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## Maritime search and rescue in the Republic of Liberia : a proposal for improvement and ratification of the 1979 SAR Convention

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## ABSTRACT

Liberia is the second largest international registry country and has signed many international maritime safety conventions. But one important area that has been overlooked is the safety of ships along its coast.

The objective of this project is to work towards establishing a search and rescue organisation, and to identify resources that will eventually result into the implementation of Search and Rescue Convention in Liberia. The integration of civil organisation such as the National Port Authority, the National Fire Service and the National Red Cross with the National Coast Guard and the Military Air Wing in Maritime and Aeronautic Search and Rescue Operation is being considered in this project.

Liberia is a progressive maritime nation that is fully aware of the consequences of maritime casualties, and its impact on the nations social economic development. However, the eight years (1989 to 1997) of civil war completely devastated the political structure, the economic and the National Coast Guards, that is traditionally responsible for Maritime Search and Rescue.

The only solution to meet these objectives will be total commitment of the Government Ministries, Bureau and Agencies responsible for search and rescue to contribute resources to form an effective search and rescue organisation in Liberia.

Additionally, the Government of Liberia may request for technical and financial assistance from the International Maritime Organisation and friendly countries in the maritime industry.

Training of search and rescue personnel is an important part of the contingency planning. The Liberia Bureau of Maritime Affairs may provide trainer training education at a recognised institution.

The establishment of Maritime and Aeronautic Search and Rescue in Liberia according to the revised Convention is possible but required a commitment from the Government.

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## CHAPTER I

### 1.1 INTRODUCTION

In presenting this document, it is of the conviction that it will be useful to give a brief background of the Republic of Liberia. Formerly founded by the American Colonization Society beginning in 1818, this West African State became independent in July 26, 1847. It has a surface area of 43000 square miles, and is surrounded by 3 neighboring states: Ivory Coast to the East, Sierra Leone to the West, Guinea (Conakry) to the North and the Southern border is the Atlantic Ocean known as the Gulf of Guinea.

From Cape Mount to Cape Palmas the Liberian coastline is about 156 nautical miles, and with mostly sandy and rocky beaches and small sea cliffs and reefs. The main problem of the coast is the high and dangerous surfs that break on the beach dangerous not only for the swimmers but also for the pirogues of the traditional fishermen. North of the offshore bar a vast system of lagoon runs from the border of Sierra Leone to Monrovia.

The most significant feature of the weather of Liberia is the rainfall. The year is divided up naturally into wet and dry seasons with little change from one day to the next during those seasons. Seasonal variations are relatively small. The Tropical temperature has little difference between the sea surface compared to that of the overlaying air being normally 1 degree centigrade in all parts of the country. The cooler water is prone to Fog patches, especially along the coastline.

The dry season, which begins in October, is ushered in by two months marked by temperature up to 35 degrees centigrade along the seacoast and 15 degrees centigrade in the hinterland. The day remains hot, but the night temperature can be as low as 6 degrees centigrade when humidity becomes low. The wet seasons begins with sudden squalls of rain and thunder sweeping westward across the country. During this transitional period the season becomes violent and it is the most difficult one as there are a lot of cases of fishing boats capsizing and drowning along the coast. The storms increase in frequency until July when the country begins to cool with the westerly wind. In September, the wet season comes to an end, squalls and storms becoming fewer during the midseason.

### 1.2 PHYSICAL FEATURES OF THE REPUBLIC OF LIBERIA

Liberia is a broken mountainous country, the surface of which the SW direction form the west slopes form the river Niger basin to a strip of comparatively level land bordering the Atlantic Ocean. Numerous rivers traverse the count most of which flow in a Northwest to Southwest direction.

Liberia coastal region is fairly well known for depth of 40 miles but the rest of the country have no statistic. The coast is generally low sandy and narrow, the ground rises slightly and then descends to form marshes and creeks altering with an precious grassy plains. The country is generally covered by dense forest and the mountains are thickly wooded up to their summits, which finished an attitude of over 1500m.

The principal rivers are Saint Paul River, Farmington River and Cavalla River that form the international boundary between the Republic of Liberia and the Ivory Coast. These rivers are not navigable to a long distance by larger ships. The prevailing geographical formation is said to be a ferruginous and sandstone covering reddish clay, but in several places, especially the eastern part of Monrovia, eruptive rocks are seen from long beaches.

The population of Liberia is about 3.5 million inhabitants belonging to over sixteen tribal groups. Monrovia the economic capital city is populated with about 20 thousands people most of whom migrated from the other counties to perform official duties and other people came looking for jobs.

The overall economy of the country depends on natural resources such as iron ore, diamond and gold. Forestry also play an important role in the economy, and agriculture product such as rubber, coffee, cocoa, oil palms and coconuts are the major export products. The Liberia Maritime Program has contributed immensely to the over-all economy of the country over the years. The greater part of the country's goods is transported from and to the country through the port of Monrovia, and to a lesser extent through the Port of Buchana, Harper and Greenville.

### 1.3 THE EFFECTS OF WIND, CURRENT AND VISIBILITY ON SAR OPERATIONS

The winds along the coast of Liberia is usually NEE to N in November to March and SW in April to November when the Inter-Tropical Convergence Zone (ITCZ) has move North.

In the extreme South, winds between South and West prevail most of the time. Average winds are generally light, force 2 occasionally 3. The general character of the wind distribution is often marked by local effect and the land and the sea breezes. Gale force 8, are very rare but strong wind of brief duration occur at the passage of squally disturbance lines. The harmattan is felt during the dry season, which lasts from December to April in the North, but only lasts for a few weeks in January in the south. In the coastal region of Liberia, and over much of the Gulf of Guinea, there is a little dry season of about 4 to 6 weeks in July and August. The increase of thunder is high during this period.

### 1.3.1 VISIBILITY AND FOG

Between Sierra Leone and Cape Palmas (Liberia), (04-22N, 07-44W) poor visibility is most frequent between December and February, reaching 25% to 30% in places. It is less frequent in March to May, varying from 20% to 25% off Sierra Leone to 5% or less off Cape Palmas for the most of the year, usually in rain.

From Cape Palmas to Cavalla River (04-36N, 08-20E), the period from about December to February is not affected by dust haze. There is a sharply marked diurnal variation; although fog and thick haze can occur as often as 20 days in January, it is usually around the dawn period and there is a considerably improvement by mid-morning. Visibility is liable to fall below fog limits during the Tropical rainstorms. The dust of the dry season and the heavy rain of the wet season cause navigational problems.

### 1.3.2 CURRENT

Figure 1.1

There is less effect of current along the coast since its effect depends on the strength of the wind force in the tropics. The equatorial counter current generally displays a moderate or high degree of constancy and flow at a speed of  $\frac{1}{2}$  to  $\frac{1}{4}$  knot being stronger in rainy seasons than dry season.

During the months of June to August, the current get stronger as it approaches the coast a small region of Sierra Leone and Liberia. This branch again subdivides at the coast, a part turning SE to join the existing SE current, a part turning NW along the coast as far as 15 to 18 degrees North causing the reversal of the normal SE flow. This NW current has a long degree of constancy as shown in Appendix II and average speed of  $\frac{1}{2}$  knot. It gradually diminishes as the extent and the strength of the Equatorial counter current decreases during the dry season.

The main stream of the Equatorial counter current however continues east to be joined by the Southeast coastal current of Liberia. It then enters the Gulf of Guinea where it becomes known as the Guinea current.

The prevailing pattern of current is sometimes affected considerably by violent winds accompanying such a storm. It is estimated that at the speed of 40 knots and over, the wind needs to blow in the same direction for over 48 hours to produce the maximum currents. Thus it is a particularly slow moving cyclone, that a strong current which may perhaps exceed 2 knots are encountered where the cyclone approaches the coast, still higher tares may be produced owing to the piling up of water against the coastline. Off the open coast, away from the entrance

to the river, the tidal stream tend to set North or West on the rising tide, South or East on the falling tide parallel to the coast. This is clearly shown on the flow of

surface current in Appendix II. From December to November, the direction and constancy of predominant winds in July and also the main sea temperature is also shown in Appendix II.

Due to the fact that much attention is not paid to the effect of wind, current and other natural phenomena, most of the SAR operations are a failure. During the months of June to August, the current blows as it approaches the coast, a small region of Sierra Leone and Liberia. This branch again subdivides at the coast, a part turning SE to join the existing SE current, another part turning NW along the Coast as far as 15 to 18N causing a reversal of the normal SE flow. This NW current has long Degree of constancy as shown in Appendix II and the average speed is about ½ knot. It gradually diminishes as the extent and the strength of the Equatorial counter current decreases during the dry season.

The main stream of the Equatorial countercurrent, however, continues east to be joined by Southeast coastal current of Liberia. It then enters the Gulf of Guinea where it becomes known as the Guinea Current.

#### 1.4 FISHING

The Liberian coastal water has provided and continues to provide fishing ground for foreign fishing vessels over the century. The coastal water has far-reaching fishing resources, and seafood provide the source of protein in Liberian food. The water is the home of variety species. These species includes barracuda, red snapper, herring, tuna, mackerel, shrimps and anchovy are the most abundant. The predominate fishing grounds are Ground Cape Mount, Marshall, Bassa Cove, Greenville, and Cape Palmas. Sustenance fishing is carried out throughout the coast as well as in land waters.

Fishing boats make up the largest fleet in recent years, the proliferation of fishing boats both for commercial and sustenance purposes increase safety hazards in Liberia.

#### 1.5 SHIPPING

The Liberian coast is geographically located at a strategic shipping route, which makes search and rescue operation important. Prior to the construction and opening of the Suez Canal, the route through the Western African coast to the cape of Good Hope in Southern Africa provided the gateway for seaborne trade between America, Europe and Asia. Presently, laden oil tankers (Capemax), which can not use the Suez Canal, will due to draft restriction, transverse this route. The temporary closure of the Suez Canal will add about 50 ships per day (ISL Shipping Statistic Year-book, 1993) with a potential risk to maritime safety.

## 1.6 MARITIME AND AERONAUTICAL ACCIDENT

Liberia had maritime accidents over the years ranging from drowning of people along the beaches to capsizing of fishing canoe and fishing boat. Distress messages from merchant vessels were also received along the coast. Statistics of these accident were kept by the National Coast Guard, dating from 1975 to 1990 but were unfortunately destroyed during the nearly ten years civil war.

From 1990 to 1997 the civil war disorganized all military and political institution, and did not permit the recording of accidents, which was at its peak at that time

However, interview conducted in the pirogue fishing community and among beach operators shows that there were numerous cases of drowning along the coast and in the cities during the period 1980 to 1990.

Record on aircraft accident is not available due to the looting of abandoned offices during the civil war. However, the following is a basic statistic of accidents recorded during conversation with some employees of the James Spring Airport in Monrovia. These accidents have no survival due to lack of search and rescue facilities in the country. Some of the pilot in this accident parachuted when they encountered problem with their aircraft, but died because rescue did not arrived.

Table 1 show a list of aeronautic accidents and Table 2 a list of accidents caused by drowning.

AERONAUTIC ACCIDENTS		
YEAR	TYPE OF AIRCRAFT	SURVIVAL
1976	Beech Baron 55	No survival
1981	Falcon 10	No survival
1984	Eurocopter EC 120	No survival
1986	Cessna 340	No survival
1997	Beech Duchess 76	No survival

Table 1

DROWNING ALONG THE BEACHES	
LOCATION	NUMBER OF PERSONS INVOLVED
MONROVIA	
Virginia beach and surroundings	8
St Paul River	8
New-Kru town and surroundings	15
West Point	18
Du-River	15
CoCo-Nut Plantation beach	10
Sinkor beaches	18
ELWA beach and surroundings	10
Drowning of people in inland counties rivers during recreation and crossing	50
Marshall City	
Marshall city and surroundings	15
Greenville city and surroundings	12
Buchana city and surroundings	15
Cape Palmas and surroundings	15
FISHING CANOE ACCIDENTS	
MONROVIA	
*Slip-way fishing community	15
*West point fishing community	25
*New.Kru town fishing community	20
Marshall city and surroundings	46
Grand Cape Mount fishing communities	36
Buchana city and surroundings	40
River Cess city and surroundings	30
Sinoe County fishing communities	34
Maryland County fishing communitues	50
Other counties river drowning caused by canoe accidents	65

Table 2

During the course of the civil war, drowning caused 20% of the death. Fishing boats and canoe were overloaded with people escaping from the fighting. Passenger ships were also overloaded with people resulting into capsizing and drowning of the occupants.

In 1997, a student of the Bureau of Maritime Affairs undergoing training at the Free Port of Monrovia fell from a tugboat and drowned, due to lack of rescue facilities at the port.

