion from hydrographic initiatives benefits, and establishing a hydrographic capability (phase 2),
- *Proposals for assistance* ; the main matters are : training, equipment and funding ; they can involve a foreign country. Training opportunities are usually not a problem.
- *Follow up actions :*
  - formation of a National Hydrographic Committee
  - provision of hydrographic services in accordance with SOLAS

- encouragement of effective and timely collection and promulgation of hydrographic Information (easy to set up)
- encouragement of development of a Hydrographic Capability
- clarification through bilaterals of the way SOLAS commitments are en(d)forced

Positive results have already come to light: examples:

- Cape Verde has strengthened links between the Port Authority and the Portuguese Hydrographic Office ; 7 actions are now ongoing, initiated by the Cape Verde Minister of Infrastructures and Transportation,
- Morocco, Mauritania and Senegal have sent representatives to visit SHOM and NAVAREA II coordination center in Brest,
- France and Senegal have entered into an agreement in order to address responsibilities as outlined in the new SOLAS Convention,
- Togo has formed a national hydrographic committee and such a committee is under development in Nigeria ,
- Benin and Nigeria are receiving hydrographic training in France and in United Kingdom
- Cameroon will apply for joining the IHO

At the same time American survey ships *LITTLEHALES* and *HENSON* and French hydrographic ships *LAPÉROUSE* and *BORDA* have recently surveyed off some main ports.

After these visits, the 8th EAtHC conference took place in Brest in october 2004 and was a n opportunity opportunity to strengthen links between the maritime countries in hydrographic and maritime charting matters and to prepare future. A technical workshop concerning SOLAS and MSI was planned to coincide with this conference and was a opportunity for a major initiative : a definition study called “CHARMER” (Cooperation in Hydrography for African Reliable Maritime Electronic Routes).

6. CHARMER PROJECT

This project federates the majority of the other recommendations and the other current decisions from the 8th EAtHC, in order to insure maritime safety in this area of the world, and to take into account submarine and coastal resources. The ships traffic between Cap of Good Hope and Europe is very important ; the traffic traffic between Cap of Good Hope and the Gulf of Guinea is increasing. Moreover off-shore maritime oil activity is also dramatically increasing in the Gulf of Guinea.

This project has a deliberately wide scope in order to insure coherence of all the actions and the necessary national and international coordinations due to geography and also to the technical characteristics of means used. This extended scope also improves the search for savings by avoiding the redundancy of means and or their incompatibility.

The specific objectives of this complete project are:

- to increase the safety of navigation by assessing the risks of catastrophic accidents and taking action to gradually reduce the risks and prevent accidents by providing suitable hydrographic information.
- to assist countries to undertake technical work needed to translate the provisions of SOLAS Convention chapter V into national laws and regulations.
- to strengthen the capacity of countries to cooperate among themselves in managing their common marine and coastal resources.
- to build capacity in countries to assess the necessary measures to control hydrography.

These objectives are necessary for other purposes like :

- to build capacity in countries to assess the necessary measures to control ship-based pollution.
- to strengthen capacity of countries to improve safety of navigation to ensure that coastal and marine resources are managed sustainably.
- to develop financing and institutional mechanisms to sustain capacity of countries to address issues of navigation safety, and to enforce in coordination with other countries laws and regulations governing the shipping and fishing industries.

The project components proposed at this stage are (see details in annexes) :

- developing a West African marine highway electronically supported (associated with ashore basic safety maritime means).
- developing the basic national hydrographic services (IHO phases 1 and 2 recommendations).
- increase regional coordination and project management in accordance with IMO, IHO regulations and recommendations, and also SOLAS Convention.
- developing training of surveyors and regional academy.

These four components are necessary for components other than the HWP ; for instance :

- contribute to developing regional coastal environment and oceanographic data centre.
- developing search and rescue capacity.
- developing regional oil spill contingency capacity.

7. COAST CHART PROJECT

By quite the same time, the COAST CHART project, led by SHOM, as well as the British, Spanish and Portuguese hydrographic services, with the European Space Agency. This project intends to determine an exact coast line from Senegal to Congo, using mainly radar satellite images, and so will provide an input for the updating of the charts of this area. It concerns 6 000 km of coast lines in 15 countries. In a first phase, charts at a scale of 1 / 50

000 will be produced, and later some charts at a scale of 1 / 15 000 derived from optical satellites pictures in complement.

The products of COAST CHART project will be countries disposal which have an hydrographic or cartographic responsibilities in these area, in order to be used with their own uses. So charts and maps will be precise and updated. Moreover, they will be compatible with works from others local hydrographic or topographic specialised offices because they will use a common geodesic reference : the world system WGS84.

