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**WORLD MARITIME UNIVERSITY
MALMÖ, SWEDEN**

**ESTABLISHMENT OF MARITIME SEARCH AND RESCUE
IN MANO RIVER UNION STATES**

by

Mohammed T. Diaby

Sierra Leone

A paper submitted to the Faculty of the World Maritime University
in partial satisfaction of the requirements for the award of a

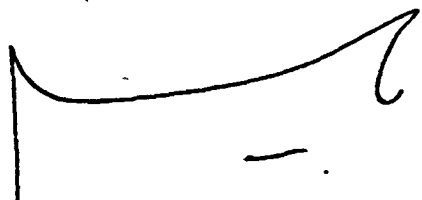
**MASTER OF SCIENCE DEGREE
in
MARITIME EDUCATION AND TRAINING (NAUTICAL).**

The contents of this paper reflect my personal views and are not
necessarily endorsed by the UNIVERSITY.

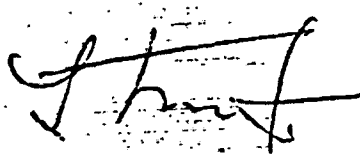
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MY WIFE STELLA ESI DIABY

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ABSTRACT

Mano River, Union an Organization binding three neighbouring countries namely: Sierra Leone, Liberia and Guinea, was formed on 3rd. of October, 1973 for economical, cultural and social cooperation among the three States. Since its inception, the organization has achieved many of its laid down objectives especially in the field of education and the cultural link. But one important area that has always been neglected and yet very necessary, is the safety of the people along the coast.

The objective of this project is to establish a Search And Rescue organization within the framework of the Mano River Union Organization. The unquestionable importance of this lies on the safety and the welfare of the people in the sub-region. It is quite evident from the economical point of view that none of these three States is capable of establishing an effective SAR organization.

The only solution to meet this objective will be regional cooperation. Through this, we will be able to put all our resources together to form an effective SAR organization to cover the 489 nautical miles of coast in the sub-region.

In more specific terms, the project is approached through the following steps:

1. Examination of casualty reports of SAR cases in each country in order to identify the need for the establishment

2. An examination of the existing facilities or resources in order to find out what will be needed
3. To examine the relevant maritime laws and regulations in each country and to see how they could work amicably.
4. To find out the reasons why SAR has not been established and to make recommendations of its establishment within the organization.
5. Achieving these through direct contact with the Maritime authorities in each country.

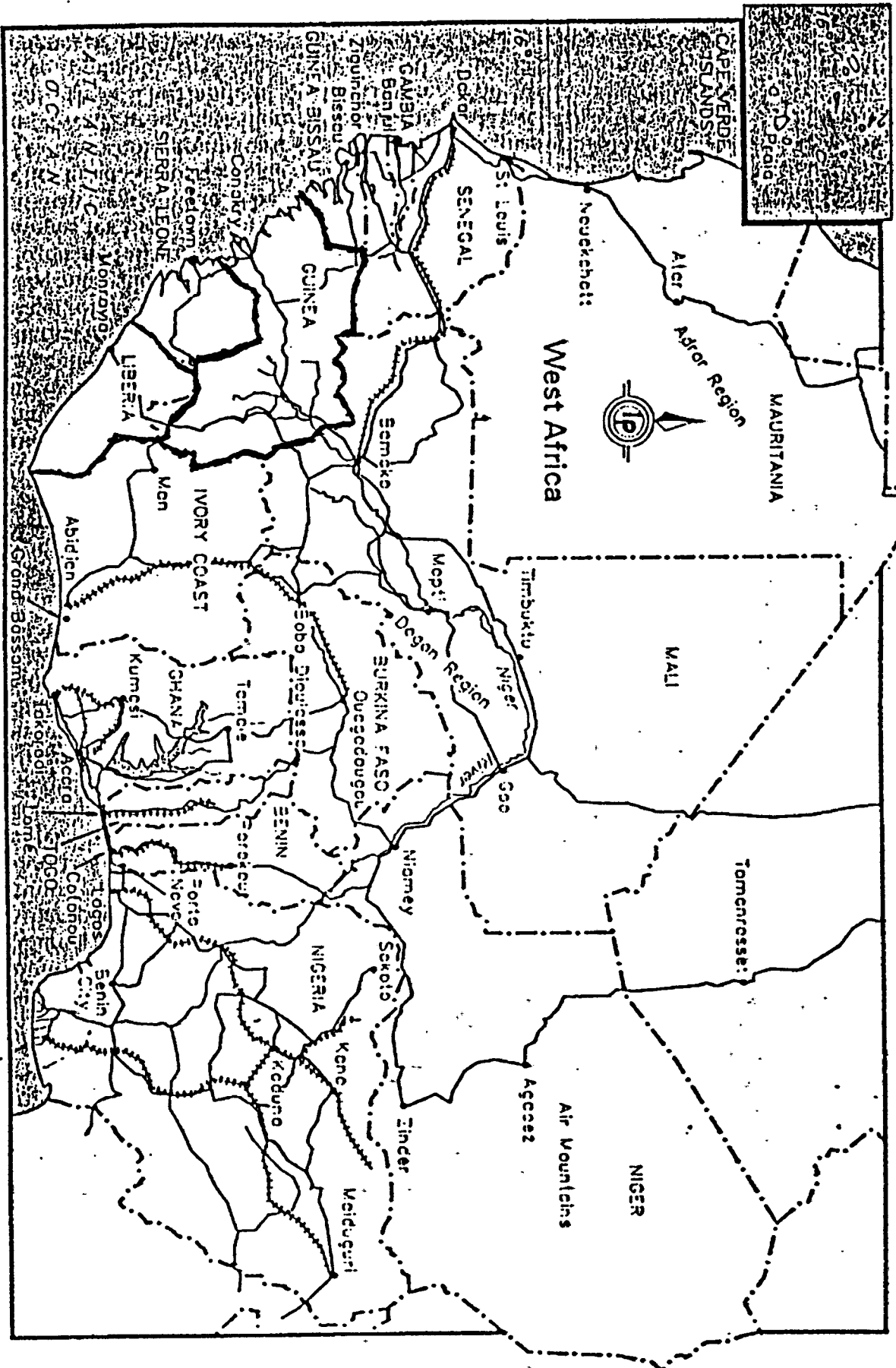
TABLE OF CONTENTS

| | PAGE |
|---|--------|
| ACKNOWLEDGEMENTS ----- | i |
| DEDICATION ----- | iv |
| ABSTRACT ----- | v |
| <u>INTRODUCTION</u> ----- | 1 |
| <u>PART I:GENERAL OVER VIEW OF THE SUB-REGION</u> ----- | 4 |
| <u>CHAPTER I</u> ----- | 4 |
| THE REGION,THE PEOPLE,THE ECONOMY AND THE POPULATION -- | 4 |
| 1.1 The location of the sub-region and the total ----- | 4 |
| area coverage. | |
| 1.2 The population in each country and the colonial --- | 5 |
| influence on the people. | |
| 1.3 Ethnic link between the people and their ----- | 10 |
| movement within the sub-region. | |
| 1.4 General economical situation,foreign trade and --- | 10 |
| debts. | |
| 1.5 Political structure in each country. ----- | 15 |
| 1.6 Mano River Union,Aims and Objectives of its ----- | 18 |
| establishment. | |
| <u>CHAPTER II</u> ----- | 20 |
| WEATHER AND CLIMATOLOGICAL CONDITIONS IN THE | |
| SUB-REGION ----- | 20 |
| 2.1 The climatological conditions of the sub-region--- | 20 |
| 2.2 The physical structure and the topography of the -- | 21 |
| coastline | |

| | |
|---|----|
| 2.3 Effects of wind, currents and visibility on SAR operations. | 25 |
| 2.4 Type of currents and effect. | 29 |
| <u>CHAPTER III</u> | 33 |
| EVALUATION OF THE SAR RESOURCES IN THE THREE COUNTRIES | 33 |
| 3.1 Total maritime SAR region | 33 |
| 3.2 Present SAR Resources | 34 |
| 3.3 The requirement for additional SAR Resources and the needs for improvement. | 39 |
| 3.4 The needs for Regional cooperation | 41 |
| <u>PART II</u> | 44 |
| RECOMMENDATIONS ON SAR ESTABLISHMENT IN THE SUB-REGION | 44 |
| <u>CHAPTER IV</u> | 44 |
| 4.1 Authorities of MRU SAR organization | 44 |
| 4.2 Headquarters of the organization and the composition of the Staff | 44 |
| 4.3 Ratification/Accession to Maritime conventions | 46 |
| 4.4 Legal aspects of SAR operations. | 46 |
| 4.5 Legal aspects and conventions. | 46 |
| <u>CHAPTER V</u> | 52 |
| 5.0 Problems, Agreements and Solutions of SAR Establishment. | 52 |
| 5.1 Problems of SAR establishment in developing countries. | 53 |
| 5.2 SAR treaties and agreement between the three | |

| | |
|---|----|
| States and privileges of duty free equipment.----- | 55 |
| X 5.3 Solution of the SAR problems in the sub-region----- | 55 |
| 5.4 Free movement of the rescue units in each others SAR region.----- | 55 |
| 5.5 Periodic discussion.----- | 56 |
| <u>CHAPTER VI</u> ----- | 57 |
| 6.1 Delimitation of SAR region,allocation of area of responsibility.----- | 57 |
| 6.2 Establishment of RCC/RSC in each country with direct link with each other and MRU HQ.----- | 58 |
| 6.3 SAR organization and Agencies ----- | 58 |
| 6.4 Level of Coverage.----- | 60 |
| <u>CHAPTER VII</u> ----- | 61 |
| X 7.1 SAR Communications ----- | 61 |
| X 7.2 Establishment of coastal radio stations and alert posts.----- | 64 |
| 7.3 Common International SAR frequencies between the RCCs and emergency frequencies.----- | 65 |
| 7.4 Global Maritime Distress and Safety System and the Local Users Terminal (LUT). ----- | 68 |
| X 7.5 Link between the RCCs and the Aeronautical emergency frequencies. ----- | 75 |
| <u>CHAPTER VIII</u> ----- | 76 |
| 8.1 Rescue planing and operations ----- | 76 |
| 8.2 Awareness and Inertial Action ----- | 78 |
| X 8.3 Allocation of SRUs along the coasts ----- | 80 |
| 8.4 Helicopter Rescue operations and emergency ----- Medical care. | 81 |