In the 21. August 1989-sea accident involving two fishing vessels at St. Sulima Sierra Leone and Liberia border, many of the sailors died. The cause of the accident was lack of knowledge of Rules of the Road.

In April 1999, a vessel in distress along the coast of Liberia transmitted a distress signal, but was received by the Guinea Coastal radio station and relayed to Liberia. Liberia was not able to assist the vessel due to lack of SAR facilities.

In addition, the increase in drowning on the beaches across the country is due to lack of lifeguards, and training programs for such important personnel. There is no set rules and regulations that one should meet before operating a beach, i.e. Life Guards and rescue boats to assist any one drowning on the beach.

Numerous maritime disasters together with aeronautic accidents has brought about the integration of Maritime and Aeronautical Search and Rescue. The harmonizing of maritime and aeronautical search and rescue will assist states in meeting their own search and rescue (SAR) needs and the obligations they accepted under the Convention on International Civil Aviation, the International Convention on Maritime Search and Rescue and the International Convention for the Safety of Life at Sea (SOLAS).

SAR operations are usually considered as remedial solutions to accidents at sea, since the impact of a maritime and aeronautic accident largely depends on the degree of success of the SAR operation. The dedicated SAR system means that a 24 hour watch and supervision of all aeronautic and maritime activities in the SAR area is kept and the system is capable of responding to all the peculiar conditions prevailing in the area, so that everything and everybody operates within limited time.

Primary factors such as type of equipment in use, proficiency of SAR personnel, facilities available and the cohesiveness by which the whole operation is being conducted influence the quality of response, (Seaways, October 1989). The single most important factor in any SAR undertaking is how fast the information about an accident reaches a SAR Unit.

There is general conception that the complex and constantly changing maritime environment is contributory to maritime accidents. However, a study conducted by the U.S Coast Guard found that only 12% of maritime casualties are caused by poor visibility. It seems that most accidents occur in clear weather with the other vessel clearly in sight, with well-established communication. It should be borne in mind that majority of accidents are caused by human error not by equipment failure and natural occurrence. Mr. W S Morrison, a former Director of IMO's Maritime Safety Division once said "the sea will always be a dangerous environment, inhospitable and unforgiving of error." "From time to time, accidents to ships and other marine craft occur within the confines of ports and harbors, in narrow



channels, in coastal waters and even in the open oceans and seas far removed from land. For example, the “Herald of Free Enterprise” and the recent catastrophe of the “Estonia” all bear witness to the above statement.

### 1.7 OBJECTIVE FOR MAKING THE STUDY

The purpose for making the study is to analyze the present SAR situation regarding maritime and aeronautic search and rescue in Liberia, which is part of the maritime and aeronautic safety development plan as a whole, and suggest the ways and means to improve the system and facilities. The study is aimed at developing a comprehensive search and rescue program in Liberia. It introduces the coastline and climatical condition under which SAR will take place and identifying SAR resources in accordance with the basic requirements of the International Maritime and Aeronautic Search and Rescue Manual and the IMO.

In addition, the study discusses the development of a National Search and Reuse Manual and the Search and Rescue Plan. The integration of the National Coast Guard, National Fire Service, National Port Authority, Telecommunication Co-operation, Ministry of Health and Social welfare and National Red Cross Society and SAR resources providers into a comprehensive SAR program. This document when successfully completed will be used as a blue print for the implementation of Search and Rescue program in Liberia.

### 1.8 RESEARCH METHODS

In order to get information and data, besides the information given by: Resident professors, visiting professors and lecturers, the author has made some research using two methods. The two, methods are supporting, analysis and discussion of this subject in this paper regarding the maritime and aeronautic safety development concerning search and rescue in Liberia.

#### 1.8.1 LIBRARY RESEARCH

This research was done by collecting information and data from the library of the World Maritime University, Malmö, Sweden and the Liberia Bureau of Maritime Library in Monrovia. The materials used are; text books, reports, the SAR Convention and related material, International Maritime and Aeronautic Search and Rescue Manual, statistical tables, magazines, literatures and others which were very important and useful.

#### 1.8.2 FIELD RESEARCH

The field research was carried out in Liberia during the winter vacation. The author prepare some questionnaires and collected data from a number of officers at Liberia

National Port Authority, the Marine department and Port Manager office, which were related with the maritime safety concerning search and rescue resources.

In addition, interviews were conducted at the Ministry of National Defense with Deputy Minister of Defense for Administration Colonel William concerning the overall Search and Rescue situation in Liberia after the Civil War. The Deputy Minister of Defense for Coast Guard Affairs, Mr. Leamah was interviewed about the current search and rescue operation in Liberia, and he highlighted the difficulties facing the National Coast Guard due to lack of logistics. Colonel Wallace of the National Coast Guard also provided useful information on search and rescue training in the National Coast Guard. The interview was extended to the office of the Director of the National Fire Service where the discussion was centered on the possible integration of his office with the National Coast Guard in Search and Rescue operation.

The final interview was conducted at the Liberia Bureau of Maritime Affairs with the Deputy Commissioner for Administration, Mr. Lami Kromah, about what was the cause of the delay in ratifying the Search and Rescue Convention, 1979 in Liberia. Mr. Kroma explained that every effort is being made to write the National Search and Rescue Plan and meeting is being conducted with the Coast Guard on how to start the SAR programs.

Information and data were obtained during the field trips arranged by the World Maritime University in Sweden, Denmark, Finland, Norway and Germany. Information was also obtained during field training in the United Kingdom.

## 1.9 ARRANGEMENT OF CONTENTS

The dissertation is divided into 7 (seven) chapters, which are explained below: Chapter I, deals with the introduction in order to describe the geographical and population situation in Liberia, the background of the study and its limitations, the aims and objectives of the dissertation, research methods adopted and arrangement of contents.

Chapter II deals with international SAR, the revised SAR Convention and the Global Maritime Distress and Safety System (GMDSS) legislation, and the role of the IMO in promoting safety at Sea with respect to Global and Regional SAR plan and co-operation.

Chapter III emphasis the importance of communication in SAR operations and the different ways of communicating, with special emphases on electronic and satellite communication system.

Chapter IV and Chapter V discuss the SAR system in Liberia with its associated problems and the resources and equipment available. The author discusses the effect

of the Liberia Civil War on SAR in the country and how to identify SAR resources in post war Liberia and manage the existing resources and equipment to provide SAR services.

Chapter VI and Chapter VII consolidate all the findings and give proposals for upgrading the SAR system that will lead to the ratification and implementation of SAR in Liberia. Chapter VII concludes the study with the hope that Liberia will begin the new millennium with the implementation of the Search and Rescue Convention.

## CHAPTER II SEARCH AND RESCUE

### 2.1 GENERAL

The increase in maritime accident throughout the world since the sinking of the titanic in 1912, has caused concern. Due to the limitation in communication technology and ship design, ship and its crew where lost at sea without anyone knowing what happen to them. Assistance to ships and persons in distress at sea is the oldest form of fraternity at sea.

Search and Rescue (SAR) is an operation co-ordinated by a rescue coordination center or rescue sub-center, using available personnel and facilities to locate persons in distress, retrieve them, provide for their initial medical or other needs, and deliver them to a place of safety. Obligation to render assistance to ships and people in distress at sea is enshrined in international conventions.

### 2.2 INTERNATIONAL CONVENTIONS

The international conventions listed below have taken into account the vital need to render assistance to persons and vessels in distress at sea.

- The Convention for the Unification of Certain Rules of Law relating to Assistance and Salvage at Sea. (Brussels, 1910) as amended.
- International Convention on the High Seas, adopted by the United Nations in 1958.
- The International Convention of the Safety of Life at Sea (SOLAS 1974 as amended)

- The International Convention on Maritime Search and Rescue, (Hamburg, 1979, as amended).

Search and rescue provisions are found in the Brussels convention and SOLAS Convention. These conventions are upheld by Article 98 of the Law of the Sea Convention: Duty to render assistance, which states that

- Every state shall require the master of a ship flying its flag, in so far as he can do so without serious danger to the ship, the crew or the passengers:
  - (a) to render assistance to any person found at sea in danger of being lost;
  - (b) to proceed with all possible speed to the rescue of persons in distress, if informed of their need of assistance, in so far as such action may reasonably be expected of him;
  - (c) after a collision, to render assistance to the other ship, its crew and its passengers and, where possible, to inform the other ship of the name of his own ship, its port of registry and the nearest Port at which it will call.

According to the Brussels convention every master is bound, so far as he can do so without serious danger to his vessel, her crew and her passengers to render assistance to every body, even though an enemy found at sea in danger of being lost.

The Brussels Convention is an additional improvement of SOLAS Convention Chapter Regulation 10 that imposes obligation upon a master of a vessel to provide assistance, on receiving distress signal from any source such as survival craft, ship, small water craft and aircraft to proceed to the location of emergency and provide the appropriate assistance.

Every coastal state shall promote the establishment, operation and maintenance of an adequate and effective search and rescue service regarding safety on and

over the sea and, where a circumstance so require, by way of mutual regional arrangement co-operate with neighboring states for this purpose.

In SOLAS Chapter V, Regulation 15 each Contracting Government is required to establish, operate and maintain such maritime safety facilities as are deemed practicable and necessary in accordance with the density of the sea going traffic to provide adequate means of rescuing people in distress. A Contracting government to SOLAS is required to make available information concerning its existing rescue facilities and any plans for future changes.

An additional requirement for passenger vessels on fixed routes to which Chapter 1 of SOLAS Convention applies became effective on 1 July 1997. They shall have on board a plan for co-operation with appropriate search and rescue services in event of an emergency. The plan shall be developed in co-operation with the ship and the search and rescue services and be approved by the administration. The plan shall include provisions for periodic exercises to be undertaken as agreed by passenger ship and the search and rescue services concerned to test its effectiveness.

The safety of passenger vessels is causing growing concern due to the trend towards ever-larger capacity cruise ships, couple with low standard design and a lack of organized safety evacuation procedures. Mr. William O'Neil, secretary-general of IMO expressed his concern by posing the questions, "How many ships would be needed to rescue 5000 passenger?" he asked. "And even if they are safely evacuated, how will they be rescued?" How many ships today have the equipment that can pick shipwrecked survivors out of the water, at night and perhaps in stormy conditions?" The SOLAS convention requires a passenger ship to be able to evacuate everyone on board within 30 minutes. "Can we guarantee that this will apply on the new cruise ships that have 5000 people or more on board?" He asked these questions when addressing the

Shipbuilding and Machinery and Marine Technology trade fair in Hamburg, Germany. 23 NOVEMBER 98 WORLD: SAFETY CONCERNS SURFACE AS CRUISE SHIPS GET BIGGER. By Fleix Chan. (SINGAPORE)

The dream of the 6,200 passenger/2,400 crew America World City may never happen nor may plans for the Cruise Bowl with its 12,000 passengers. Mr. O'Neal's vision of a future Titanic is disturbing. Taking a closer look at present search and rescue facilities, Coast Guards helicopters could never handle 5,000 survivors. This will depend on how quickly other vessels reach the scene. If they arrive on time, not all vessels are equipped to pull people out of the sea. Besides passenger vessels which tend to have platform and fast rescue boats, the average commercial vessel is capable of rescuing two or three people from the sea or survival craft, but this is a slow and painstaking procedure and inappropriate for a 5000 passenger cruise ships, hence a second Titanic. The 50 per cent chance that the rescue would take place at night under severe weather condition is a logistical nightmare. It is about time new technology and regulation on search and rescue is put into contemplation.

The incident of the Titanic when 1500 passengers were shipwrecked reminds us about the consequences when safety technology has not kept up with the capacity of modern cruise ships. The size and capabilities of SAR facilities and co-ordination in most Sea-area of the world does not match the size of modern cruise ship passenger capacity. The 50 percent possibility of night rescue is a food for thought.

### 2.3 THE INTERNATIONAL CONVENTION ON MARITIME SEARCH AND RESCUE 1979, AND REVISED CONVENTION

The original search and rescue convention was adopted on 27 April 1979 and entered into force in 1985. The aims of the convention are:

- to develop an international maritime search and rescue plan;
- to promote regional co-operation among search and rescue organizations;
- to co-ordinate activities regarding safety on and over the sea among national and international organizations;
- to encourage government to establish, operate and maintain facilities to assist vessels in distress;
- to provide assistance to persons in distress at sea;

## 2.4 GENERAL OUTLOOK OF THE SEARCH AND RESCUE CONVENTION, 1979

The search and rescue convention contains six chapters

### 2.4.1 TERMS AND DEFINITIONS

Chapter 1 comprises Terms and Definitions

### 2.4.2 ORGANIZATION

Chapter 2 of this convention deals with basic structure for establishing a search and rescue Organization. Contracting states are required to send to the Secretary General of IMO details of their search and rescue organization, location of rescue co-ordination centers (RCC), available search and rescue facilities and limits of the regions of their responsibility. Parties are required to co-operate with other states, ensure that sufficient search and rescue regions are established within each sea area. The regions should be contiguous and not overlap. It must be clear that the delimitation of search and rescue regions to facilitate agreements with neighboring states shall not prejudice the delimitation of any boundaries.