In order to improve precision of the exact coast line, it will need some “ground truth points” to fit with the satellite images. So, the interested african countries, who have capabilities and who which to participate in the project, are invited to give to ESA existing topographic maps concerning sea-side (ports, town….). and to give also GPS data of some details easily identifiable with the satellite images in the area (runways, bridges, crossroads, jeties….). SHOM will be pleased to send to people interested in this project, some proposals with details to be done. Transfer the ground truth points data for the COAST CHART projet could be officialized by an agreement with SHOM with the all the details and eventually the confidentiality restrictions.

So many decisions have to be taken at the political level to improve safety life at sea. The first actions could take momentum and eventually snowball. They speak in favour of an reinforcement of coordination and exchanges between hydrographes and surveyors about the coastal areas. This area has an increasing interest and many ministries are involved in. These experiences could also be applicable to maritime countries in other navigation areas.

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Appendix 1

IMO SOLAS CONVENTION (Safety Of Life At Sea) (excerpts)

CHAPTER V, SAFETY OF NAVIGATION

Regulation 4 : Navigational warnings
Each Contracting Government shall take all steps necessary to ensure that, when intelligence of any dangers is received from whatever reliable source, it shall be promptly brought to the knowledge of those concerned and communicated to other interested Governments(1).

Regulation 9 : Hydrographic services

- Contracting Governments undertake to arrange for the collection and compilation of hydrographic data and the publication, dissemination and keeping up to date of all nautical information necessary for safe navigation.
- In particular, Contracting Governments undertake to co-operate in carrying out, as far as possible, the following nautical and hydrographic services, in the manner most suitable for the purpose of aiding navigation:
  - to ensure that hydrographic surveying is carried out, as far as possible, adequate to the requirements of safe navigation;
  - to prepare and issue nautical charts, sailing directions, lists of lights, tide tables and other nautical publications, where applicable, satisfying the needs of safe navigation;
  - to promulgate notices to mariners in order that nautical charts and publications are kept, as far as possible, up to date; and
  - to provide data management arrangements to support these services.
- Contracting Governments undertake to ensure the greatest possible uniformity in charts and nautical publications and to take into account, whenever possible, relevant international resolutions and recommendations(2).
- Contracting Governments undertake to co-ordinate their activities to the greatest possible degree in order to ensure that hydrographic and nautical information is made available on a world-wide scale as timely, reliably, and unambiguously as possible.

Regulation 31: Danger messages
Each Contracting Government will take all steps necessary to ensure that when intelligence of any of the dangers specified in paragraph 1 is received, it will be promptly brought to the knowledge of those concerned and communicated to other interested Governments.

(1) Refer to the Guidance on the IMO/IHO World-Wide Navigational Warning Service adopted by the Organization by resolution A.706 (17), as amended.

(2) Refer to the appropriate resolutions and recommendations by the International Hydrographic OrganizationAppendix 2

Appendix 2

STAGES OF DEVELOPMENT OF HYDROGRAPHIC SURVEYING AND NAUTICAL CHARTING CAPABILITY

Phases of Development	National Activity
Phase One Collection and circulation of nautical information, necessary to maintain existing charts and publications up to date	• Form National Maritime Safety Committee • Create/improve current infrastructure to collect and circulate information • Strengthen links with charting authority to enble updating of charts an publications • Minimal training needed
Phase Two Creation of a surveying capability to conduct: Coastal projects Off-shore projects	• Establish capacity to enable surveys of ports and their approaches • Maintain adequate aids to navigation • Build capacity to enable surbeys in support of coastal and offshore areas • Requires funding for training & equipment or contract survey work.
Phase Three Produce charts and publications independently	• Is Phase 3 needed ? **(requires high investment for production, distribution and updating)** • Alternatively, bi-lateral agreements for charting can provide easier solutions and rewards.

Appendix 3

SUGGESTED TERMS OF REFERENCE AND TASKS FOR A NATIONAL MARITIME SAFETY COMMITTEE

TORs FOR A NATIONAL MARITIME SAFETY COMMITTEE

⇒ To advise governmental authorities on the:

- Safety of navigation in the EEZ and national waters
- Recovery of revenues and funding of maritime safety services
- Implications of international maritime regulations and conventions
- Law enforcement in the EEZ and national waters

⇒ The MSC
- should involve the Navy, Ministries in charge of transport, communications, natural resources, environment, ports, as well as representatives of shipping companies
- should meet regularly to monitor maritime developments and revise national maritime policy
- may invite regional observers dealing with safety of navigation