| | |
|---|---------|
| 8.5 Probability of detection of distress ----- | 85 |
| X 8.6 Public relations and documentations ----- | 87 |
| 8.7 SAR mission conclusion ----- | 89 |
| X 8.8 Training and Seminars ----- | 90 |
| 8.9 Crewing of rescue units-qualification ----- | 92 |
| 8.10 Use of Computer in SAR Calculations ----- | 93 |
| <u>CHAPTER IX</u> ----- | 97 |
| 9.1 Summary ----- | 97 |
| X 9.2 Conclusion and recommendations ----- | 100 |
| X 9.3 Utilization plan of present SAR Resources ----- | 103 |
| X Annex I. Reported cases of drowning and sea ----- | 108 |
| accidents in MRU States. | |
| ANNEX II. Climatological conditions in the Sub-region - | 112 |
| ANNEX III. Probability of detection graph, Search area worksheet effort allocation worksheet.----- | 121 |
| ANNEX IV. Founders and Present Leaders of MRU. ----- | 130 |
| List of Abbreviations ----- | 133 |
| BIBLIOGRAPHY AND REFERENCES----- | 136 |



INTRODUCTION

"Constructive Nationalism and effective Development of Maritime Nation, depend upon the stability and the safety of the people in the region. Therefore, no price is too high for the safety and the advancement of our maritime sector" President Joseph Saidu Momoh of Sierra Leone during the Mano River Union Head of States annual meeting in Freetown November 1988. It is quite evident that Mano River Union, an organization binding the three neighbouring countries has been working effectively to achieve some of its objectives.

In this regard, a lot has been done and much is still underway; but one area that has been neglected and yet very important is the establishment of maritime Search And Rescue organization in the sub-region.

It should be considered that nearly 70% of the population of Mano River Union (MRU) States (Liberia, Sierra Leone and Guinea) live along the coast. Most of these people depend on the sea, for both their local and external trades. For some, it has been their livelihood since very long time. It has been like this and will continue to be so for many more years to come. The ethnical link, the shorter distance by sea between the capital cities and economical reasons cause a lot of movement along the coast.

It is shorter to travel to Conakry, Freetown and Monrovia by sea than by road. Because of this, there are a lot of small vessels plying these routes every now and then. Many of these people have met their untimely death due to lack of proper SAR facilities, safety equipment and precautions, knowledge and consistent weather reports.

We must not forget these are all developing countries. Due to economical reasons, it is practically impossible for any of these to establish an effective Search And Rescue organization.

The only way to achieve this, is through regional cooperation which in fact is the idea geared by UN, clearly stated in article 12(2) of UN convention of the High Seas 1958 Regulation (15) of Chapter V of SOLAS 74/78, and also Chapter 1 (1.5) IMOSAR.

It has always been the idea of our member States to cooperate in developing their SAR organizations as stated in the above Manuals; also in the objective of the sub-regional seminar and workshop on Maritime Search And Rescue held in Lagos Nigeria from 16-20 May 1988.

In conformity with the above, the aims of this project is to carry out studies with the final result of recommendations leading to establishment of a Maritime Search And Rescue organization in the MRU States. Bearing in mind that we are all developing countries facing similar problems of our economical development and SAR establishment along our coasts. Thus, the only way to develop our economy, safeguard lives and properties of our people through better use of our maritime resources, is to establish relationship with the neighbouring countries either bilateral or multilateral and also through International organizations.

Therefore, there could not be any other organization more suitable to serve and meet the needs of the people in this sub-region than Mano River Union. It is hoped that through this, we can solve most of the problems of economy, social,

cultural and other humanitarian understanding such as the present unrest in Liberia which has resulted in the movement of the masses from that country to the neighbouring countries of Guinea and Sierra Leone. Through this understanding, we can put all our resources together to form a better SAR organization in the sub-region. The system will be fast in responding to all our SAR cases because of the closer relationship. We will help each other to cover large areas in a shorter period of time. These are the ideas of regional cooperation, hence the aims and objectives of this Project.

PART I.

General Overview Of the sub-region:

Chapter I

The Region, the people, the economy and the politics.

1.1 The location of the sub-region and the total area coverage.

The Mano River Union States which consist of Guinea, Liberia and Sierra Leone are located on the north-western part of Africa between (04-20N, 07-31W), the International sea boundary between the Republics of Liberia and Ivory Coast and (12-10N, 16-25W) which is another International sea boundary between Guinea-Bissau and the Republic of Guinea. The whole area is bounded:

- On the West by the Atlantic Ocean
 - On the North and North/West by Guinea-Bissau and Senegal
 - On the North and North/East by the Republic of Mali
 - On the South and South/East by the Republic of Ivory Coast.
- The total area coverage of the three countries equals 428,966 sq.km. FOR each country, the area coverage is:-

| | |
|--------------------|---------------------|
| Sierra Leone Area: | 71,740 sq.km |
| Guinea | Area: 245,857 sq.km |
| Liberia | Area: 111,369 sq.km |
| Total | Area: 428,966 sq.km |

The above coverage is only for the land; the total maritime SAR region is given in Chapter III.

1.2 The population in each country and the colonial influence on the people.

The total population in the sub-region as estimated from 1989 is as follows:

| | |
|-----------------------|---------------|
| Sierra Leone----- | 4.0 millions |
| Guinea ----- | 6.5 millions |
| Liberia ----- | 2.5 millions |
| Total population----- | 13.0 millions |

The colonial influence on the people in the sub-region can be explained separately by considering each individual country.

Sierra Leone:

In April 1787, after the American war of Independence, a ship carrying 411 people (including 100 whites) sailed from Britain for West Africa to establish a colony on the peninsula on today's Sierra Leone. Treaty arrangements with the local population resulted in acquisition of 20 square miles of land. By 1790 the number reduced to 48 due to diseases. In 1792, another 1,200 freed slave Nova Scotians joined the settlement and just before the turn of the century, 550 Maroons from Jamaica were also brought to the colony, which was governed by the Sierra Leone company.

In 1808, Britain legislated against the slavery and the same year, Sierra Leone became a crown colony that marked the beginning of the colonial influence on the people and

the region. Until 1880, the settler population continued to grow by the addition of West Africans Liberated from slave ships by the British Navy. The British had more influence on and contact with their liberated slaves who were made to look more important than the rest of the indigenous Sierra Leoneans.

The organization of the administration of the colony gave advantage on a fairly consistent basis to a segment of the settler population. Although from the beginning, settlers had intermarried with the indigenous population, very gradually this privileged group had identified itself with the British culture and education began to define itself as separate and distinct from the local population. The settlers were internally divided by education, economic status, language and religion. Some practised Christianity, and thus gained favour with the administrators and Missionaries, while others held on to their Islamic faith which they brought with them to the colony.

The British then adopted a system of "divide and rule" in the whole country which had vast influence on the people even today. The trace of this colonialism can still be found among the people.

GUINEA:

Guinea was apparently inhabited in neolithic times, stone shaped then have been found on the western coast in the Baga region and in the Fouta Djallo. Recorded history only dates back to the end of Ghana empire in the 11th century and the development of the Mali empire up to the 15th century. At that time, most of the country was inhabited by

the people of Manding origin;the Malinke to the east and the Susu to the west.Fulani immigration took place during the 15th. and 16th. centuries.

In the second half of the 19th.century,Alimay Samori Toure with a sense of strategy, asserted his authority over most of the Manding people and effectively resisted the Franch troops which had secured a protectorate over the Fouta Djallo by 1898.Guinea which was previously known by the French as River of the South, later became a colony in 1891.It was French West Africa at first and later in 1946 it became French Overseas Territory (Territoire d'outre mer).The French adopted a system of assimilation in their territories.The people were divided into subjects and citizens.Those born in Dakar,Gore and Rufisque in Senegal were considered to be citizens of France and those born in Guinea were subjects.They could go to jail without trial and forced labour was imposed on them.This colonial influence created bad feelings among Guineans for the French regime which led to the formation of political groups by late Sekou Toure in the 40s.

That was why in 1958 the then French President Charles de Gaulle offered the French African colonies a choice between two kinds of international status.In the referendum of 28th. September 1958,Sekou Toure led a campaign for total independence from France and polled 1,134,324 "NO" votes as against 56,981 votes in favour of the French plan for Franco-African community.Guinea became the first and the only country then to break away from the colonial empire with the popular saying "It is better to die in poverty than to live in hard labour and slavery" by Ahmed Sekou Toure.

With this, Guinea was looked upon with admiration in other African countries. The French administration was not happy with this, therefore they burnt down all the important files and cut down even the electric poles.

Guinea was left with virtually nothing to start with.

President Kwame Nkrumah of Ghana then came to their rescue by giving them a loan of 57 million pounds.

Liberia:

The Liberian population consists of descendants of black settlers of 16 major tribal groupings.

Liberia has a unique position in Africa history. It was the first independent republic in the continent and only country apart from Ethiopia to escape direct colonization. It has had a special relationship with the United States of America since the 19th. century.

Although Liberia was not colonised by any of the colonial powers, there was a sense in which the black settlers who founded the republic imposed a form of settler colonialism on the indigenous people in a manner not entirely dissimilar from white settler colonialism in other parts of Africa.