### 2.4.3 CO-OPERATION

Chapter 3 approved those parties in addition to their own search and rescue establishment should also co-operate with neighboring states. Provisions should be made in the national legislation to empower the parties' immediate entry into or other territorial sea or territories or rescue units of each other solely for the purpose of search and rescue operations.

Neighboring states should upon establishing SAR agreement provide for expediting entry of RCCs units into each other territorial waters with the least possible formalities. Each party should permit its RCCs:

- to appeal for and render such assistance including personnel, vessels, aircraft or equipment, as may be needed from or by other co-ordination centers.
- to grant any necessary permission for entry of external personnel or equipment into or over its territorial sea or territory, and to make the necessary arrangements with the appropriate customs, immigration, health and other authorities.

### 2.4.4 PREPARATORY MEASURES

Chapter 4 of the convention contains preparatory measures to be taken by RCCs and RSCs and the state of preparedness of rescue units. RCCs and RSCs should be equip with the latest information regarding their area, detail of rescue units and coast watching unit, transportation facilities, mobile units, fuel supplies and other resources, means of communications including names, telephone and fax number of shipping agent, port authorities and other national and international agencies who may be able to assist in obtaining important information on vessels, identity of maritime and aeronautical mobile services, radio stations, civil aviation companies and other such information which may prove relevant in case of an emergencies.

The RCCs and RSCs should have ready access to information regarding and how to contact them, the position, course and speed of vessels within its area that may be able to provide assistance to persons, vessels or other craft in distress.

#### 2.4.5 OPERATIONAL PROCEDURES

Chapter 5 deals with requirement for parties to ensure continuous radio watches are kept on international distress frequencies. It provides initial action to be taken by search and rescue units upon receiving information of a distress incident.

The operational procedures followed three main emergency phases:

1. Uncertainty phase: when a person has been reported as missing or a vessel or other craft is overdue; or when a person, a vessel or other craft fail to make an expected position or safety report;
2. Alerting phase: when attempts to contact a person a vessel or other craft and inquiries to other appropriate sources have been unsuccessful or when information received indicate that operating efficiency of a vessel or other craft is impaired, but a distress situation is unlikely;

3 Distress phase: when positive information is received that a person a vessel or other craft is in danger and need immediate assistance or further unsuccessful attempt to establish contact with a person, a vessel has failed and the probability that the vessel is in distress, or that the operating efficiency of a vessel or other craft has been impaired to the extent that a distress situation is likely.

Detail procedures that should be followed by RCCs and RSCs in each of these phases are:

- Co-ordination when two or more parties are involved.
- On-scene co-ordination of search and rescue activities
- termination and suspension of search and rescue operations
- Designation of on-scene co-ordinator and responsibilities.
- Designation of co-ordinator surface search and responsibilities
- Initiation of search and rescue operation when the position of the search object is unknown.
- Passing information to persons, vessels or other craft for which an emergency phase has been declared.

#### 2.4.6 SHIP REPORTING SYSTEMS

Chapter 6 recommends establishing a ship reporting system individually by parties or in co-operation with other states if necessary to facilitate search and rescue operations. The system should provide up to date information on the movement of vessels in order to reduce the interval between the loss of contact with a vessel and the initiation of search and rescue operations.

The Ship reporting system should provide information on vessel's movements, including sailing plans and position reports, maintains of a shipping plot and receive report at appropriate intervals from participating vessels. The system should be simple in design and operation and use an internationally agreed standard ship reporting format and procedures of IMO Assembly Resolution A. 648 (16).

#### 2.4.7 SEARCH AND RESCUE RESOURCES

SAR resources are provided by government or public and private organizations. State provincial, and local government departments in planning search and rescue operation, consideration should be given to calling upon public

departments for assistance, as private Organization may demand considerable payment for services. Examples of public sources for SAR assistance are:

- Broadcasting stations; Communication networks and public information broadcasts,
- Civil aviation administrations; Air traffic services personnel, communications networks, and departmental aircraft,
- Coastguard and lifeboat authorities; where established this authorities are the primary source of maritime SAR assistance,
- Electric and public works departments; first aid personnel, helicopters, and communication lines,
- Fire departments; the general public turns for help or to report an accident, they may provide rescue units including fire fighting brigades, emergency medical technician and vessels,
- Health departments; hospital and first-aid facilities, ambulances, and emergency medical stations in remote areas,
- Hydrographic and other marine survey departments; marine navigation warnings and information and vessels,
- Lighthouse and pilotage authorities; vessels and crews,
- Marine and fisheries departments; vessels and crews, and vessel reporting systems,
  
- Military services; military services are the best source of all-weather facilities and trained personnel in SAR capabilities. Police departments; Police departments are public focal point for reporting abnormal observation. They may provide:
  - alerting post,
  - Communication facilities,
  - traffic control,
  - fencing and guarding of accident site, and
  - helicopters, small aircraft, and rescue boats

#### 2.4.7.1 COMMUNICATION FACILITIES

Communications are very important to effective SAR operations system provides means of receiving distress alerts and direct the efforts of responding

facilities. SAR manager should ensure that each RCC has access to the following communications networks:

- air traffic services networks;
- amateur radio stations;
- State-owned and private broadcasting stations;
- cable, telephone and telegraphic co-operations;
- coast radio stations;
- meteorological communication networks;
- military communications networks;
- railway communications system;
- dedicated SAR communications networks;
- satellite communications systems, e.g., INMARSAT and COSPAS-SARSAT; and transport communications systems.

#### 2.4.7.2 AIRCRAFT OPERATING AGENCIES

Arrangements should be made with aircraft operating agencies and for their co-operation in SAR. They may provide assistance by; making suitable aircraft and crew available for SAR operations;

- requesting air crew to keep a visual or radio watch for aircraft or vessel lost in the vicinity of their route;
- encouraging aircraft operators and aerodrome s to monitor the radio Frequency 121.5 MHz or 406 MHz

### 2.4.7.3.MERCHANT VESSELS

International conventions recommend that the master of a vessel, on receiving a message that persons are in distress at sea, should proceed to assist them when it can be done without undue risk to the safety of the responding vessel and crew. Vessels at sea are potential SAR assets. Fishing vessels, yachts and small crafts are sources from which volunteer assistance may be obtained.

## 2.5 PROBLEMS ENCOUNTERED WITH THE 1979 SAR CONVENTION

The SAR Convention of 1979 was designed to provide the framework for search and rescue operations. It and the two-associated manual, together with other resolutions recommendations adopted at the 1979 conference, should ensure that such operations are conducted with maximum speed and efficiency, no matter where the distress incident occurs. However, its productiveness relies in turn on the action taken by the parties to the Convention.

Because the Convention imposes considerable obligations on parties- such as setting up the shore installations, many countries have not ratified the convention. By the end of 1997, for example, the SAR convention had been ratified by only 56 countries, who's combined merchant fleets represented less than 50% of the world's tonnage. Equally important, many of the world's coastal States had not accepted the Convention and the obligations it imposes.

As a result, the development of 13 areas SAR plans has been relatively slow and by 1995, ten years after the Convention entered into force, provisional SAR plans had only been drawn up for nine regions. It was commonly decided that one reason for the small number of acceptance and the slow pace of implementation was due to problems with the SAR Convention itself and that

these could best be overcome by amending the Convention. Consequently, a meeting was held in October 1995 in Hamburg, Germany to reflect on the problem and it was decided that there were substantial concerns that require action to be taken into account including:

- experiences of States which have implemented the Convention;
- questions and concerns posed especially by developing States which are not yet parties to the Convention;
- needed improvements to IMOSAR and MERSAR, the two IMO SAR Manuals which are prevented by the present wording of the convention;
- need to further harmonize the IMO and ICAO SAR provisions;
- difficulties in finalizing the IMO SAR Plan which result from the present Convention; and
- inconsistent use of Convention terminology and phraseology.

## 2.6 THE REVISED CONVENTION

The subcommittee on Radio-communications and Search and Rescue (COMSAR) was requested to revise the Convention. A draft text was prepared and was approved by the 68<sup>th</sup> session of the MSC in May 1997. It was put forward for adoption by the 69<sup>th</sup> MSC session in May 1998. It is hoped that revised Convention will enter into force in the year 2000.

In the revised SAR Convention, terms and definitions embody in Chapter 1 has been amended and Chapter 2, which deals with Organization, has been redrafted to make the responsibilities of Government cleared. The new text requires parties to establish essential element of search and rescue service, which are defined as:

- a legal framework;
- assignment of responsible authority;
- Organization of available resources;
- co-ordination of operational functions;
- and
- processes to improve the service, including planning, domestic and co-operative relationship and training.

Chapter 2 describes the Organization of SAR services and how national capabilities are developed. Parties are required to establish rescue co-ordination centers and to operate them on a 24-hour basis with staff having a working knowledge of English.

Chapter 3 contained co-operation among States and Chapter 4 deals with Operating Procedures, but incorporates a Revised Version of the of the original Chapter 4 on preparatory measures. The original Chapter 6 (Ship Reporting Systems) has been updated and renumbered as Chapter 5.

#### 2.6.1 THE IAMSAR MANUAL

The significant innovation of the revision of the SAR Convention is the importance now being placed on the co-ordination of maritime and aeronautical SAR operations. IMO and the International Civil Aviation Organization (ICAO) have established a Joint Working group on the harmonization of aeronautical and maritime SAR operations. The joint group has its fifth meeting in Colonial Williamsburg, United States in October 1997 and prepared the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual.

The principal aim of the manual is to assist States in meeting their own SAR



needs and obligations they have accepted under the Convention on International Civil Aviation, the International Maritime Search and Rescue and the International Convention for the Safety of Life at Sea. The manual provides guidelines for a common aviation and maritime approach to organizing and providing SAR service.

The Mobile Facilities volume is intended to carry rescue units, civil aircraft and vessels to help with performance of a search, rescue or on-scene co-ordination function and with aspects of SAR that pertain to their own emergencies.

The IAMSAR Manual will replace both the MERSAR and IMOSAR Manuals.

## 2.6.2. DEVELOPING THE GLOBAL SAR PLAN

Major effort has been made in the past few years to improve the implementation of the SAR Convention. One by one the gaps in the 13 SAR areas have been filled, a decisive moment was in September 1997 when coastal States agreed on provisional SAR plans for the Mediterranean and Black Seas.

The development of SAR plans in all the world's sea areas is important not only to the success of the SAR Convention but to the implementation of another IMO innovation which has already made a major contribution to shipping safety and has already saved many lives at sea.

The Global Maritime Distress and Safety (GMDSS) became fully effective from 1 February 1999. By that date, the Morse code will be phased out and all ocean-going passenger ships and all cargo ships of 300 gross tonnage and upwards on international voyages will be required to carry equipment designed to improve the chances of rescue following an accident, including satellite emergency position indicating radio beacons (EPIRBs) and search and rescue transponders (SARTs) for the location of the ship or survival craft.

### 2.6.3 THE SAR CONVENTION AND GMDSS

The GMDSS is essentially a worldwide network of automated emergency communications for ships at sea. The basic concept is that searches and rescue authorities ashore as well as shipping in the immediate vicinity of the ship in distress; will be rapidly alerted through satellite and terrestrial communication techniques to a distress incident so that they can assist in a coordinated SAR operation with the minimum of delay.

The 1979 SAR Convention was designed to provide for responding to emergencies and the GMDSS was established to provide it with the efficient communication support needed. Both the GMDSS and SAR are crucial to the future of maritime safety and when both are fully operational, any emergency at sea will result in a distress call and the response to that call will be immediate and effective. The days when ship and its crew could vanish at sea without trace should then hopefully be ended

## 2.7 INTERNATIONAL ORGANIZATION ON SEARCH AND RESCUE

International standards are set by international organizations formed to promote international co-operation on SAR among nations signatory to the convention. Important international organizations and agencies are described below.

### 2.7.1 INTERNATIONAL MARITIME ORGANIZATION (I.M.O.)

IMO is a branch of the United Nations that provides machinery for co-operation and exchange of information among governments on technical matters affecting shipping engaged in international trade. It administers the conventions on Maritime Safety and Environment Protection. IMO co-ordinates matters on national and international operational procedures for SAR at sea. In SOLAS

Convention, IMO requires merchant vessels to respond to distress signals and carry life saving appliances including radio equipment with automatic alarm devices. In 1979, IMO adopted the International Convention on Maritime Search and Rescue whose aim was to develop International SAR Plan resulting in, no matter where an accident occurs, the rescue of persons in distress at sea will be co-ordinated by a SAR organizations and, when necessary, by co-operation between neighboring SAR organizations.