TASKS OF THE NATIONAL MARITIME SAFETY COMMITTEE

⇒ To acquire official recognition by the Government

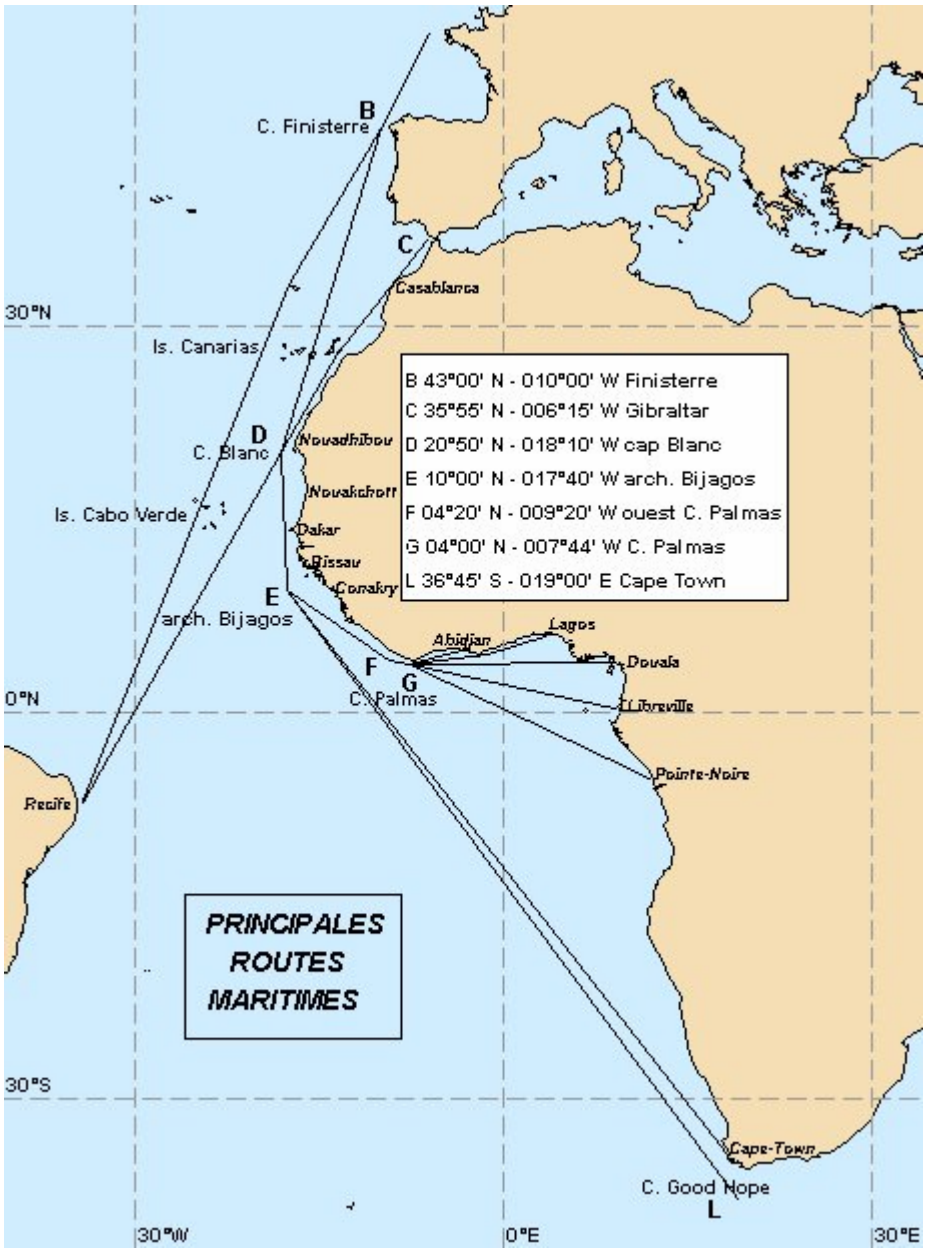
⇒ Submit a structure for taking responsibilities for:
- maritime safety information
- hydrographic surveys
- nautical charting
- aids to navigation
- oil spill response
- search and rescue
- law enforcement in maritime zones

⇒ Advise the government on the relevant international standards and the means for achieving them

⇒ Submit to the Government proposals for recovery of revenues and funding of the services

⇒ Advise the Government on the application of relevant international regulations

Appendix 4


B
C. Finisterre
C
Casablanca
30°N
Is. Canarias
B 43°00' N - 010°00' W Finisterre
C 35°55' N - 006°15' W Gibraltar
D 20°50' N - 018°10' W cap Blanc
E 10°00' N - 017°40' W arch. Bijagos
F 04°20' N - 009°20' W ouest C. Palmas
G 04°00' N - 007°44' W C. Palmas
L 36°45' S - 019°00' E Cape Town
D
C. Blanc
Nouadhibou
Nouakchott
Is. Cabo Verde
Dakar
Bissau
Conakry
E
arch. Bijagos
Lagos
Abidjan
Douala
F
G
C. Palmas
0°N
Libreville
Pointe-Noire
Recife
PRINCIPALES
ROUTES
MARITIMES
30°S
Cape-Town
C. Good Hope
L
30°W
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