Relatively little is known about the early history of the peoples who now occupy the territory of Liberia. There are now 16 major tribal groupings, most of whom overlap into the neighbouring countries. The largest linguistic grouping is the Mande-Speaking group, including the Mandingo, the Kpelle, Mende, Kroo, Gullah and the Vai.

The settlers were not a homogeneous group. The first

settlers were a caste grouping of Mulattoes who were ousted by the true Whigs is the dominant social group, Liberia's high society;and constitutes the "300 families".

The settlers arrived in 1822 under the auspices of the American Colonisation Society, a group for various motives wished to rid America of the problem of the freed slaves no longer wanted by the plantation economy. Some freed slaves who regarded this as humiliation refused to be repatriated to Africa and demanded their right to a place in America society. Those who wanted were the staunch christians and regarded themselves as a part of a mission to bring civilisation to Africa. They were exponents of the dominant culture of the society from which they came and they attempted to recreate this culture in Africa; Graceful colonial style Mansions; Masonic Lodges which dominated the political patronage network; and an Army formally called the Frontier Force; a constitution directly modlled after that of the USA. The seat of the Government was even called capitol.

A sad irony is that the settlers with the slogan "the love of liberty brought us here" imposed a form of forced labour, akin to slavery on the indigenous peoples. The scandal of sale of such labour to Spanish colonialists in Fernando Po in 1930 even caused British and the USA to break Diplomatic relations with Liberia for five years.

The black settlers of Liberia, unlike white settlers under colonial sponsorship in other parts of the continent, were never able to develop an independent economic base to provide them with sufficient capital to run a State; let alone to exploit the labour and the resources of the whole territory or even a small part of it. Consquently they were

entirely dependent on foreign assistance, with imposed hard restrictions, especially after the industrial revolution in the West dispersed with the basis for the form of trade from which the settlers had briefly prospered.

During the "Scramble for Africa" the Liberia State lost large sections of its territory to the British and the French, it was stagnated in acute economic backwardness, and the territory never received even the economic stimulus which colonialism would have produced such as basic infrastructure in terms of transport, the lack of which the country still suffers from today.

1.3 Ethnic Link between the people and their Movement.

There are a lot of links among the tribes within these three countries which are very important for communication. If we take some of the tribes that are common to both countries, we can easily demonstrate the link that exists between them:

- Mande speaking group including Mandingoes in Liberia.
- Mnadingo, Koranko, Mende, Kissy, Vai and Kroo speaking group in Sierra Leone.
- Malinke, Koranko, Kissy, Susu and Fullah speaking group in Guinea.

Each of these tribes are inter-related in family ties, marriages, cultural societies and strong blood link. Because of this, there is always a movement and trade among them. Most of the travelling is done by sea for economical reasons, which however is very dangerous.

1.4 General economical situation, Foreign trade and debts.

The economical situation in the sub-region is a bit difficult to generalise due to diversity of different problems, utilization of available resources and the political atmosphere prevailing in each country. In this regard, one would look into the economies separately. But before that, I would like to measure some of the general reasons of our economical decline both externally and internally and the contributing factors to this.

1.4.1 External cause of Economic Decline.

Although most African Governments often argue for International political non-alignment and geo-political neutrality, nearly every country on the continent is firmly in the western economic sphere, in fact even those countries which claimed to have strong political links with USSR and other east European bloc countries.

The pillars of this external relationship with the west are trade, aid and investment; the decline of all the three have added to Africa's poor economic performance during the past decade. Perhaps one of the most serious of these external factors is Africa's worsening terms of trade, with declining traditional exports both in price and quantities and increasing imports, in both price and volume. In fact, the average current deficit in the region rose from about 4% of GNP in 1970s to more than 7% of GNP in the 1980s. This period marked the initial stage of Mano River Union development.

1.4.2 Internal cause of Economic Decline.

Africa's internal problems are general one and not common

to MRU States alone. They include rapid population growth and urbanization, natural disasters (such as draught and floods) and absence of satisfactory human and physical infrastructure. Some attribute the cause to inappropriate public policies, combined with mismanagement and official corruption. Many believed that these internal problems outweigh the external factors. In order to clarify what has been said above, as a general view, I will briefly explain the economical situation in each country separately.

Sierra Leone:

Sierra Leone has a small economy with a population of only four millions, growing at a rate of 2.1% per annum and is well endowed with agricultural and mineral resources (diamonds, iron ore and gold), but it has run into hard times as the best mineral resources have been exhausted, while price of oil and essential imports have increased more than exports.

Superficially, the economic performance has been impressive with GNP growing at 3.8% 1976-83 while at that time the population increased only 1.7% over the same period. The external trade balance has been in deficit since in 1978 although greatly improved in 1983/85, the country exports diamonds 19%, cocoa 8%, coffee 3%, rutile 20% and bauxite 15%

Main destinations: UK 33%, Netherlands 14%, German FR 10% other EEC 16% and USA 13%.

Import: Fuel 36% of total value, foodstuffs 20% machinery and transport equipment 18% and manufactured goods 13%.

Main Sources: Nigeria 18% UK 16% German FR 11%, Japan 5% Netherlands 5%.

Foreign Debt in 1984 = \$ 342 millions

Trade Balance in 1985 = \$ 6.2 millions

Guinea:

The Military coup of 3rd. April 1984 brought an entirely new, open-market philosophy to Guinea. Work began on a "plan to purify the economy and finance". Problems to be tackled included the debts of \$1.6bn., an inconvertible currency, deficit financing, neglected infrastructure needing vast investment and insufficient food problem. The economy of Guinea is only viewed as an economic liberalisation, which has been strongly controlled by the State with little private sectors.

Now the Government is heavily depending on the income from the mining companies; in recent years two-third of income have been derived from this sector, largely in the form of export levies and corporate taxation. With the development of bauxite resources since 1970s, the country's external trade position has greatly improved with a population of six and half millions.

External trade: Regular trade surplus since mid 1970s due to export of bauxite and alumina. Balance of payments support provided by IMF, World Bank and Foreign aid, including those from USSR. Guinea does not belong to the West African monetary union.

Exports: Dominated by aluminum and bauxite, which accounted for 95% of export earnings. Agriculture products and diamonds make up the remainder.

Destination: USA, USSR, France, Spain and German FR.

Imports: Mainly foodstuffs, machinery and transport

equipment;petroleum products,textiles and and construction materials.

Main sources:France,USA,USSR,Brazil,Trinidad and Tobago.

Trade Balance in 1983 : 111.2 millions

Foreign Debt in 1984 : 1.7 billions

Liberia:

There are still relatively few Liberian businessmen and few from the indigenous people.70% of business in Liberia is foreign-owned.Most important are those in iron ore mining,rubber and,small but growing,the forestry industry.

The economy with its plentiful and varied natural resources,healthy balance of trade and stable dollar currency in the 1960s and 1970s.But from 1980s little has gone right for the economy.The Government deficits led the idea to mint \$20m of local coins,a decision which led to a loss of confidence and the minting was temporarily stopped though it has resumed since to meet periodic debt crises.

External trade:Increase outflow of foreign company remittances,debt repayments and falling exports have kept current account in deficit.Balance of payments support provided by USA and German FR.in the form of concessional aid.Also soft loans provided from IMF and the World Bank.
Exports:Iron ore 61% rubber 20% diamonds 2.4% coffee 4% and timber 5%.

Main Destinations:German FR 30% USA 18% Italy 18%.

Imports:Machinery and transport equipment 27.4% other manufactures 23%, foodstuffs 23% and lubricant 17.5%.

Main sources:German FR 12%,USA 25% Netherlands 10% and Japan 8%

Foreign Debt in 1984 = L\$ 756.7 millions

Trade Balance in 1986 = L\$ 166 millions

1.5 Political Structure in each country.

The political structure in each country varies considerably due to colonial influence and the system of politics adopted in that country. Due to these differences, I will take each of the countries and explain the politics adopted in that country separately.

Sierra Leone:

Sierra Leone is a Republican one-party State headed by an executive President elected for a seven year term. The one-party constitution came into effect on June 14th. 1978 following referendum-the first ever to be held in the country in which over 97% of the 2,215,952 voters declared themselves in favour of the new constitution. It was first adopted by the parliament by 81 votes to 3 with 6 abstentions, or appreciably more than the required two third majority. This in turn, followed a three-year nation wide debate, held at the grassroots level in each of the country's 85 constituencies, during which the consensus in favour of the one-party system.

Under the new constitution, Sierra Leone remains a parliamentary democracy with a legislative chamber of which 85 members are elected on a constituency basis by secret ballot and exercise universal adult suffrage. In each constituency, the sit is contested by two candidates who receive the highest number of votes in the primary pool conducted at the level of local party organization.

Twelve other members of the house are paramount chiefs; each selected by and representing the chiefdoms of one of the country's 12 administrative districts. Up to seven others are appointed by the President, these make up the rest of the house. The normal life of the parliament is five years.

The President is the supreme Head of the State and Commander-in-Chief of the Armed Forces. He appoints the first and second Vice-Presidents, as well as the Ministers of the Government, Deputy Ministers and Parliamentary special Assistants, all of which must be member of parliament. The President determines the size of the cabinet and chairs its meetings.

The 1978 constitution like the previous one, guarantees the fundamental rights, liberties and freedom of all the individuals, including the freedom of conscience, expression, movement and assembly and association. Freedom of expression is specifically defined as including "the freedom to hold opinions and to receive and impart ideas and information without interference"; while freedom of movement includes the right of the citizens to enter and to leave the country, reside in any part of it, and immunity from expulsion. The constitution also guarantees protection from arbitrary arrest or detention without trial, and from deprivation of property, and safeguards the position of the paramount chiefs.