The International Code of Signals (INTERCO) includes sections on emergencies, distress and SAR.

IMO's Merchant Ship SAR Manual (MERSAR) comprises procedures for merchant ships involved in SAR.

IMO Search and Rescue Manual (IMOSAR) assist government to implement the SAR Convention, and provides outlines for a common maritime SAR policy. It encourages coastal states to co-operate and provide mutual assistance

## 2.7.2 INTERNATIONAL CIVIL AVIATION ORGANIZATION (I.C.A.O.)

ICAO is a division of the United Nations that administers Conventions on International Civil Aviation. The convention recommends comprehensive standards, practices and procedures for SAR by aircraft. SAR details for services and operations are included in the ICAO SAR manual. The manual contain section on geographical responsibilities of member states. The updated 4<sup>th</sup> edition takes into account harmonization of aeronautical and maritime SAR. Further development of the manual is under consideration in co-operation with IMO.

## 2.7.2 INTERNATIONAL TELECOMMUNICATION UNION (ITU)

ITU is an intergovernmental agency related to the United Nations. It adopts international regulations and treaties governing all terrestrial and space uses of the frequency spectrum as well as the use of the geostationary satellite orbit within which countries adopt their national legislation. ITU develops standards to facilitate interconnection of telecommunication systems on a worldwide scale. ITU prescribe the frequencies for uncertainty alert, distress, emergency and safety messages. It provides emergency information to organization concerned with Safety of Life at Sea about ship in distress or need of assistance.

## 2.7.3 INTERNATIONAL RADIO MEDICAL CENTRE (C.I.R.M.)

C.I.R.M is a humanitarian Organization with headquarters in Rome, Italy. It provides humanitarian medical services and assist in arranging the removal of injured or strongly ill seafarers from vessels worldwide. CIRM furnish facilities where no medical advice is accessible.

## 2.8 IMO ROLE IN PROMOTING MARITIME SAFETY

IMO primary objectives are the promotion of safety of life at sea. Over the years IMO has drafted and adopted various conventions and protocols as well as codes and recommendations dealing with maritime safety. The most important of its safety conventions is the Convention on Safety of Life at Sea, better known as SOLAS, which covers a wide range of measures, designed to improve the safety of shipping. It has taken various measures to ensure that those involved in accident is rescued as urgently as possible.

### 2.8.1 LIFE SAVING APPLIANCES AND SAFETY DRILLS

IMO has made provision and improvement of life saving equipment and techniques to ensure safety at sea. The Maritime Safety Committee has adopted International Life Saving Appliances Code in order to provide international standards for life-saving appliances required by SOLAS.

Ships are provided with life-saving equipment and survival crafts sufficient for all persons on board and to quickly and safely launched in case of an emergency. These appliances are made to save and maintain life for a specific period of time or until they are rescued.  
survival crafts.

### 2.8.2 TRAINING MANUAL

Life-saving appliances are provided with training manual. Such manual should contain instructions and information in easily understood terms on their use and method of survival. Part of the information should be in the form of audio-visual aid in lieu of the manual. The manual should explain the instruction on maintenance and safe use of the survival equipment.

### 2.8.3 DISTRESS ALERTING AND SIGNALLING

Before the invention of radio signals, visual signals such as parachute rocket flares, hand flares, buoyant smoke signals and other signals were used for alerting vessels and people within the vicinity of distress. Visibility and sea conditions restricted these methods. The invention of radio and launching of satellite into space have revolutionized maritime communication in distress alerting. With this invention the shipping industry was very timely to apply this

development. Passenger vessels, irrespective of size and cargo vessels of 300 GRT and above must carry at least 2 two-way VHF radiotelephone equipment.

#### 2.8.4 GMDSS DISTRESS ALERTING

The basic concept of the GMDSS is that SAR authority ashore, in addition to shipping in the immediate vicinity of a casualty, must be rapidly alerted to a distress incident so that they can assist in a co-ordinated SAR operation with minimum of delay.

IMO specified nine function ship carriage requirements for radio communications equipment in the specific sea areas in which the vessel trades. The nine functions are:

- Distress alerting; ship to shore.
- Transmitting and receiving distress alerts: ship to ship.
- Transmitting and receiving SAR co-ordination communications.
- Transmitting and receiving on-scene communications.
- Transmitting and receiving locating signals.
- Transmitting/receiving maritime safety information (MSI).
- Transmitting and receiving general radio communications from shore-based radio networks.
- Bridge to bridge two way communications.

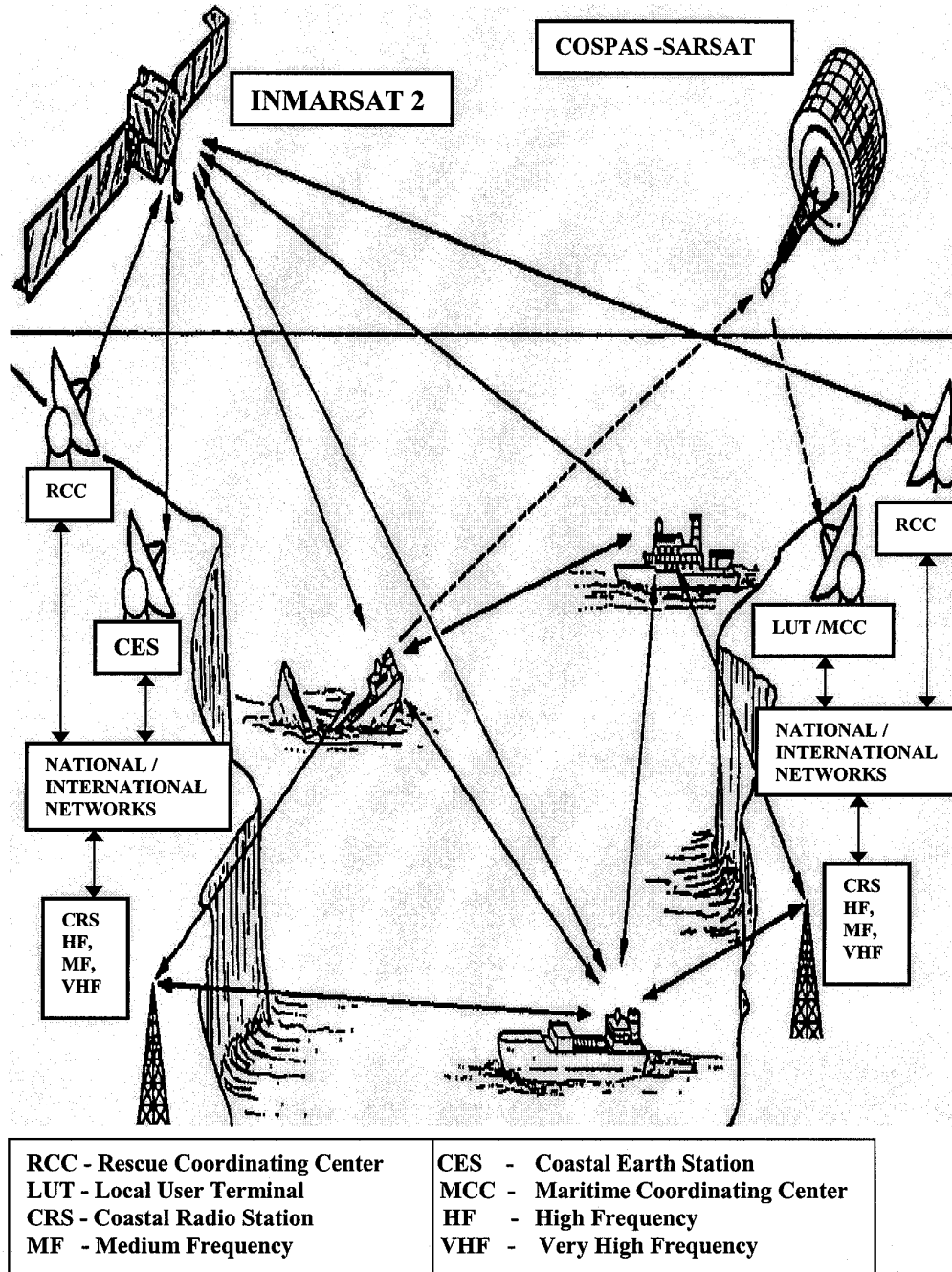
To achieve ship to shore distress alerting there must be a means of transmitting ship to shore distress alerts by at least two separate and independent methods, each using a different radio communications service.

Figure 1-show concepts of basic GMDSS alerting

## 8.5 GMDSS SHIP CARRIAGE REQUIREMENTS

GMDSS required every vessel over 300 gross tons, which chooses to operate subject to its regulations to be provided with a VHF radio installation providing communications on channels 6, 13 and 16 with the facilities for DSC alerting on channel 70, a receiver for continuous DSC watch on channel 70, two radar transponders (SART) transmitting in the 9 GHz band, a NAVTEX receiver, receiver for the reception of Maritime Safety Information transmitted by Inmarsat coverage where NAVTEX is not provided, satellite EPIRB capable of being manually or automatically activated to float free, two (three on ships over

Figure 5.1 : General Concepts of the GMDSS



(Source : Calcutt, D and Tetley, L, 1994)



500 grt) water proof VHF handheld transceivers for on-scene communication, MF communication on 2182 KHz until February 1999. Other equipment will be fitted depending upon the geographical areas through which the ship trade. (UNDERSTANDING GMDSS, Calcutta, D and Tatley, L 1994)travels on

The GMDSS communications system under SOLAS complements the International Convention on Maritime Search and Rescue (SAR), 1979. It was adopted to develop a global SAR plan, so that no matter where an incident occurs, the rescue of persons in distress will be co-ordinated by a SAR organization and where necessary, by co-ordination between neighboring SAR countries.

From 1 February 1999, all passenger vessels and all cargo vessels of 300 gross Tons and upward on international voyages must comply with GMDSS.

IMO and the International Hydrographic Organization (IHO) have established World Wide Navigational Warning System (WWNWS). The system divides the world oceans into sixteen areas called NAVAREA. It is for long range NAVAREA warnings and coastal NAVTEX warnings. It provides for globally co-ordinated transmissions with NAVAREA Co-ordinators for each NAVAREA. The purpose of the system is to promulgate rapid transmission and reception of distress messages and navigation and safety warnings to vessels. Warnings which SAR personnel may send over WWNWS include:

- distress alerts
- information about overdue or missing aircraft or vessels Collectively, these types of alerts, combined with navigation and meteorological warnings, are called maritime safety information (MSI).

Common language, despite the advances in communication at sea and SAR

organizations, confusion exists due to language barriers. The international language of SAR is English, even then certain phrases and words can be misinterpreted by the parties at both ends. To overcome this problem, IMO Assembly has adjusted and standardized the English terms used at sea. Where neighboring States use language other than English, it is useful to have someone at the RCC or on call capable in that language too. Advantage can also be taken of the increasing trend of communication service providers to offer translating services on the telephone. However, every RCC should always have personnel on watch, who is able to speak, read, and write the English language to enable timely and effective communications with aircraft, vessels, and other RCCs.

#### 2.8.6 ABANDONING SHIP AND SURVIVAL TECHNIQUES

Many ships are abandoned or sink without affording the crew enough time to prepare for the emergency. The greatest danger to life after abandoning vessel is the lost of body heat (hypothermia). When body core temperatures fall below 35 degree centigrade the person is suffering from hypothermia. Drowning is the secondary cause of death. Many of those who drown did so because of incapacitation due to cold.

The tragic sinking of the Titanic in 1912 provided an insight into cold water immersion. The quick sinking of the vessel did not permit its passengers and crew to wear adequate protective clothings and lack of survival technique caused those in the sub-zero temperature water not to survive when rescue arrived. As a result, there has been improvement in life saving appliances by the adoption of subsequent SOLAS conventions and its protocol and code such as the International Life-saving Appliances (LSA) Code. The code was adopted to provide international standards for life saving appliances required by SOLAS 1974 Convention. The Code is mandatory. In addition, personal protective aids

are included in the code to provide protection against hypothermia. IMO publication, 'A pocket guide to cold water survival', gives practical advice on cold water survival and how to treat victims.

## 2.8.7 SEARCH AND RESCUE PHASES

IMO has been concentrating its efforts on developing a worldwide-integrated system to respond to vessels in distress. The most significant of these are the SOLAS conventions of 1974, the International Convention on Maritime Search and Rescue (SAR), and the Global Maritime Distress and Safety System (GMDSS).