Guinea:

Following the Military coup of 3rd. April 1984, the country's sole political party-Parti Democratique de

Guinea (PDG) was dissolved. Although no political organizations have been active in Guinea since the coup, there still exist several groups which were originally formed by Guineans in exile to oppose the regime of the late president Sekou Toure. The constitution of the Peoples Revolutionary Republic of Guinea which was adopted in May 1982 was suspended by the Military Committee for National Recovery, which had assumed power in a coup. The country's former name, the Republic of Guinea was subsequently restored. The establishment of a committee to draft a new constitution was announced in October 1988. Since then the country is being headed by General Lansana Conte, a professional soldier and there are plans to establish a multi-party system in the country.

Liberia:

From 12 of April 1980, Liberia experienced a new page of their political scene. A small group of Non Commissioned Officers led by Master Sergeant Samuel Keyon Doe mutinied and stormed the president's Executive Mansion. President Tolbert was shot dead. The group called themselves peoples Redemption Council (PRC) and then assumed power.

The Liberian coup was inspired by egalitarian principles and one of the first step was to increase salaries of every one. The Martial Law was declared on 25th. of April and suspended 133 years old constitution until further notice.

On 26th of July 1984, the ban on political parties was lifted and several parties including General Doe's National Democratic Party of Liberia (NDPL) were formed, and many other parties. The campaign for elections started in July with three opposition parties the LAP, UP

started in July with three opposition parties the LAP, UP and LUP finally allowed to participate. The election was on 15th of October 1985 to elect the president, vice president, 26 senators and 64 other parliamentary representatives. On 29th. October SECOM announced that General Doe had won 264,362 votes or 50.9% of the pool.

On 6th January 1986 Doe was sworn in as president and pledged himself to reconciliation and rehabilitation. That is the political system in Liberia. But one can not say that General Doe's Government has been a stable one. This fact has recently been shown by the political unrest in the country and now seven months bloody civil war led by Charles Taylor. The whole Government is now destabilized and the outcome is not known. But from all indications it seems as if there is going to be a new Government.

1.6 Mano River Union, Aims and Objectives of its Establishment:

Mano River Union was originally formed on 3rd. October 1973 as a Union between Sierra Leone and Liberia. The aims and the objectives are:

To establish a customs and economic Union between member States. In order to improve living standards, a common external tariff was instituted in April 1977; intra-Union trade began on May 1980. An industrial development unit was set up in 1980 to identify projects and encourage investment. Construction of Freetown-Monrovia road began in 1984 and other road projects are planned. Feasibility studies for a hydroelectric scheme were completed in 1983. Joint institutions have been set up to provide training in post and telecommunications, forestry, marine activities and customs and excise and trade. A joint Airline, Air Mano is

to be established soon. Decisions are taken at a meeting of a joint ministerial committee formed by the finance and economy ministers of the member States: Guinea, Sierra Leone and Liberia. According to Dr. Abdoulaye Diallo the Secretary General, most of the aims and objectives of MRU are on the right track.

Also a former Sec. Gen. of MRU Dr. Cyril Bright of Liberia once stated categorically that the future of the Union depended on the extent to which "our attitudes reflect the fundamental difference" between the Union being merely a hollow structure, as against being an instrument for development. It is for this reason that the Union Ministerial Council has given approval for an overall assessment of the Union to be made. Dr. Bright saw this assessment as a full scale legal, financial, economic and administrative evaluation of the activities of the Union since its inception.

This will no doubt establish the extent to which the achievements during this period have fulfilled the aims and objectives of the Mano Declaration.

CHAPTER II

WEATHER AND CLIMATOLOGICAL CONDITIONS IN THE SUB-REGION.

2.1 The Climate And Weather.

The most significant feature of the weather of this sub-region is the rainfall. The year splits up rather naturally into wet and dry seasons with little change from one day to the next during those seasons. Seasonal variations are relatively small. Departure from long term, average of about 3 degrees centigrade are most likely to occur between 09-N and 20-N changes of up to 10-C have been reported over a period of four hours which may cause condensation problems in ships and consequently effect on SAR operations in the area.

The difference between the sea surface compared to that of the overlying air is normally 1 degree centigrade in all the parts of the sub-region. The cooler waters are more reliable to patchec of fog, especially areas close inshore. Checks on water temperature help in anticipating the fog hazard, which in turn will help the problem of SAR in case of survival at sea.

The hot humid ,and often dull weather with monsoon rains persist most of the year near the Equator, but not the areas further north, from about 5 to 18-N where the sub-region of Mano River Union States lies, the length of the wet season is progressively less, and is governed by the extent at which the Inter-Tropical Convergence Zone (ITCZ) moves to the north.

Despite its closeness to the Equator, say about 550 miles

or less than 900km, away from Freetown which is centrally placed in the sub-region, the whole area enjoys a varied climate. The dry season which begins in mid-November, is ushered in by three weeks marked by temperatures up to 90-F (32-C) and humidity as high as 90%, with heavy morning mist; and occasional thunderstorms at night.

This is followed by local dry wind, which lasts for up to two months. The days remain hot, but night temperatures can be as low as 45-F (7-C) and humidity becomes low. The wet season begins with sudden squalls of rain and thunder, sweeping westwards across the region; this transitional period is the most difficult one as there are a lot of unknown cases of capsizing and drowning along the whole coast. The storms increase in frequency until July when the whole region is cooled with more westerly wind. In mid-September, squalls and storms become fewer again.

2.2 The Physical Structure and the topography of the coastline.

The actual physical condition of the sub-region is not uniform, therefore the structure and the physical condition will have to be described separately.

Topography:-

The continental shelf of the coast between the Cabo Roxo (12-20N, 16-43W) and Cape Sierra Leone (08-30N, 13-18W) has a minimum width of 150 miles and has been built forward by deltas. The West African coast between cape Palmas (4-22N, 07-44W) and the Niger delta (04-16N, 06-05W) has a narrow mud covered shelf, with a bulge west of the delta of the river Volta. The local magnetic anomalies are reported only off Iles de Loos in the Republic of Guinea, but

nothing in the other two States-Sierra Leone and Liberia.

2.2.1 Physical feature of the Republic of Guinea.

The coastal region is a flat strip of low-lying country defined inland by sandstone hills which make the edge of the plateau leading up to Fouta Djallo; a vast plateau over 1200m high which occupies the central part of the territory.

The most important West African rivers have their sources in this plateau; among these are rivers Gambia and Niger from which both the Republics of Nigeria and Niger got their names. From the SE end of the Fouta Djallo, a succession of great plains or low plateaus extend east to Ivory Coast. Further south, a chain of mountains along the frontiers of the Republics of Sierra Leone and Liberia.

The main river of this territory is Fleuve Tinguillinta (formerly Rio Nunz) and other rivers are Fatala (formerly Rio-Pongo) and riviere Mellacoree. Unfortunately these are not navigable to any longer distance from their mouth.

Most of the central and eastern parts are made of old crystalline schists and gneisses, but in the northern part are schists and quartzites. Ils de LOOs near Conakry are formed entirely of eruptive rocks.

2.2.2 Physical Features of the Republic of Guinea.

Apart from the thickly forested Gabbro Hills of the Sierra Leone Peninsula, the western half of the country is a vast gently undulating plain which may be divided into two parts; a coastal belt of Marine and deltaic sediments averaging 25 miles in width and a continental belt extending 60 miles farther inland.

Within the coastal belt, the tidal limit marking the junction with the inland plain. The coastal zone is generally swamp and grassy covered with mangroves and other trees bordering the creeks and rivers.

The inland belt has a gently undulating thickly bushy-covered surface which rises gradually to between 120m and 150m in the west. It is broken by several isolated hills and ranges, relics from an earlier plateau. The eastern half of the country consists of an elevated plateau lying between 300m and 600m above sea level.

The principal rivers in this country are: Sierra Leone rivers which include, Great and Little Scarcise, Sherbro river, Rokel 480 miles, Moa 165 miles and Sewa 130 miles rivers. Most of these rivers are navigable for some distances. One important feature of this country is that most of the coastline is covered with mangrove and extensive areas of swampy forest occurring behind the coast in the southern part of the territory. The highest ground in the country occurs in two eastern ranges, Tingi hills and Loma mountains, each with inselbergs exceeding 1830m.

2.2.3 Physical features of the Republic of Liberia.

The Republic of Liberia is a broken, mountainous country, the surface of which in the SW direction from the west slopes of the river Niger basin, to a strip of comparatively level land bordering the Atlantic Ocean. It is traversed by numerous rivers, most of which flow in the general north-east to south-west direction.

The coastal region is fairly well known for depth of 40 miles but the rest of the country is mostly unexplored. From the coast, which is generally low sandy and narrow, the ground rises slightly and then descends to form marshes and creeks altering with an extensive grassy plains. Through out this stretch, there are patches of comparatively high ground. The country in general, is covered by an extremely dense forest, and the mountains are thickly wooded up to their summits, which are reported to attain an altitude of over 1500m.

The principal rivers are: Saint Paul river and riviere Cavally which forms the International boundary between the Republics of Liberia and Ivory Coast. None of these rivers are navigable to a very long distance by larger ships. The prevailing geological formation is said to be a ferruginous sandstone covering a redish clay, but in several places, especially the eastern part of Monrovia, eruptive rocks have cropped out.

2.3 Effects of wind, current and visibility on SAR operations.

The winds along the coastal regions of MRU States are usually NEE to N in dry season, (November to March) and SW in the wet season (April to November) when the Inter-Tropical Convergence Zone (ITCZ) has moved North.

In the extreme south, winds between south and the 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 disturbances 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.

2.3.1 Visibility and fog:

Between Sierra Leone and Cape Palmas, (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, poor visibility occurs only on few per cent on occasions, usually in rain.

From Cape Palmas to Calabar 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 considerable 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 at times.

2.3.2 Current:

The effect of current along the coast is not much 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 1/2 to 1/4 knot being stronger in rainy seasons than dry season.

During the months of June to August, the current bifurcates 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 18 degrees north causing the reversal of the normal SE flow. This NW current has a long degree of constancy as shown in Annex I and average speed of 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 south-east 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 rates 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 streams tend to set N or W on the rising tide, S or E on the falling tide parallel to the coast. This is clearly shown on the flow of surface current in Annex II. from December to November. The direction and constancy of predominant winds in July and also the main sea temperature is also shown on the same Annex.

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 failure. This year alone, there has been a lot of helicopter crashes into the Sierra Leone river but most of the attempted rescue operations were failed. Several lives were lost and no attempt is still been made to overcome the situation.

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2.4 TYPES OF CURRENT AND EFFECT.

2.4.1 TYPES OF CURRENT:

Currents are divided into various categories which together form the total water current which provide the vector necessary in determining datum. This vector is the combined effect of all the water current forces acting upon a search object. Some of these currents that affect the search objects are:

- Lake currents
- River currents
- Longshore currents
- Surf currents
- Tidal currents
- Wind driven currents
- Sea currents

Wind driven currents and Sea currents are considered while planning ocean search. Each of these currents will be discussed and their effect on SAR operations clearly pointed out.

2.4.2 Lake Currents:

From the nature of the lake, this type of currents appear in different forms. They are formed and vary due to changes in seasons, rotation of the Earth, density differences, shape of the basin, depth and the volume of the water entering and leaving the lake. There are very few lakes in the Mano River Union States such as Lake Sonphone in Sierra Leone.

The direction of the lake currents are mostly counter clockwise on most larger lakes. Unless this direction is known it is very easy to drown and object location will be

difficult. Being that there are not much lakes in the sub-region, much attention is not paid to it. The most important thing in the lake located areas is the local knowledge; as there are no studies being carried out on them.

2.4.3 River Currents:

These are highly susceptible to seasonal change which is due to increases and decreases of the quantity of water being carried by the river. This is very common in most of the west Africa rivers where the rainfall is very high especially in the MRU States; because of this phenomenon, most of the data obtained in SAR planning, must be used in conjunction with the local knowledge and experience. We should not underestimate the local knowledge and experience because they might be the leading guide to the success of our SAR operations.

2.4.4 Longshore Currents:

These are caused by the build up of water from swells along the coast line. It normally runs in the same direction throughout the year. There is hardly accurate data for these currents, so local knowledge here is very important in search planning. It is very important for the search planner to gather as much information on the current in his operational area as possible. In fact most of the unsuccessful SAR cases in the sub-region, are due to the negligence of the use of local knowledge and experience. The speed of currents parallel to the shore vary with the amount and size of the swells at any given time. This must be taken into account.

2.4.5 Surf Currents:

There are two types of surf currents; both of these will

have effect on rescue planning but no effect on search planning. These are the surf current and the rip current. Because of the build up of the water volume in side of a surf line, the water will be pushed in a direction parallel to the shore this is known as the surf current. Sometimes, depending upon the nature of the bottom along the shore line, the water will exit through the surf and goes back into the open sea; this phenomenon is known as the rip current. It is a very narrow current and extremely fast and moves only few yards. These type of currents could be very dangerous to inexperienced swimmer. Most of the drowning cases especially on public holidays along our beaches are due to these factors

Because surf currents totally depend upon the amount of swell activity and the bottom conditions which are changing constantly, there is no good data that can be obtained hence we will have problems on SAR operations.

2.2.6 Tidal Currents:

These are the biggest contributing factors to total water currents. They are caused by the combined gravitational pull of the Moon and the Sun on the surface of the Earth. This pull has an effect on the water on the Earth surface. The Sun being larger, has much larger gravitational pull than the Moon; but because the Moon is much closer to the Earth than the Sun, its affect on our tide is much greater. This is why the water is pulled in the direction of the Moon. This is what causes high and low tides. In some places on Earth, it occurs once in a day (diurnal) while in others it occurs twice in a day (semi-diurnal). In MRU States it occurs twice.

There are two types of tidal currents Reversing and Rotary currents. Reversing currents are those those which the flow is restricted by the land masses around them ;such as those found in river mouths, harbour entrances and in narrow bays and sounds. They are called reversing currents because the general direction of the current is in opposite directions.

Rotary currents are found in areas less restricted by the land mass. The direction of rotary current is changing constantly ,changing within the one tidal cycle, it will set to all directions of the compass.

2.4.7 Combination of Currents:

while performing the task pf SAR planning, it is important for the planner to understand that a wind driven current is different from tidal current. Rotary and Reversing currents are both tidal currents; one of the two will be acting on the water surface in a given position at any one time if any.

Wind driven current can act upon the same surface as a tidal current. When both are present, the vectors from both currents must be computed and then added together to establish the total water current.

CHAPTER III

3. Evaluation of SAR Resources In the three countries

3.1 Total Maritime SAR Region

The total Maritime SAR region of the three Countries is a 489 nautical miles excluding the rivers and the inland waters. This could be broken down as per country: Guinea 205nm, Liberia 156nm and Sierra Leone 128nm.

No one really knows the extent of the rivers or the inland waters and how far they are navigable in each country, because no actual survey has ever been done on them. Few attempts have been made to enumerate some of the larger rivers within the countries which are widely used and are very important for SAR purpose. In Sierra Leone, There are five main rivers namely: Jong river, Srwa, Rokel, Sherbro, Great and Little scarcise, and river Mano where MRU got its name. The six main rivers in Guinea are- Fatala, Tinguillinta, Mallecore, Kunkure, Juliba and Numez. The six main rivers in Liberia are: St. Paul, Junk, Grand Kulloh, Bruni, sangwin and Sinu.

Starting from river Cacheu (12-10N, 16-25W) is the International boundary between the Republic Of Guinea and Guinea-Bissau while Riviere Cavally is the International boundary between the Republics of Ivory Coast and Liberia. If we sum up the length of all the navigable rivers in the sub-region, the total SAR region will be well above 2000 nautical miles. That is a very large area to be effectively covered by these countries individually.

3.2 Present SAR Resources

In trying to find out what we have in terms of SAR resources, to see whatever we can cope up with the establishment of sub-regional SAR organization, I did a survey on the three countries my these findings on the SAR resources on each country are as follows which are clearly shown in the tabulated form below.

From each country, we can see the names of all the important sea ports and what are really available in terms of SAR resources as at now. But because of the civil war in Liberia, most of the mentioned resources may not be available now. In addition to the tabulate columns of the resources, there are also diagrams showing the Maritime SAR region and the important sea ports.

Guinea

There are three main sea ports and three Naval Observation Posts in this country.

| Seaport/Obs.Pos | Coastal Radio Station | Available Resources |
|-----------------|--|--|
| Conakry | CRS available VHF. on CH.16 nearest CES France | 4 x 35m Patrol Boat 3 x 20m----- 2 Tugs Fishing Vessels Airforce Helicopters and fixed wing planes. |
| Kamsar | VHF.CH.16 Naval Communications | Marine Nationale Observation Posts |
| Cap Koundide | Naval Communications | Marine Nationale Observation Posts |
| Ile Tamara | VHF.CH.16 | Naval Communications |
| Benty | VHF.CH.16 | Naval Communications |
| Taboriya | ----- | Naval Communications |

Sierra Leone

There are three main Sea ports in this country and they are as follows:

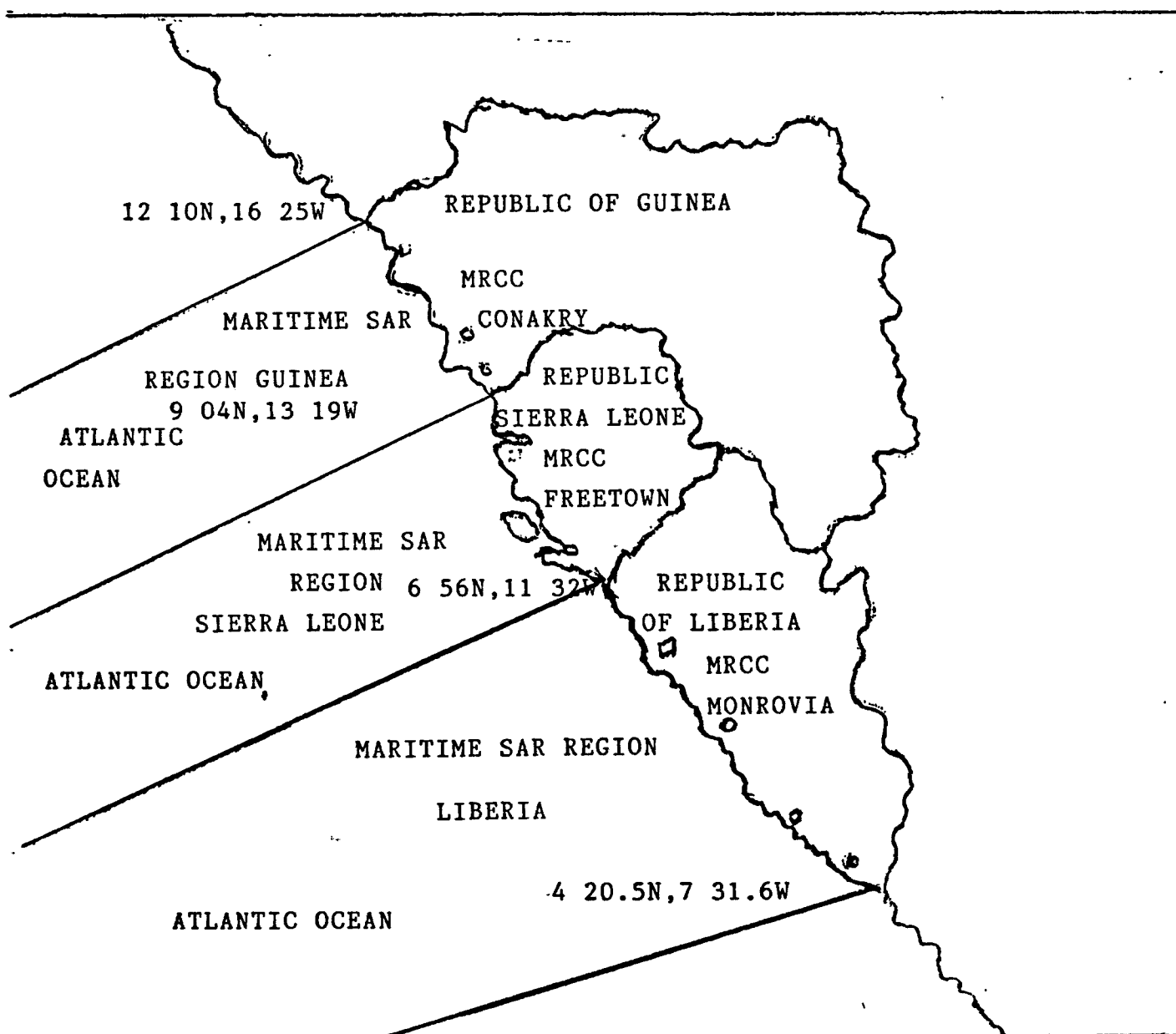
| Sea Port | Coast Radio Stations | Available Resources |
|----------|---|---|
| Freetown | Freetown Signal Stations VHF.CH.16 VHF.CH.16 in pilot office and Harbour Masters office | 2 x 38m Patrol Boats 1 x 31m ----- 1 x 20m ----- 3 Tugs 30 Fishing Vessels 5 Helicopters 2 pilot boats RSC at the Naval Base |
| Pepel | VHF.CH.16 | 1 x 14m Patrol Boat 1 Tug |
| Bonthe | VHF.CH.16 | 2 x 14m ----- Local Fishing vessels |