## 2.8 IMO SEARCH AND RESCUE MANUAL (IMOSAR)

The main purpose of IMO SAR manual is to assist government in implementing the objective of the International Convention on Maritime Search and Rescue, 1979. It provide guidelines on maritime search and rescue policy, encouraging coastal states to develop their program on similar framework and enabling neighboring states to co-operate and provide mutual assistance.

### 2.8.1 MERCHANT SHIP SAR MANUAL (MERSAR)

The purpose of the manual is to provide guidance for those whom during emergencies at sea may require assistance from others or who may be able to render such assistance themselves. In particular, it is designed to aid the master of any vessel who might be called upon to conduct search and rescue operations at sea for persons in distress. The two main categories of distress are coastal incident and ocean incident.

The basis for the manual is pertinent international conventions, which set out

responsibilities for assistance at sea. It is accepted as normal practice for seafarers, certainly there is an obligation upon masters, that they render every assistance within their power in case where a person or persons are in distress at sea (MERSAR) 1993.

## 2.9 GLOBAL MARITIME SAR PLAN'

The world oceans have been divided into different areas for the development of global SAR Plan. The development of SAR Plans in all world sea areas is important not only to the success of the SAR Convention but to the implementation of the Global Maritime Distress and Safety System (GMDSS).

Member's governments within such areas are asked to provide necessary information with view to prepare a provisional maritime SAR Plan in accordance with the provisions of the 1979 SAR Convention. The areas is divided in 13 sea areas, these areas are as follows:

- Area-1 North Atlantic
- Area-2 North Sea
- Area-3 Baltic Sea
- Area-4 Eastern South Atlantic
- Area-5 Western South Atlantic
- Area-6 Eastern North Pacific
- Area-7 Western North Pacific
- Area-8 Eastern South Pacific
- Area-9 Western South Pacific
- Area-10A North West Indian Ocean
- Area-10B South West Indian Ocean
- Area-10C East Indian Ocean
- Area-11 Caribbean

Area-12A Black Sea

Area-13 Arctic Ocean

These World Sea Areas are, in addition, sub-divided into smaller regions for the relevant coastal states to develop their SAR plans agreeably. As a result, Liberia falls within Area-4 Eastern South Atlantic of the World Sea Areas. Countries within the Area-4 Eastern South Atlantic are;

- .1 Angola
- .2 Benin
- .3 Cameroon
- .4 Cape Verde
- .5 Congo
- .6 Equatorial Guinea
- .7 Gabon
- .8 Gambia
- .9 Ghana
- .10 Guinea
- .11 Guinea Bissau
- .12 Cote d'Ivoire
- .13 Liberia
- .14 Mauritania
- .15 Morocco
- .16 Namibia
- .17 Nigeria
- .18 Sao Tome and Principe
- .19 Senegal
- .20 Sierra Leone
- .21 South Africa
- .22 Spain (Canary Islands)
- .23 Togo
- .24 Zaire

These countries are obligated to establish MRCC in their respective sea area for the performance of SAR operations. Due to the large number of members in Area-4 it was found prudent to establish committees for area discussions and development of Area Maritime SAR Plans with participation as follows;

1 North Western Sector Committees

Mauritania, Cape Verde, Senegal, Gambia, Guinea-Bissau, Guinea, Sierra Leone, Liberia, Cote d'Ivoire, Ghana and Togo.

2 South-Eastern Sector Committee

Benin, Nigeria, Cameroon, Equatorial Guinea, Sao Tome and Principe, Gabon, Congo, St Helena, Zaire, Angola, Namibia.

## 2.9.1 REGIONAL CO-OPERATION ON SAR

On the 16<sup>th</sup> to 20<sup>th</sup> May 1988 the West African Region held its first seminar and workshop devoted entirely to maritime search and rescue in Lagos, Nigeria. Similar meetings have been held in Asia and the Pacific and in the Caribbean regions. The occasion was organized by IMO and financed by the United Nations Development Program (UNDP). Liberia was assigned SAR zone during the seminar, see Figure 2 .

The aim of the workshop and seminar were;

- to assist developing countries in the region to establish and improve their maritime search and rescue capabilities in accordance with SOLAS Chapter V.
- to encourage early implementation of the International Convention on Maritime Search and Rescue, 1979, and also the Global Maritime Distress and Safety System (GMDSS) on regional level.
- to assist neighboring coastal states in co-ordinating their maritime SAR operations in line with SAR convention 1979.

The development of SAR depends initially on the respective country's territorial waters where it exercises its sovereignty. The expansion of SRR depends on facilities available to the coordinators, and their ability to receive communications from sea and to effectively respond to the number of SAR mission established in that region.

## CHAPTER III

### SAR COMMUNICATIONS AND OPERATION

#### 3.1 GENERAL

SAR communication is considered one of the most important and sometimes the weak link in the SAR system. What matters is the overall timeliness and quality of communication from their source to the final destinations. Therefore, all sea, land, air and space segments must be examined to eliminate weak links, delays, and deterioration of quality. SAR communications must be able to take place reliably and quickly between units in distress and the SAR system, and also between components of the SAR system, nationally and internationally.

#### 3.2 DISTRESS COMMUNICATIONS

Distress communication includes all messages relating to immediate assistance required by persons, aircraft, or marine craft in distress, including medical assistance. Distress communication may also include SAR communications and on-scene communications. Distress communications take absolute priority over all transmissions; anyone receiving a distress call must immediately cease any transmission that may interfere with the call and listen on the called frequency.

Distress alerts may reach RCCs from diversity of equipment sources and through a variety of alerting posts. Alerting posts includes, coast radio stations (CRSs), Local User Terminals (LUTs) and Mission Control Centres (MCCs) of the Copas-Sarsat System. Other includes Land Earth Stations (LEs) of the Inmarsat System, Air Traffic Services (ATS) units, public safety units such as police and Fire department, and vessels, aircraft, or other persons or facilities that relay distress alert between their source and the responsible RCC, and may even include other RCCs.

#### 3.3 DISTRESS SIGNALS

According to international agreements, certain signs and signals indicate distress or emergency. Such signs or signals are inscribed in the International Code of Signals. Common maritime and aeronautical signals must be listed in the SAR plans, and SRUs should carry a copy of the International Code of signals.

#### 3.4 VISUAL, AURAL AND ELECTRONIC SIGNAL

Visual signing equipment for part of the Life Saving Appliances, such equipment includes:

- Daylight visual signal: fluorescent materials, sea dye markers or smoke signal
- Night visual signals: strobes, incandescent or chemical lights, fires, pyrotechnics or reflective material.



- The voice or aural signals are usually considered the most practicable means of communication for directing on-scene operations. The most common facilities used are telephones, radiotelephones and INMASAT. A voice distress signal is preceded by the word mayday. 156.8 MHz (Channel 16) is the international VHF maritime voice distress, safety, and calling frequency. The frequency 156.3 MHz (Channel 06) may be used for communications on-scene.

### 3.5 SPOKEN EMERGENCY SIGNALS

There are three spoken emergency signals used by aircraft and vessels:

Distress signal: MAYDAY (pronounced M' AIDER) is used to indicate that a mobile craft is in distress and requires immediate assistance, and has priority over all other communication. For example, man overboard message.

Urgency signal: PANPAN (pronounced PAHN-PAHN) is used when the safety of a mobile craft is in jeopardy or an unsafe situation exist that may eventually involve a need for assistance, and has priority over all distress traffic.

Safety signal: SECURITY (pronounced SECURITAY) is used for messages concerning safety of navigation or giving important meteorological warnings.

Any Aircraft commander or vessel captain experiencing a distress situation should declare a distress condition using the MAYDAY signal. However, if these words are not used, and there is any doubt whether an emergency exists, the hearer should assume it is an actual or potential emergency and obtains enough information to handle the emergency intelligently.

### 3.6 ELECTRONIC SIGNALS

Emergency electronic signals come in the form of radio alarms. International radio alarms are used to alert ships, aircraft and radio stations during an emergency situation. Several frequencies in different radio bands are assigned for distress, urgency, safety, or SAR signals and messages. It is very important that SAR personnel thoroughly understand the frequencies and their authorised use. The frequencies used includes:

- 500 kHz-International radiotelegraph alarm distress and calling signal is a series of twelve, 4-second dashes with 1-second spacing, for actuating automatic alarm devices on ships and marine coastal radio stations not maintaining a continuous listening watch on 500 kHz.
- 2182 kHz-International voice distress, safety, and calling radiotelephone alarm signal, is used for transmitting a warbling two-tone signal on 1300 Hz and 2200

Hz, alternating 4-times per second and continued for 30 seconds to 1 minute. It is transmitted on 2182 kHz or 156.8 kHz (Channel 16) during alert or emergency situations to attract attention and actuate automatic alarm devices.

### 3.6.1 DIGITAL SELECTIVE CALLING (DSC)

Digital selective calling is used for distress alerting and safety calling on terrestrial frequency. The frequencies are HF, MF and VHF. Frequencies assigned for distress and safety purposes are:

- MF band: 2,187.5 kHz
- HF band: 4,207.5 kHz, 6312KHz, 8414.5 kHz, 12577 kHz and 16,804.5 kHz
- VHF band: 156.525 MHz (Channel 70)

These frequencies when used actuate the receiving selectors on all ships that are equipped with digital selective calling regardless of code number. The total duration of All Ship Call signals should be at least 5 seconds.

### 3.6.2 EMERGENCY POSITION INDICATING RADIO BEACON (EPIRBs)

Two types of maritime satellite Emergency Position Indicating Radio Beacons have been accepted into GMDSS. They are devices that transmit radio signals either on 1.6 GHz (the Inmarsat frequency) or the 406 MHz frequency used by the COPAS-SARSAT system. These are fully automatic, semi-automatic, or hand activated. They may be transmitters, transceivers, beacon only, or a combination. Worldwide coverage is only possible with satellite EPIRBs operating on 406 MHz as those operating on the aeronautical emergency frequency 212.5 MHz or 243 MHz can only be received when an LUT is within the satellite's footprint.

### 3.6.3 RADAR TRANSPONDERS

The main difficulty during SAR operation is simply locating the survivors. In many cases the distress alert will have been sent by the ship or automatically by the satellite EPIRB and survivors will have embarked into survival craft. Radar transponders are the device that assists rescue units to locate ships and survival craft by day or night in all weather conditions. Receiving and radar pulse activates it. It then sends out a series of pulses that are display on the radar screen of the interrogating ship or aircraft. This clearly identifies the transponders' position, making it much easier for SAR units to reach the sport quickly. Survival craft and ship transponders operating on 9 GHz are mandatory under GMDSS.

### 3.6.4 AUTOMATED MUTUAL ASSISTANCE VESSEL RESCUE SYSTEM (AMVER)

AMVER is a world-wide-computerised ship reporting system operating exclusively to support SAR and make information available to all RCCs. It is a system for maintaining the dead reckoning navigation position of participating merchant vessels. Any merchant vessel of 1000 gross tons or more on any voyage or greater than 24 hours is welcome to participate by sending movement reports and periodic position reports voluntarily to the AMVER centre in New York via designated coastal or appropriate radio stations. Any vessel between 80 degrees North and 80 degrees south worldwide may participate. The SAR data collected is published periodically to AMVER bulletins and distributed to RCCs.

Where communication link exist, AMBER centre can produce a surface picture of vessels in the area of SAR incidents, together with predicted positions and their characteristics. The surface picture (SURPIC) may be requested in two formats.

1. Circle SURPIC giving latitude and a longitude with a radius of up to 200 miles.
2. Area SURPIC of any shaped area bounded by no more than 100 reference points, i.e. a square search area would have four reference points.

Benefits of participation include:

- Improved likelihood of rapid assistance during emergencies
- Reduced number of calls for assistance to vessels unfavourably located to respond
- Reduce response time to provide assistance
- To provide medical advice or assistance to distress vessel, when a doctor is not on board.

### 3.7 AN INTRODUCTION TO SATELLITE COMMUNICATIONS

Satellite offered a solution to the problem with radio messages travelling in straight line. Because they do not follow the curve of the Earth's surface eventually they disappear in space (except on HF). Radio messages sent via a satellite also travel in straight lines, but they can immediately be re-directed from the satellite back to Earth, greatly extending the range of communications. Satellite enables a message to be sent to a satellite and then back to a dedicated station on land that is designed and equipped to deal with such emergencies. It provides an immediate respond to emergency situation.

The primary satellite systems used for SOLAS compliance are Cospas-Sarsat and Inmarsat.