Liberia

There are four main Sea Ports in this country and the present SAR Resources are as follows:

| Sea Port | Coast Radio Station | Available Resources |
|--------------------|---|--|
| Monrovia | VHF. CH.16 in the Harbour and at the Coast Guard Base | No MRCC or MRSC ARSC located at Roberts-Field. 2 x 30m Patrol Boat 3 x 20m ----- Tugs, Fishing Vessels, Pilot Boats. |
| Buchanan | VHF: CH.16 at Port of Buchanan | No RSC 3 Tugs 1 Pilot Boat Local Airfield located between port of Buchanan and Robertsfield. |
| Port of Greenville | VHF.CH.16 | No facility for repairs no RSC only one small Tug is available. |
| Cape Palmas | Coast Radio Station on CH.16 | no RSC Tugs are available Local Airfield 4 flights in a week |

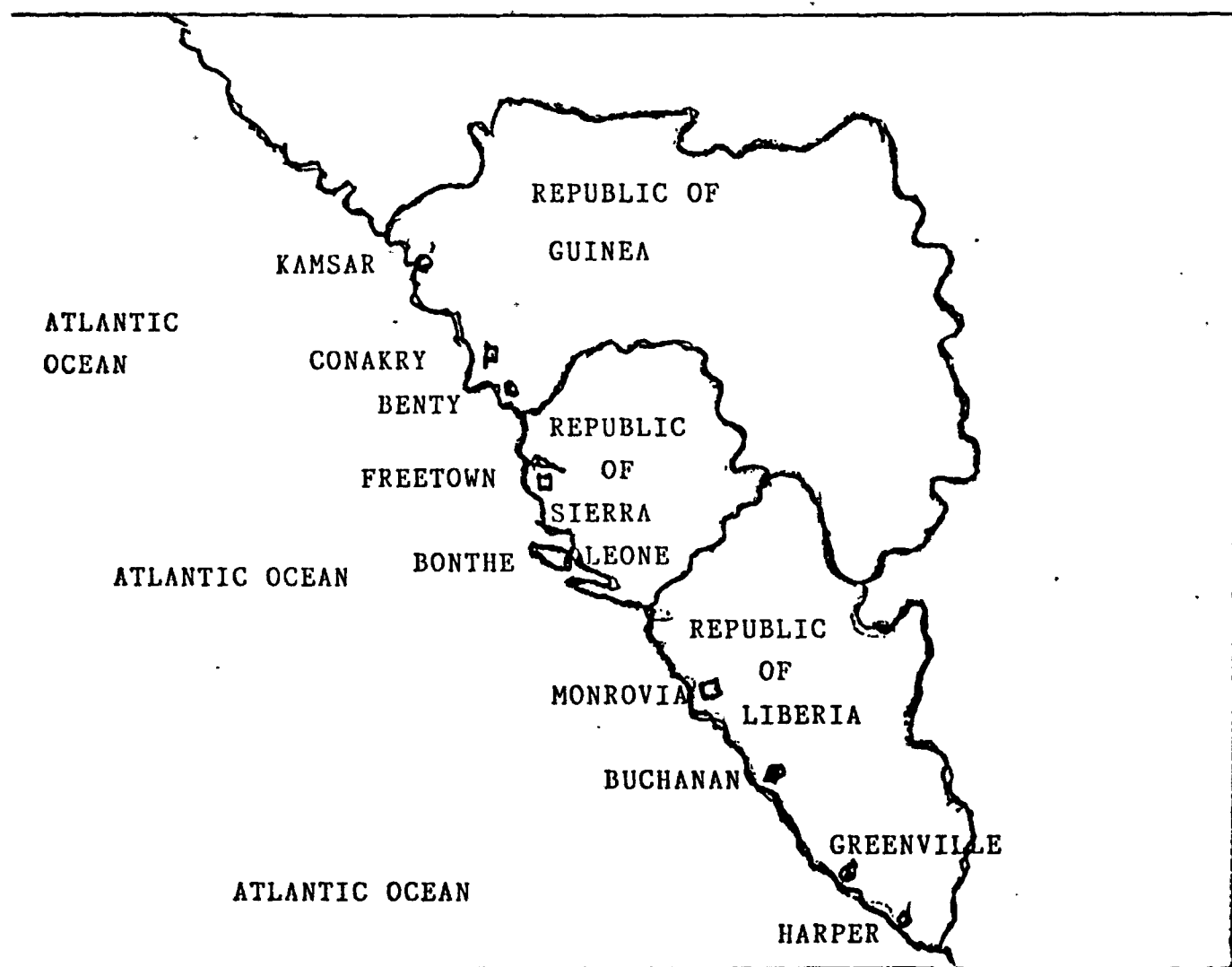
THE MARITIME SAR REGION IN THE MANO RIVER UNION
STATES AND THE AREA OF RESPONSIBILITY



THIS DIAGRAM IS NOT TO SCALE

THE MANO RIVER UNION STATES

AND THE IMPORTANT SEA PORTS



3.3 The requirement for additional SAR Resources and the needs for improvement

Considering the total maritime SAR region in the three States when compared with the present available resources, it is obvious that the need for more equipment and the establishment of SAR organization in the sub-region is quite evident. In order to make this project a success, I made a survey in the three countries in order to know the present resources that are available; what will be needed in each country and finally to see if there is a need for the establishment of such an organization within the framework of Mano River Union. The response from each country was very encouraging. The survey was carried out in different phases.

3.3.1 A visit to MRU Secretariat, discussion with the Secretary General of MRU Dr. Diallo, the Financial Controller Mr. Steven Swaray, the Liaison officer Dr. S. Kanu Head of the communications and the Legal adviser. It was clear that there is a need for the establishment of SAR in the member States.

3.3.2 A comprehensive survey was made into the police records in all the three States for cases of death and accidents at sea. This was based on seven years statistics and the results for this period is amazing. From all indications the periods of 1983/90 as shown in Annex I, no one actually knows the number of lives and properties lost. In fact there are no ways of knowing this because all the obtainable reports are those recorded either in police records or various maritime organizations in

individual countries. All those accidents that happen along the coast, unknown to the police or proper maritime authorities, cannot be accounted for.

3.3.3 Even though there are a lot of movements by the people within the coastal regions of these countries, no attempt has ever been made to educate them on the safety aspect at sea. Very few of the higher authorities know anything about the sea, if they do, they are not much interested for various reasons. Therefore those who encounter problems while at sea, are at the mercy of whoever comes to their rescue.

Having established that there is a great need for the establishment of SAR in the sub-region, knowing well the present resources in each country, we can easily enumerate our requirements. These however, should be within the reach of the organization taking also the economical situation in each country into account if we want this project to start earlier and be effective. In addition to what we have now, the following additional resources are needed if we want to establish proper SAR organization in the sub-region.

Even though we have few Patrol boats, helicopters and fishing vessels in each country, I should honestly say that most of these are very old and one cannot rely on them properly especially when it comes to the problems of running and repair cost. Also if there are SAR cases at a longer distance the reliability of these boats in such cases would be difficult. Therefore, for a successful SAR organization the following additional facilities are needed:

-Additional Fast Patrol boats with a present IMO standard of rescue boats specifications to cover all the important areas especially in the congested parts in the sub-region.

-More helicopters to cooperate with the established RCCs in each country; this would also include the use of various Airforces and some other supporting agents.

-Establishment of coastal radio stations/alerting posts along the whole sub-region, this will definitely ease the means of proper communication network. This however, should start from Kamsar in Guinea to Cape Palmas in Liberia.

-To acquire proper communication equipment that will link the MRU SAR Headquarters to the RCCs of all the others. Until this is done, and we utilise our present resources in a proper way, we cannot talk of having SAR organization in our sub-region. Lives and properties will continue to be at risk.

-3.4 The Needs for Regional Cooperation:

-It is quite impossible for any of the three countries in the MRU States to establish proper and adequate SAR organization with all the available resources. Guinea, Liberia and Sierral Leone have similar problems in many respect such as economical, social, cultural and otherwise. The MRU in fact was formed with the ideas of solving some of these problems on sub-regional level, which was quite in place.

As early as 1975, the first Inter-state agreements in the field of aeronautical co-operation "Accord" between the Republics of Guinea, Liberia and Sierra Leone were signed

in January that year. This regulates the use of crash removal equipment available in Sierra Leone. This in fact was the first summary of SAR agreements. In this connection, my idea of regional cooperation is already existing in this sub-region.

3.4.1 Other Information:

The meteorological offices concerned will in accordance with the provisions of para. 1.5.2.4 of Annex 3. of the agreement supply the RCC/RSC upon request, either directly or through A.T.S until pertinent information required for Search And Rescue by the RCC/RSC.

A record of all the unremoved or unobliterated wreckage or objects which could be mistaken for wreckage is maintained and available at RSC. This agreement extends to the facilities available in both countries.

Under the Mano River Union declaration, the Heads of States of the member countries made the following declaration:

"We the Presidents of Liberia and Sierra Leone, desiring to establish a firm economic foundation for lasting peace, friendship, freedom and social progress between our countries....

In pursuance of our determination as already affirmed in the joint statements issued on 28th. of January and 16th. of March 1972 to accelerate the economic growth, social progress and cultural advancement of our two countries.

Recognizing that this can be accomplished by active

collaboration and mutual assistance in matters of common interest in economic, social, technical, scientific and administrative fields.

Having resolved to intensify our efforts for closer economic cooperation between our two countries, and having decided to take the necessary steps for the attainment of this objective".

This was the first declaration signed by the two founding members of MRU. Dr. Siaka P. Stevens of Sierra Leone and William R. Tolbert (Jr.) of Liberia. The Union was established on the above ground with the aim of regional cooperation hence extending the ideas of IMO, which states that neighbouring States should cooperate and put all their resources together in establishing their SAR organizations. Chapter I (1.5) IMOSAR. Article 12(2) of UN convention of the High seas and Regulation (15) of Chapter V of SOLAS 74/78 mentioned about the same regional cooperation. All of these are for the economical advantage of individual countries especially for developing countries like ours, where it is not possible for any one of us to establish a proper SAR organization on our own. The only practical solution is the regional cooperation and that is my idea on the establishment of SAR organization under the frame work of the Mano River Union. It would be a dream come true to see the day when we shall all work together at sea in common frequency to save our people and their properties from the peril of sea.

PART II:

RECOMMENDATION ON SAR ESTABLISHMENT IN THE SUB-REGION.

Chapter IV

**4. Authorities, Organization, Conventions and Legal aspect of
SAR in the Mano River Union States.**

4.1 Authorities of MRU SAR Organization.

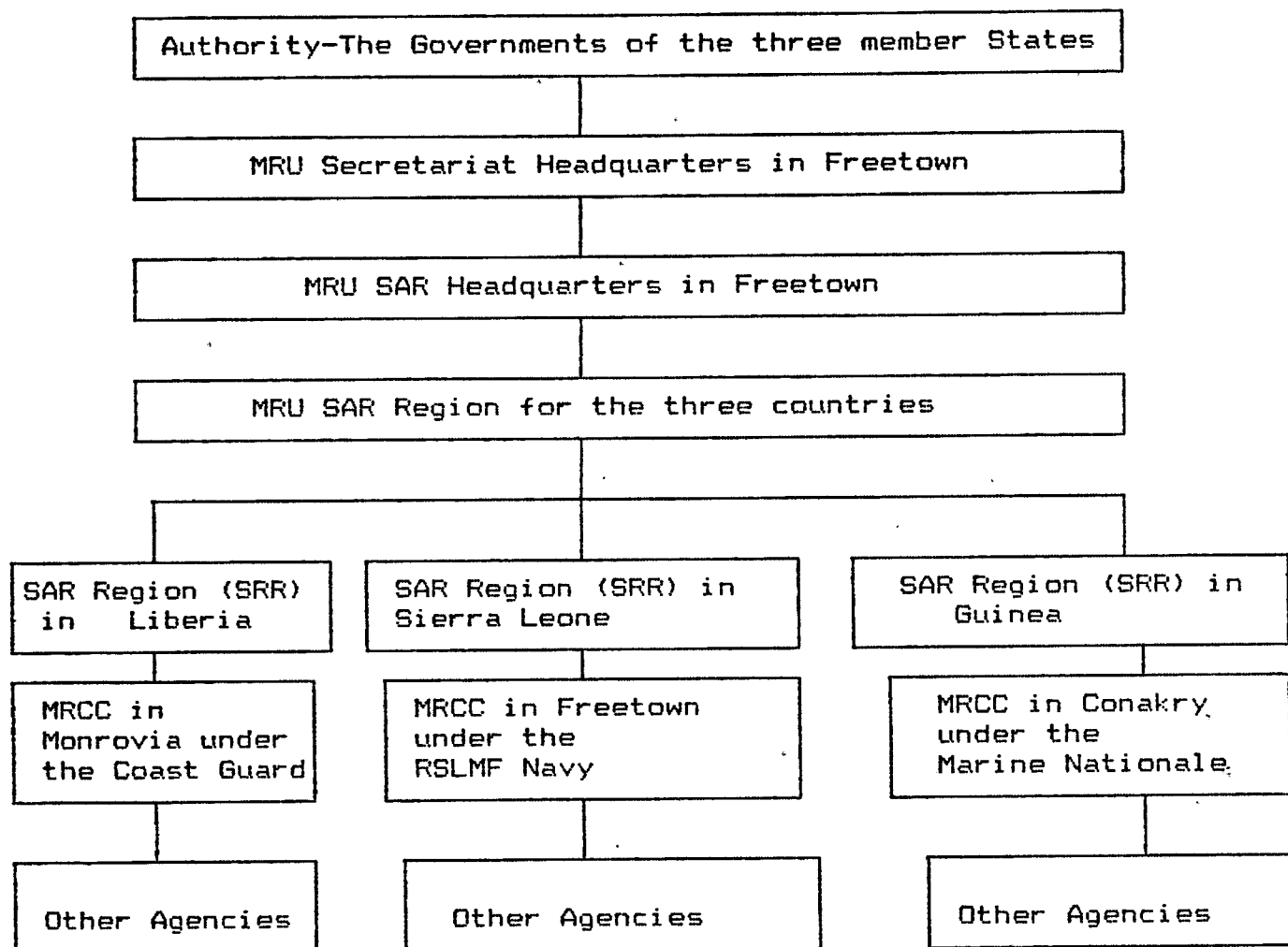
The Authorities of the Mano River Union SAR Organization
are the Governments of the three member States. The smooth
running and the financial commitments of the Union are the
sole responsibility of the member States. All decisions
with regard to finance are taken by the economic Ministers
of the three member States with the approval of the Head
of States through the Secretary of the Union.

**4.2. Headquarters of the Organization and the composition
of the Staff.**

Being that MRU is a sub-regional Organization, the whole
organization will be based on the MRU framework. The
Headquarters will be in Freetown where the main
Headquarters of the Secretariate of the Union is located.

Since it is a regional organization, the Staff will be
drawn from all the three member States and work under the
Secretary General of the Union. The main tasks of the Staff
will be coordination of all the activities of various RCCs
and act as link between the various countries and the SAR

MRU MARITIME SEARCH AND RESCUE ORGANIZATION



organization. The Staff should be able to monitor and report all the rescue activities to the Secretary General on the achievements which will later be included in his progress report to Heads of States during their annual meetings.

Each RCC should have direct link with MRU SAR Headquarters; in case of emergency where the operation might overlap into another country's SAR region. With the Union, most of the protocols relating to the movement of ships would be easy through the Headquarters.

4.3 Ratification/Accession to Maritime Conventions.

Out of the three member States, Liberia is the only country that has ratified the International Convention on Maritime Search And Rescue, 1979.

Even though Sierra Leone and Guinea are members of the International Maritime Organizations (IMO), they have never ratified any of the conventions. Actually, few third world countries realize the importance of these conventions. It does not cost much but most countries adopt a laissez-faire attitude without any reasonable reasons.

4.4 Legal Aspect of SAR operations in each country.

When we speak of Search And Rescue, knowing full well that the primary purpose of SAR is to save life and property, then we start to think less on the legal aspect involved during the operations provided that we are carrying out the task of rescuing with reasonable care, good judgement, and common sense. However, if the operations are other than these, then we start to look into the legal

aspects in different dimensions as follows:

4.4.1 Statutory Framework:

Most countries have their own statutory laws or codes which guide the organizations to perform their duties. In the United States for example, such codes permit the Coast Guard to rescue persons or property in distress, take charge of and protect property saved, provide food and clothing to persons in distress and destroy or tow hazards to navigation. This is a discretionary status in which duty to perform SAR is not mandatory.

One thing that should be taken into consideration is that once a mission is undertaken, it has to be properly prosecuted in a reasonable manner. At times an agency performing the SAR mission may be subject to liability to rescuer's failure to exercise reasonable care in a rescue; and if this negligence worsens the plight of the distressed person or if the harm is caused because the person relied on the rescuer without asking for some other assistance.

4.4.2 International Framework.

Under the International code with regards to 1910 ideas of "brotherhood of sea", if a ship is engaged in bona fide effort to assist persons in danger or distress at sea, it has the right to enter into the territorial seas of other States without prior permission. As a sign of international courtesy, the Coastal State should be informed and also to alert the SAR resources. This right is to be exercised only when the vessel is aware that persons or property are in danger or distress and the location is known.