Inmarsat (International Maritime Satellite Organisation) the convention on Inmarsat was adopted in 1976 by IMO and entered into force in 1979 and Inmarsat became operational in February 1982.

The Inmarsat system was established for the following purposes:

- To make provision for the space segment necessary for improving maritime communication and aeronautical communications as practicable,
- Assisting in improving distress and safety of life, communication for air traffic services.
- Efficiency and management of ships and aircraft communication,
- Maritime and aeronautical public correspondence services and radio determination capabilities.

### 3.7.1 THE INMARSAT SYSTEM

The major components of Inmarsat are:

- Space segment
- Operations control centre (OCC)
- Coast Earth Stations (CES)
- Network co-ordination stations (NCS)

Inmarsat uses a satellite in each of the areas listed below. Together the satellites provide coverage along the entire equator between 70 degrees latitude north and South, and serve aeronautical, land and maritime users.

Atlantic Ocean Region-East (AOR – E)  
Pacific Ocean Region (POR)  
Indian Ocean Region (IOR)  
Atlantic Ocean Region – West (AOR – W)

### 3.7.2 THE SPACE SEGMENT

The four space crafts in geo-stationary orbit 35700 Km above the equator and located over Atlantic Ocean region – West, Atlantic Ocean region – east, Indian Ocean region and Pacific Ocean region.

### 3.7.3 THE NETWORK COORDINATION STATIONS (NCSs)

There are three CESs located in Southbury (USA) and at Yamaguchi and Ibaraki (Japan), used by INMARSAT to serve as NCS. They assign space segment capacity i.e. telephones channel in demand, to earth stations and coast earth stations, and monitor the signals transmitted by these stations.

#### 3.7.4 THE NETWORK COORDINATION CENTRE (NCC)

The INMARSAT headquarters in London is the INMARSAT system energy centre. The NCC is directly connected to the satellite control centres of organisation from which satellite capacity is leased from the Atlantic and Indian Ocean regions. The system co-ordinates all the operational activities of INMARSAT network, and operates 24 hours a day.

#### 3.7.5 COASTAL EARTH STATIONS (CESS)

Land earth stations (LESs) also known as coast earth station for maritime functions and ground earth stations (GESs) for aeronautical functions, provide the link between the space segment and the terrestrial telecommunication networks. Signatories to the INMARSAT Operators Agreement own and operate it.

#### 3.7.6 SHIP EARTH STATIONS (SESs)

The INMARSAT ship earth station and ground earth stations enable the shipboard operator and aircraft operator to link with each other and the rest of the world. It is considered a key to the maritime satellite system.

#### 3.7.7 COSPAS/SARSAT

COSPAS (Space System for Search of Distress Vessel)

SARSAT (Search and Rescue with satellite Aided Tracking)

COSPAS-SARSAT is an international satellite system for search and rescue established in 1979. The system is designed to locate distress beacons operating on aviation distress frequencies.

It consists of a constellation of satellites in polar orbit and a network of stations known as Local User Terminals (LUT) which provides SAR distress alerting and location information on a global scale for maritime, aviation and land users in distress.

The COSPAS-SARSAT programme was officially instituted in Paris between Canada, France, the former USSR and USA. Moreover, the system is internationally available and access to the system by users in distress is free of charge.

COSPAS-SARSAT is designed to locate distress beacons transmitting on the frequencies 121.5 MHz. The information stored in 406 MHz is not only relayed in real time but also time-tagged and stored for dumping as each Local User Terminal (LUT) comes into view. This frequency therefore provides a global service with maximum detection time of about one and half-hours.

The 125.5 MHz beacon transmitting to aircraft is currently not accepted as a satellite EPIRB in the GMDSS due to unavailability of global coverage, however, it is expected that the beacon will be used in the future as an aircraft homing device by life-raft.

COSPAS/SARSAT relay alert signals from 406 MHz distress beacons have 90% accuracy and also offer other information i.e. nationality, call-sign, and type of vehicle in distress.

The 406 MHz satellite EPIRBs signals are relayed via Copas-Sarsat satellite, Local User Terminals and Mission Control Centre (MCC) to SAR Point of Contact (SPOCs). The distresses that are picked by the satellites are relayed to LUT for processing to determine beacon location. The information is passed to a MCC to alert the SAR authorities.

Mission Control Centre has been established in each country operating at least one LUT to disseminate information to appropriate Rescue Co-ordination Centre. LUT already exist in Toulouse (France), Tromsø (Norway), Ottawa, Goose Bay, Edmonton and Churchill (Canada) Kodiak, San Francisco and St Louis (USA), Moscow, Arkangelsk, Vovosibirsk and Vladivostok (USSR) Bangalore (India). In addition to the four participating parties, Norway, the UK, India, Brazil, Sweden, Denmark, Italy, Japan and Chile are COPAS-SARSAT participants.

### 3.7.8 GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS)

GMDSS is an integrated communications system using satellite and terrestrial radio communications to ensure that no matter where a ship is in distress, aid can be dispatched to it.

The GMDSS was developed by IMO in close co-operation with the International Mobile Satellite Organisation (INMARSAT), the International Telecommunication Union (ITU) and other international organisations, notably the World Meteorological Organisation (WMO), the International Hydrographic Organisation (IHO) and the COSPAS-SARSAT PARTNERS.

All passenger ships and all cargo ships over 300 gross tons on international voyages have to carry specified satellite and radio communications equipment, for sending and receiving distress alerts and maritime safety information and for general communications. The regulations governing the GMDSS is contained in the International Convention for the Safety of Life at Sea (SOLAS), 1974.

GMDSS requirements on radio communications are contained in chapter IV of SOLAS and were adopted in 1988. The requirement entered into force on 1 February 1992 but provided for a phase-in period until 1 February 1999.

All ships subject to the SOLAS Conventions are obliged to be fitted with GMDSS Communications equipment. Certain fishing vessels and other marine craft may also carry GNDSS compatible equipment.

Information on GMDSS Communications equipment, which each SOLAS vessels carry, is made available to RCCs through the flag states, ITU publications and data Bases, communications service providers, ship reporting system databases, SAR data providers or other sources.

RCC personnel should be familiar with SOLAS GMDSS provisions, and associated IMO documents. GMDSS communication shift alerting emphasis from ship-to-ship (through this can still be done), and towards ship-to-shore, where SAR professionals can help arrange assistance.

GMDSS equipped vessels are expected to perform the following function where they operate:

Transmit ship-to-shore distress alerts by two independent means;

Receive shore-to-ship alerts (usually relayed by RCCs); and transmit and receive:

- Ship-to-ship alerts
- SAR co-ordinating communications;
- On-scene communication;
- Locating signals;
- Maritime safety information;
- General radio communications to and from shore; and
- Bridge-to-bridge communications.

GMDSS offer new training requirements and more complex equipment control; relatively low reliability of automated distress alert; varying level of integration of GMDSS system; incomplete development of related shore base infrastructure; and maintenance requirements. Until these matters are resolved, the level of effort needed for training SAR personnel and others on communications matter will be substantial.

Furthermore CRSs may affect the equipment which ships must carry to comply with SOLAS and DSC availability, NAVTEX transmitters, etc. for example, if a State does not provide short range DSC coastal coverage, ships must be equip with longer range equipment even if it sails only in their coastal waters.

Under GMDSS, the navigable water of the world are divided into four sea areas and each contracting Government will have to decide on how they want to define their coastal waters. To achieve this requires co-operation with neighbouring States. The four GMDSS sea areas are defined as follows:

Sea Area A-1 is an area within the radiotelephone coverage of at least VHF coast station in which continuous Digital Selective Calling (DSC) alerting is available.

Sea Area A-2 is an area within the radiotelephone coverage of at least one MF coast station in which continuous DSC alerting is available.

Sea Area A-3 is an area, excluding sea areas A-1 and A-2, within the coverage of INMARSAT geo-stationary satellite in which continuous alerting is available.

Sea Area A-4 is an area outside sea areas A-1, A-2 and A-3.

### 3.7.9 GMDSS COMMUNICATION EQUIPMENT

The requirements for communication equipment will vary according to the sea area of operation of a vessel within the GMDSS radio-net. Coastal vessels, for example will have to carry shore-base VHF coastal radio stations that provide continuous alerting by digital selective calling. Typically, the radio range would be approximately 20 to 30 nautical miles (NM). Ships that navigate beyond the 30 NM range will have to carry MF equipment as well as VHF providing digital selective calling. The radio range would be 100 to 150 NM. Ships, which operate outside the MF range, will have to carry HF or INMARSAT equipment in addition to VHF and MF. Ships that navigate in A-4 will have to carry VHF, MF and HF.

Furthermore, vessels which operate subject to GMDSS requirements must be provided with Emergency Position Indicating Radio Beacons (EPIRBs) for either the COSPAS-SARSAT or INMARSAT systems and Radar Transponders (SARTs) for location of ships or survival craft in distress. In addition, ships are required to have a receiver for the reception of maritime safety information transmitted by Inmarsat's Enhanced Group Call (EGC) system if on voyages in sea areas of Inmarsat coverage where NAVTEX is not provided. Two waterproof VHF portable transceivers are required for on-scene communications.

According to SOLAS Consolidated Edition, 1997 Chapter IV regulations 15, 16 and 17, GMDSS ships operating in sea areas A-1 and A-2 must ensure the availability and readiness of equipment. The equipment must use methods duplication of equipment, shore-base maintenance or at-sea electronic maintenance capability, or a combination of these to the satisfaction of the administration. In sea areas A-3 and A-4, a combination of at least two of these methods must be used.

Regulation 16 addressed the qualification of radio personnel and such person should have attended a course leading to "General Operator Certificate" (GOC). The radio personnel will be designated to have primary responsibility for safety, and distress radio communication during distress incidents. A navigation officer that holds General Operator Certificate is qualified to serve as radio officer.

According to regulation 17 a record shall be kept, to the satisfaction of the Administration and as required by the Radio Regulations, of all incidents connected



with the radio communications service which appear to be of importance to safety of life at sea.

### 3.7.10 INMARSAT –E EPIRBS, ELTs and PLBs

Inmarsat-E EPIRBS distress messages is relayed via Inmarsat satellite and Inmarsat-E CES to Inmarsat-E RCCs.

LUTs are Cospas-Sarsat earth stations. MCCs collect, store and sort data from LUT and other MCCs, exchange data within the system, and provide alert messages to the SPOCs, which include point outside the SAR system where no RCC is available.

Copas-Sarsat also relay alerts from aviation 406 MHz satellite personal Locator Beacons (PLBs). Signals are also relayed via over-flying aircraft and satellite from 121.5 and 243 MHz ELTs and EPIRBS not specifically designed for satellite VHF EPIRBS using Channel 70 may be used in lieu of satellite EPIRBS where receiving stations are available.

Most ELTs and EPIRBS provide homing signals on 121.5 MHz; some also use 243 MHz, and some EPIRBS may also integrate SARs into their designs.

A Copas-Sarsat satellite must be in view of both a beacon and a LUT at the same time for 121.5/243 MHz signals to be relayed; this requires many LUTs for broad geographic coverage, and is called local mode of operation.

Signals from 406 MHz ELTs and EPIRBS can be stored aboard a satellite and relayed to ground later if no LUT receiver is immediately within view of the satellite, enabling the system to operate in a global mode with fewer LUTs required. Inmarsat-E EPIRBS transmit messages via Inmarsat geo-stationary satellites and CESs, to RCCs. These beacons have registered coded EPIRB identities in an Inmarsat-E database associated with all registration data. Position information from Inmarsat-E EPIRBS is derived either from integral equipment such as GPS or via interfaces with shipboard navigation equipment. Inmarsat-E EPIRBS operate within Inmarsat's coverage area.

Users of ELTs and EPIRBS should be informed about how to properly install, register, and use this equipment, and what happen when these devices are activated. They should be made to understand that these are the means of last resort, which should not be depended upon to replace portable communications as the primary means of alerting

## CHAPTER IV

### SEARCH AND RESCUE IN LIBERIA

#### 4.1 GENERAL

There is international obligation for coastal states to establish along their shores maritime and aeronautical search and rescue services. According to the Search and Rescue Convention, 1979 and the draft revised convention, coastal states are obliged to establish search and rescue facilities along their coastline to assist vessels and aircraft in distress. This obligation is also included in a number of various international conventions.

Liberia is a coastal state that has not signed the SAR 1979 Convention. Therefore, she needs adequately trained professionals and equipment to implement the Search and Rescue, 1979 Convention, and the revised Convention that will enter into force in the year 2000. The main task is to provide and co-ordinate all SAR resources, at a national and regional level whether public or private. SAR services should be provided in respect of safety and human life, and to ensure that the Government's obligation to provide immediate assistance in case of shipping and aviation accident are fulfilled.

#### 4.2 INTERNATIONAL OBLIGATION

Liberia is signatory to the International Convention on the Safety of Life at Sea, 1974. At such it's obliged to establish search and rescue services and to fulfil the obligation of the Convention.

According to SOLAS Chapter V, Regulation 15, each contracting government undertakes to ensure that any necessary arrangement are made for coast watching and for rescue or persons in distress at sea round its coast.

#### 4.3 LEGAL BACKING

The primary purpose of establishing SAR services is to assist Liberia meet its own search and rescue needs, and the obligation it accepted under the convention for the Safety of Life at Sea and the International Convention on Search and Rescue (when ratified). Liberia is obliged under these international conventions to provide certain aeronautical and maritime SAR co-ordination and services.

#### 4.4 RESPONSE

The newly established National Coast Guard is not train and equipped to respond to any distress situation. According to the Deputy Minister of Defence for Coast Guard Affairs, the United Nations arms embargo on Liberia has made it impossible for the

National Coast Guard to purchase new equipment for SAR purpose. Because the Coast Guard patrols boat used to conduct SAR is considered as military equipment.

In March 1999 a vessel in distress along the coast of Liberia sent a distress signal and was received by the Republic of Guinea Maritime Authority, and relayed to Liberia. Due to the lack of equipment, Liberia was not able to receive the distress signal or respond to it.

#### 4.5 SAR ORGANISATION

The National Coast Guard and the Military Air Wing are the two organs that conduct SAR services, assisted by the National Port Authority. The National Coast Guard has sub-bases in the Ports of Greenville, Buchana and Harper to respond to distress incident when SAR equipment is available. See Figure 2 simple SAR organisation.

#### 4.6 COMMUNICATION

The Liberia Telecommunication Corporation is responsible for communication under the Ministry of Post and Telecommunication in Liberia.

The Telecommunication Corporation is responsible for making available telecommunication services nationally and internationally, accountable for aviation, maritime and all mobile communication services. It also assigned radio frequencies carried out maintenance and operation of coastal radio stations.

##### 4.6.1 NATIONAL PORT AUTHORITY

The National Port Authority operates four channel 16 coastal radio stations for ships calling at its ports. The radio installations are located at the ports of Monrovia, port of Harper, port of Buchana and port of Greenville respectively. The ports are used for Coast Guard sub-bases and also serve as Search and Rescue Unit.

#### 4.7 PROBLEMS AFFECTING SAR IN LIBERIA

Liberia is coastal state, signatory to many international maritime conventions and member of the IMO. Liberia has a responsibility to ratify the 1979 SAR Convention. Even though, the National Coast Guard carries out SAR as part of its military duties, there is no national legislation on SAR. The maritime sector hold very important role in the Liberia economy, especially the International Ship Registry programmes.

##### 4.7.1 TRAINING

Liberia lacks trained professional for SAR operation. There are very few personnel of the National Coast Guard and National Fire Service who have had formal SAR

training. These men have not carried out SAR practices during the past ten years due to the Liberia civil war and lack of equipment.

Training is critical in performing successful SAR operation. The training of personnel to make sound risk assessments will help to ensure that trained professional and valuable facilities are properly used for SAR activities. SAR training facilities are lacking. The training facilities at the National Coast Guard and Liberia Maritime Training Institute were looted during the civil war.

Before the civil war begin in 1990, the National Coast Guard was very effective in SAR operation in the local shipping industry. They have assisted ships and local fishermen in distress along the coast in the past.

#### 4.7.2 UNITED NATIONS ARMS EMBARGO

The United Nations imposed arms embargo on Liberia during the civil war, has prevented the Government from acquiring military boats and other training hardware for the Coast Guard. The United Nations should consider the safety of life at sea and allow the Liberia Government to purchase basic SAR equipment for the National Coast Guard.

#### 4.7.3 PORT

The Liberia National Port Authority does not have rescues boat or patrol boat. There is a tugboat that could be used to tow vessel if required, but are slow to be used for SAR operation.

#### 4.7.4 FISHING VESSELS

There are many fishing vessels that could be used for SAR operation if proper arrangements are made with the owner. The owners of the fishing boats may ask for compensation for using their boat for SAR operation. Besides the vessels that are registered under its flag, Liberia does not own any merchant vessel.

#### 4.7.5 AIRTRAFFIC CONTROL SYSTEM (ATS)

The Robert International Airport was completely burnt during the civil crisis, including the Air Traffic Controls system. The newly installed air traffic control system is of low standard and operates eight hours a day and shut down during the night.

## CHAPTER V

### SAR RESOURCES AND EQUIPMENT IN LIBERIA

#### 5.1 GENERAL

SAR response requires facilities, including SRUs, with specialized equipment and trained personnel as well as other resources to conduct SAR operations. Every SRR has unique transportation, climate, topography and physical characteristics. These factors create a different set of problems for SAR operations in each SRR. Such factors influence the choice and composition of the services, facilities, equipment and staffing required by SAR services.

An SRU can be an air, maritime, or land-based facility. Facilities selected as SRUs should be able to reach the scene of distress quickly. It is the role of SAR coordinators to organize them to provide the most effective response.

The following are SAR resources available in Liberia, and the list may expand in the near future to include other facilities.

#### 5.2 THE LIBERIA NATIONAL COAST GUARD AND MILITARY AIR WING

The National Coast Guard and Military Air Wing are traditionally responsible for SAR operations. They exercise this responsibility by approving rescue co-ordination center which co-ordinates all services and resources made available for the task, and by requesting assistance from ships, fishing vessels, pleasure boats and aircraft.

##### 5.2.1 ORGANIZATION

The SAR responsibility is divided according to the National Coast Guard bases within Liberia. It provides centralized control, coordination and effective use of all available SAR facilities, including SAR coordinators (SCs), rescue coordination centers (RCCs), rescue sub-centers (RSCs), SAR mission coordinators (SMCs), onscreen commander (OSCs), and search and rescue units (SRUs).

The Coast Guard headquarters in Monrovia is used as an RCC, and the bases around the country serve as SRUs. The commandant of the headquarters serves as SMC and the commander of each base is the OSC.

The equipment and infrastructure of both organizations are based primarily on military duties, but are used to carry out SAR activities. Since the end of the civil war in 1997, it has become evident that there is scarcity trained SAR personnel and equipment within the National Coast Guard and Military Air Wing. They were either killed during the war or went into exile.

### 5.3 NATIONAL PORT AUTHORITY

#### 5.3.1 GENERAL

The National Port Authority is an autonomous government agency responsible for the operation of the four ports in Liberia. They are the Free Port of Monrovia, the Port of Buchana, the Port of Greenville and the Port of Harper. The Free Port of Monrovia is the major port.

#### 5.3.2 EQUIPMENT AND RESOURCES

Communication equipment at the ports is VHF channel 16, and the port of Monrovia maintains a 12 hours watch on this channel, and shut down at night. There are programs for additional communication equipment to cover digital selective calling (DSC).

All the ports are equipped with tugboats that have capacity of about 1500-horse power. The port of Monrovia is equipped with a fire fighting truck maintained to respond to emergencies at all times. Pilot boats and harbor patrol boats are available in every port.

### 5.4 ROBERT'S INTERNATIONAL AIRPORT

The Robert's International Airport is the main air link between Liberia and the rest of the world, and provides air traffic control services that are vital in SAR operations. It is capable of providing assistance in requesting aircrews to keep a visual or radio watch for aircraft or vessels lost in the vicinity of their route. It may provide Aircraft capable of communicating with SAR vessels and SRUs during SAR operations. The air traffic control system may encourage aircraft operators and aerodromes to monitor the radio frequencies of 121.5 MHz and 406 MHz.

## 5.5 MERCHANT AND FISHING VESSELS

### 5.5.1 GENERAL

The use of vessels in conjunction with aircraft is an effective method for a coordinated air and surface search. Their endurance enables them to respond to nearby incidents where search is not a major factor, and allow assignment as OSC. Marine SRUs are effective in rescues involving large numbers of survivors. They may be used for towing disabled craft, and escort and delivery of rescue equipment and Medical personnel to the scene of the accident.

### 5.5.2 MERCHANT VESSEL

There is no State own vessels in Liberia, but the Government operate the second largest International Shipping Registry. However, there are a few privately owned vessels that are equipped with HF and VHF and have a navigational capacity. There are substantial numbers of vessels sailing along the coast from Europe and the Americas to Western and Southern African regions. The sea route is home for ULCCs that cannot use the Suez Cannel.

Vessels at sea, although not always available to participate in extended search operations, are potential SAR assets. Masters of vessels has a duty to assist others whenever it can be done without endangering the assisting vessel or crew s. 5.6. 3

### 5.5.3 FISHING VESSELS AND SMALL CRAFT

Fishing vessels account for 70% of the coastal activity. They provide fish, which is the main source of protein in Liberian food.

Many of the small craft are equipped with HF and VHF - FM voice radios and has a navigation capacity. The wooden fishing canoes do not carry radio equipment. The SAR capability of small craft is limited to the coastal areas and where adjacent fishing vessels are in continuous sight of each other and able to rescue survivors in close proximity. Small craft are foremost in reporting distress cases along the coast and often assist each other. Some pleasure craft are equipped with VHF (channel 16) and short range radar

## 5.6 RESCUE BY SHIPS

The methods of rescue used by merchant and fishing vessels vary according to the type, of ship, its displacement, and whether the rescue is close to land or in mid ocean. It also depends on the tides, current, sea conditions, reefs, etc and the time of the day or night may also be important factor.

Merchant vessels rescue method depends on the facilities it is equipped with to enable it get people off a distressed ship, or rescue them from the water, life rafts and from lifeboats. This is considered one of the most difficult phases of a SAR mission.

The basic rescue methods are:

### 5.6.1 RESCUE BY FISHING BOAT AND PLEASURE CRAFT

When Survivors are located near the coastline, or those in lagoons, sheltered waters and rivers, pleasure crafts close to the vicinity of the distress will often carry out the rescue. Due to the limited capacity of pleasure boats to carry all survivors on board at one time, rescue boats should be dispatched to the scene as quickly as possible to retrieve the remaining survivors. When this is not possible, the rescue boat should marshal rafts so that those survivors who cannot be taken on board immediately can either be towed ashore or kept afloat while waiting. Warm clothing and every necessary step should be taken to make the survivors left behind as safe as conditions allow.

## 5.7 HELICOPTERS

Helicopters used by the Executive Air Service and Military Air Wing are sources of SAR helicopter, and may be used to assist in SAR operations. The Bell Trextron four-seated helicopter may be used for medical supply and rescue operations. Privately owned helicopter operators may be asked to provide assistance in SAR operation.

During rescue operations a helicopter normally uses a special device for hoisting or lowering persons. Large helicopters frequently lower members of their own crew aboard the ship for assisting in the disembarkation procedure and in the use of the equipment. For the evacuation of persons, the end of the hoisting cable may be provided with a rescue sling, a rescue basket, a rescue net, a rescue litter or a rescue seat.

All crewmembers concerned, as well as the person to be evacuated, should wear lifejackets. On no account should the lifting device on the end of the winch cable be secured to any part of the ship or become entangled in the rigging or fixtures. There is



also a serious risk of an electrical shock for individuals being evacuated if they contact an ungrounded helicopter hoist. Even in this case, a metal part of the lifting device should first be allowed to touch the deck in order to avoid possible shock due to static electricity.

## 5.8 LIBERIA MARITIME INSTITUTE

### 5.8.1 CURRENT STATUS

The Institute was plundered during the Liberian Civil War, but efforts are being made to restore the facilities.

The Institute is located on the Fammington River where it meets the Atlantic Ocean. The institute and its environment may be used for training SAR personnel in both theory and practice. It is an ideal place for regional training of SAR personnel from Guinea, Sierra Leone and Liberia since these countries are closely located. The institute has once served as a training ground for seafarers from these countries.

In addition, the institute may provide SRU training for ships, pleasure boats and fishing canoe that sail along the Fammington River.

## CHAPTER VI

### PROPOSALS FOR RATIFICATION OF THE SAR CONVENTION, 1979 AND UPGRADING EXISTING SAR OPERATIONS IN LIBERIA, AND ESTABLISHING TRAINING PROGRAMME

#### 6.1 GENERAL

Liberia acknowledge the great importance of saving lives in distress at sea and the need to be directly involved in rendering aeronautic and maritime search and rescue services to persons in distress.

Besides the benefits of reduction of loss of life and suffering by providing rescue services, Liberia's concern and involvement with SAR may offer other advantages. Excellently performed SAR operations can provide positive publicity about situations that may otherwise be negative. On the other hand, a poor or ineffective response to a major accident or disaster can also result in worldwide publicity and adversely affect sensitive industries such as tourism.

SAR is a non-controversial and humanitarian mission. Therefore, it provides an excellent means for promoting co-operation and communication among states and between organisations at local, regional, national and international levels.

However, Liberia has had a devastating civil war that destroyed its Search and Rescue facilities. The re-establishment of its search and rescue organisation and rebuilding of facilities require technical assistance from the International Maritime Organisation and financial assistance from friendly countries in the international maritime community.

Equally, there is a need for commitment from the Government to meet the requirements set by the United Nations for lifting the arms embargo imposed on the country from the civil war era. When the arms embargo is lifted the government will be able to provide basic SAR facilities for the National Coast Guard to enable it meet some of the SAR requirements.

Considering the present social and economic situation in Liberia, the following proposals will facilitate the ratification of the SAR Convention, 1979, reactivation of the SAR organisation. Liberia will also stand ready to ratify the revised Maritime and Aeronautical Search and Rescue Convention when it entered into force in the year 2000.

#### 6.2 PROPOSALS/RECOMMENDATIONS

Recommendation 1: It is proposed that Liberia ratify the International Maritime Search and Rescue Convention, 1979. The implementation of the convention is very important to the relatives and people who work in the aeronautic industry and at sea, and who travel by sea, such as seafarers, ship passengers, fishermen, the tourism industry and offshore personnel within and around the Liberian waters.

Recommendation 2: It is proposed that before ratification of the SAR Convention, 1979, the necessary National Legislation should be put in place (primary and subsidiary).

### 6.3 SAR ORGANISATION

Present situation: The SAR organisation is presently dormant in Liberia, it was once the responsibility of the National Coast Guard.

Recommendation 3: A Maritime and Aeronautical Search and Rescue organisation should be established in Liberia under the auspices of the National Coast Guard and the Military Air Wing/Air Force.

Recommendation 4: It is proposed that the authorities of the Liberia SAR organisation should be the Liberia Bureau of Maritime Affairs, Ministry of Transport, National Port Authority, Ministry of National Defence, National Fire Service, Ministry of Health and Social Welfare/Red Cross and Ministry of Post and Telecommunication.

Recommendation 5: It is also proposed that a SAR board be set up with duties to mobilise resources, seek financial and technical assistance for the organisation, investigate accidents, find out probable cause(s) and make safety recommendations.

The staff of the SAR organisation should be drawn from participating ministries, bureau and agencies. They should be integrated with the Coast Guard to carry out SAR operations.

A good training program produces true professionals to meet SAR system objectives by developing SAR specialists. Since considerable experience and judgement are needed to handle a typical SAR situation, necessary skills require significant time to reach levels of proficiency. Training can be expensive, poor training even more expensive and can result in poor operational effectiveness, which can result in the loss of lives of SAR personnel and loss of valuable facilities.

Recommendation 6: The proposed Rescue Co-ordination Centre (RCC) is the National Coast Guard Base, located in Monrovia.

Recommendation 7: The SAR Mission Co-ordinator (SMC) is to be selected from among the officers of the National Coast Guard by the SAR co-ordinator to manage a specific SAR mission, and the full operational authority of the SAR co-ordinator.

The proposed On-scene Commander (OSC), is the commander of the local Coast Guard Base in whose area of jurisdiction the accident occurred. The OSC may be designated from the SMC's service or from SAR headquarters depending on the nature of accident.

The local Coast Guard Base may serve as a Search and Rescue Unit (SRU), with its commander as the on-scene commander. If the SRU is alone on scene, when performing OSC, it should keep the SMC informed.

## 6.4 FINANCE

Recommendation 8: It is proposed that the amount of USD 1,000,000 (one million United States dollars) should be raised as the Government initial financial contribution for the SAR Project. The rising of this fund should be share between the ministries of Defence, Transport, Post and Telecommunication, the Bureau of Maritime Affairs, and the National Port Authority.

The Government of Liberia as a matter of priority should approach friendly maritime countries for technical and financial assistance for further improvement of the Maritime and Aeronautic SAR facilities.

## 6.5 SAR EDUCATION AND TRAINING

Recommendation 9: A proposed SAR training program should be established. The integration of maritime and aeronautic search and rescue requires specialise training to meet new developments in these industries. The Liberia Maritime Training Institute located in Marshall City should be used by the SAR organisation for training crew of the rescue boats and helicopters. Training should include the National Coast Guards, Airforce, and National Fire Service, medical personnel, National Police, Telecommunications and other agencies involved in SAR operations. All SAR specialists need some training in particular, the SC, SMC's and OSC's. Training should be based on the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR Manual) standard.

Recommendation 10: It is recommended that the English language be used as the SAR operational language. The need for a working knowledge of the English language should be consider as an important tool. RCCs should be able to communicate with other RCC's, as well as ships masters and aircraft captains, who are required to have a certain level of proficiency in the English language. Air traffic service units also have requirements for English language speaking skills. Planning for future training need will be more effective if knowledge and skills, which will be needed due to changing technology, can be predicted.

## 6.6 COMMUNICATION

Coastal Radio Station; presently there is no coastal radio station in Liberia except Channel 16 Base radio located in the various ports.

Recommendation 11: It is proposed that the Liberia Telecommunication Co-operation in consultation with ITU assesses the coast of SAR communication, taking into account the satellite communication available in the country. The Telecommunication Co-operation should be responsible for the establishment of Coastal Radio Station and observation posts along the coast in accordance with the requirements of GMDSS. In the future such station should be link with the nearest Coast Earth Station either in France or the United States.

## 6.7 NATIONAL SAR PLAN

Recommendation 12: A proposed National SAR Plan should be drawn up to provide a National Plan for the co-ordination of search and rescue resources to meet domestic needs and international commitments. The National SAR Plan describes how emergency services will be provided, organised and supported in all types of search and rescue mission. The Plan when implemented will provide greater protection of life, the environment and property, and ensure efficient and effective SAR response. As a requirement the SAR Plan should be signed by all Government agencies which provide or support SAR activities.

The National is a single document that pertains to the SRR's RSC's RCC's and SAR related functions for which a state is responsible. The document contains principles of operational co-ordination which serve as a basis for more detailed provisions in subordinate state documents such as a SAR Manual of Plans of operations. The SAR plan also addresses mutual co-operation such as co-operation and training with neighbouring states. In addition, the SAR Plan includes a copy of all agreements with other RCCs.

## 6.8 NATIONAL SAR MANUAL (NSM)

Recommendation 13: It is proposed that a National SAR Manual be written to facilitate the implementation of the National SAR Plan. The manual consolidates the information needed to effectively conduct SAR mission, and provides for the activation of components in stages as needed. The writing of the SAR manual may be undertaken as a special project, and if necessary, expert advice from IMO may be requested.

## 6.9 VESSEL REPORTING SYSTEM

Recommendation 14: It is recommended that the SAR organisation in the near future in conjunction with the National Port Authority raised funds for the establishment of a Vessel Traffic Reporting System to monitor the movements of vessels, and encourage their participation in SAR operations. The SAR Convention, 1979, recommends the inclusion of the Traffic Reporting system in the SAR Plan. Information regarding the system should be made available to agencies involved in SAR operations so as to request the assistance of vessels navigating within the area to participate in SAR operation.

All vessels passing through a designated SAR area should report at least 24 hours before entering the limits of this area. On entering the area every vessel shall report time and position, route detail, speed, course and estimated date and time of exit from this area so that a proper record and track can be maintained of all the traffic navigating within this area.

## 6.10 EMERGENCY MEDICAL CARE FOR SURVIVORS

Recommendation 15: A proposed designated hospital for the treatment of survivors; the ministry of Health and Social Welfare and the National Red Cross should

designate medical centre to be involved in SAR operation. They should train SAR personnel in first aid and medical care. They should also participate in SAR operations to administer first aid and medical aid on scene and en-route, and provide doctors and nurses. They should also provide ambulance services to transport injured or ill survivors to the medical centre, and should set up medical facilities to receive injured survivors on scene.

Arrangement should be made so that as soon as emergency calls are received, medical staff will report to the designated medical stations, avoiding time delay in the management and treatment of the survivors.

## 6.11 REGIONAL COOPERATION

Recommendation 16: It is recommended that a joint collaboration and sharing of SAR information be established in the region among countries of the Economic Community of West African States (ECOWAS). It will be beneficial to all concerned if some form of mutual assistance is developed.

Sub-regional initiative within the Mano River Union countries of Sierra Leone, Guinea and Liberia should be encouraged in SAR operation.

## 6.12 SUMMARY OF PROPOSALS AND RECOMMENDATIONS

In summary the proposals for ratification of the Search and Rescue Convention, 1979, and upgrading SAR operation in Liberia and establishing training programme are:

- Ratification of the SAR Convention, 1979,
- The establishment of SAR authorities and board,
- The establishment of SAR organisation under the auspices of the National Coast Guard,
- The establishment of the National Coast Guard Base as the SAR Mission Co-ordination Centre,
- A proposed budget of USD 1000000 (one million dollars) from the Government, for initial financing of the SAR project,
- The establishment of SAR education and training programme,
- The use of the English language as the SAR working language,
- The establishment of GMDSS communication facilities under the auspices of the Liberia Telecommunication Co-operation in consultation with the International Telecommunication Union,
- The writing of the National SAR Plan,
- The Writing of the National SAR Manual,
- The establishment of Vessel Traffic Reporting System and the
- Establishment of special emergency medical care centre and unit for SAR operations.

These recommendations and proposals when implemented will form the basis for the establishment of SAR operation in Liberia.

## CHAPTER VII

### CONCLUSION

#### 7.1 CONCLUSION

The maritime situation in Liberia shows that the country is interested in ratifying and implementing the SAR Convention, 1979. There is a lack of adequate infrastructure, as regards organisation and personnel for SAR operations. This problem could be minimised if Liberia was to meet the conditions set by the United Nations for lifting the arms embargo imposed on the country from the civil war era. The lifting of the arms embargo will enable the Government to purchase basic SAR patrol boats and other resources sufficient for the National Coast Guard to resume SAR activities. The mentioned basic problems have continued to exist because there has been the need to identify the problems themselves. There has been the vital need to provide guidelines, proposals, suggestions and information on the many activities to be attended to in order to overcome the problems that currently impede the implementation of SAR Convention in Liberia.

Before ratification, Liberia will have to take the necessary steps to ensure implementation by preparation of National Legislation (primary and secondary). The National Search and Rescue Manual and Search and Rescue Plan should be put in place. The necessary executive orders should be prepared, including instructions to officials concerned, and the development of appropriate SAR management infrastructure.

After ratification, officials of the Maritime Administration should initiate the implementation of the National legislation through the exercising of appropriate functions.

In conclusion, to realise the implementation of SAR in Liberia there is a need for technical assistance from IMO and financial assistance from developed maritime nations. Funds should be allocated from the Liberia Maritime Program, the Ministry of National Defence and the Ministry of Transport for the initial SAR budget of one million United State dollars. It may be said that in light of the SAR situation in Liberia as it exist today, the implementation of the recommendations mentioned earlier should put Liberia in an eminent position to afford a SAR organisation. The SAR capacity will not only benefit the people working at sea and travelling by sea in Liberia waters. It will also contribute to the safety of our neighbouring countries such as Sierra Leone, Guinea and the Ivory Coast, as well as in the areas of the Atlantic Ocean.

In addition, I wish to emphasise the need for training the trainers and education of SAR personnel as part of the Liberia Maritime program. Such a program will play an important role in the operation and maintenance of SAR resources in specific terms. No matter what resources and organisation is available, it will not be adequate, unless all the persons involved in such organisation are properly trained.

Finally, the requirement for joint collaboration and sharing of SAR information in the region will promote SAR activities in the Economic Community of West African

States (ECOWAS). Therefore, it will be beneficial to all concerned if some information sharing and mutual assistance is developed.

In this necessary circumstances, it will be appropriate that regional seminars or workshops are organised and sponsored by ECOWAS, IMO and the Government or other institutions which have interest in the aeronautical and maritime industries on a regular basis. The development of SAR curricular in close consultation with the International Aeronautical and Maritime Search and Rescue Manual and other relevant IMO documents in conjunction with the present short course program on SAR through Norwegian contribution should be considered. The Liberia Maritime Institute should be equipped with facilities for teaching such a course or courses, since the institute has the environment for doing so.

In the proceeding, it can be seen that this document has stressed some problems involved and has emphasised the need for RCC in Liberia. It is hoped that this study is sufficiently exhaustive in itself, and has covered sufficiently all the various issues leading to the possible solutions in ratifying and implementing SAR in Liberia. It is our hope that this document will be helpful in making all concerned aware of the main problems affecting SAR and thus begin to resolve them as early as possible.