These are some of the difficulties that the Mano River Union SAR organization will try to limit. It is clearly included in Chapter V under the agreement between States. The legal aspect of free movement in accordance with good spirit of saving lives and property will have access to enter free. However, anytime such entry is done, the Coastal State should be informed. The use of Aircraft for such operations is not allowed.

Another area that will be looked into by MRU SAR organization without going through Diplomatic procedures are: Body searches, Landing of Foreign Units, Removal of human remains and Disposal of human remains. In conducting these, the local law enforcement authorities should be informed.

4.4.3 Entry/Handling Private Property.

Property here refers to land belonging to a person or group of persons. If SRU needs to enter into this property for the sake of performing SAR operation, permission from the owner or owners should be obtained.

Any private property that comes into the possession of SAR personnel should be safeguarded, inventoried and handed over to the owner. This is an added sign of the duty of SAR. If the owner cannot be located, it should be handed to the person assigned for property handling or to local law enforcement authorities.

~~4.5~~ Legal Aspects and Conventions.

In general, the items of Legal aspects can be traced to the past. The assistance to any vessel or person in distress at sea has, since the dawn of history, always been recognized by mariners as normal practice and a traditional moral obligation. This obligation was given legal status when it was incorporated in International Maritime Law. Today, the following international treaties contain provisions requiring mariners to render assistance to vessels or persons in distress at sea.

-The convention for the unification of certain rules of law relating to assistance and salvage at sea (Brussels 1910)

-The international convention for the safety of life at sea (SOLAS-London 1974)

-The international convention on Maritime Search And Rescue (Hamburg, 1979) and finally

-The United Nations convention on the Law of the SEA (Montego Bay-Jamaica, 1982).

Under the Brussels convention, "Every master is bound, so far as he can do so without serious danger to his vessel, her crew and passengers, to render assistance to everybody even though an enemy, found in danger of being lost".

The provisions of brussels convention are supplemented by those of Chapter V of SOLAS convention. Regulation 10 of that Chapter details the obligations placed upon a master who receives a distress signal from any source that a ship

or aircraft or survival craft therefore is in distress and also specifies the procedures which must then be followed.

The SAR related provisions of the SOLAS convention are supported by the provisions of Article 98 of The Law of the Sea which provides that:

1. "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 ships, the crew or the passengers;

2. to render assistance to any person found at sea in danger of being lost;

3. 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;

4. after a collision, to render assistance to the other ship, its crew and its passengers and where possible, to inform the other ship, its port of registry and the nearest port at which it will call.

Under this same article, it is a requirement that every State shall promote the establishment, operation and maintenance of an adequate and effective search and rescue service regarding the safety on and over the sea, and where circumstances so require by way of mutual regional arrangements to co-operate with neighbouring States for this purpose".

It is recognized in the SAR convention that it will not always be possible for all parties to reach agreement, particularly with respect to SAR region in which case they

shall use their endeavours to reach agreement on appropriate agreements which would provide equipment overall co-ordination of search and rescue services.

In order to facilitate agreement on search and rescue regions, the convention stipulates that the delimitation of search region is not related to and shall not prejudice the delimitation of any boundary between States, such as those between Sierra Leone, Guinea and Liberia. It is required that all parties arrange for their SAR services to give prompt response to any distress call and must take urgent steps to provide the most appropriate assistance to any person in distress regardless of Nationality or States of such a person is found. All parties are required to co-ordinate their SAR facilities and services nationally by establishing rescue co-ordination centres (RCCs) and rescue sub-centres (RSCs). They must also ensure that each RCC and RSC has adequate means for receiving distress communications and communicating with its rescue units and with RCCs and RSCs in adjacent areas. This is exactly what we intend to do establishing SAR in the MRU States.

Agreements with neighbouring States are also recommended for pooling of facilities; the establishment of common procedures; the conduct of joint training and exercises; regular checks of inter-State communications; liaison visits by RCC personnel; and exchange of search and rescue information.

CHAPTER V

5. Problems, Agreements and Solutions of SAR Establishment.

5.1 Problems of SAR Establishment in developing Countries.

The problems of SAR establishment in developing countries is based on the knowledge of SAR activities in the region, the economical situation and the willingness of the Government to invest on it. At times, much attention is not paid to the activities at sea especially in the areas such as SAR which does not bring income directly into the country except the fame and the moral respect from the public. This is the area where the knowledge of the authorities concerned becomes very important because if they are aware of what is happening at sea and have the love for their people, then they will devote some attentions to SAR establishment at sea.

Another reason why less attention is paid to SAR establishment in most developing countries especially in Africa is due to tribal and sectionalism attitude of some of the leaders. Sometimes the Minister of Transport and Communication or the Minister of Agriculture and Natural resources with special responsibility on the sea may neglect the development required on the sea and devote most of the attention on the area that they come from. With the system of Government we have, in which these Ministers would have to be voted in every five years, one can then understand why such attitudes exist. Therefore, SAR establishment in such countries is very difficult. Until these things are completely wiped out we cannot easily make headway. And that is a fact in which the attitudes of the people has to be changed.

--One other important setback is the economical situation prevailing in developing countries. Sometimes the leaders look at it from the priority point of view and whether in fact it is necessary to establish such an organization or not. The negative response in this is a disaster and the effect is due to economical setback relating to SAR establishment.

--5.2 SAR Treaties, Agreements between the three member States and Privileges of duty free SAR equipment.

--As mentioned in Chapter III para.(3.4), neighbouring States may find it advantageous to put all their suitable resources together for SAR which will reduce the number of facilities that have to be established individually and will allow a better coverage of the areas concerned. With a sub-regional organization like MRU where it is anticipated that SAR facilities situated in one country will be available for use in another, it may be necessary to involve higher authorities to achieve agreements. This will be accomplished through MRU organization.

--It is very important that such agreements authorize direct lines of communication at operational levels between officials in the three States; this will be easy if we make use of the objectives of the MRU Communication Training school in Freetown. With students coming from the three countries, a common system of communication could be learnt and be adopted. To keep the delays to a minimum during the time of emergency operations, authorities which normally control entry into a state, such as Customs, Health, Immigration etc should be informed of:

--5.2.1 Any agreements permitting or facilitating the

the entry of SAR personnel and equipment whether civil or military, from other States; and

5.2.2 Any agreements concerning the servicing and fueling of the equipment.

For the fact that the operations will encompass the movement of the SAR vessels within the member States, the agreements in this regard should include the privileges of duty free SAR equipment and cover some other areas apart from this.

In fact under the consolidated protocol to the Mano River Declaration which was signed by the three Heads of States concerning the privileges and immunities of the Mano River Union, the under mentioned declaration was made:

5.2.3 TAX Exemption:

The assets, funds, income, property, operations and transactions of the Mano River Union including but not limited to Union Training and Research Establishments shall be immune from all taxation, levies, duties, fees, charges and also restrictions on import and export by the Union for its official use. Provided such exemptions shall not relate to charges for public utility service and that in case of articles imported or exported by the Union for its official use, such articles in accordance with conditions agreed to by the affected member State. It will be of great help if these privileges are extended to the SAR organization within the Union's framework as it is already extended to other areas within the organization.

--5.3 Solution of the SAR problems in the Sub-region.

The actual solution of the SAR problems in the sub-region lies on the development of regional co-operation which if properly handled can solve most of the problems. In connection with this, it will be necessary to enlist the co-operation of all those in the region who are able to provide some form of assistance and what facilities they have, their locations and where to contact them. Some of these may include Captains of ships at sea, owners of small craft, police, fire brigades, voluntary helpers etc. All of these, if incorporated into the system, could be of great help in solving the SAR problems by cutting down the spending power.

--5.4 Free movement of the Rescue Units in each others SAR region.

The idea of allowing a rescue unit from one country to move freely into the SAR region of another country completely demonstrates the co-operation existing between the countries within the region; this is considered to be one of the most important factors in the success of SAR operations since it involves lives and property. Because of this, SAR Units in MRU States should be allowed to move freely in each others region for the sake of SAR purpose.

5.5 Periodic Discussion.

In order to know the efficiency of the SAR operation in the sub-region and to keep abreast of what is happening at any one time, it is very important to evaluate the degree of co-operation existing between the participating countries and the facilities used within the sub-region. The heads of these facilities should review the success and look for feed back they receive from the public. Without this periodic discussion, there will come a time when they will be completely lost in the operational aspect of the organization. Therefore it is very important to have this discussion at regular intervals.

This in fact is done in Bremen Germany in which all the captains of the rescue boats meet in their headquarters in Bremen and discuss all their problems with each other and suggest ways and means to tackle them in future. This will also give them opportunity to voice out certain requirement for effective operation of their rescue units in future.

CHAPTER VI

6.1 Delimitation, Establishment of RCC/RSC and SAR Organization.

For effective coverage and proper control of the total Maritime SAR region in the Mano River Union States, it will be necessary to divide the whole area into three separate Search And Rescue regions which will comprise of the SAR region of Guinea bounded by (12-10N, 16-25W) from river Cacheu between Guinea/Guinea-Bissau border to (09-04N, 13-19W) at Pointe Shallatouk Guinea/Sierra Leone boundary. A total area of 205 nautical miles.

The Maritime SAR region (MSRR) of Sierra Leone starts from Pointe Shallatouk to the mouth of Manna River (06-56N, 11-32W) a river from which MRU got its name. This area covers a total of 128 nautical miles.

7 The Maritime SAR region of Liberia will also start from this river which is the International boundary between Sierra Leone and Liberia to Riviere Cavally (04-20N, 07-31W) which is also the International boundary between Liberia and the Republic of Ivory Coast.

6.2 Establishment of RCC/RSC in each country with direct link with each other and MRU Headquarters.

Each country will then have its own SAR region in which the co-ordination SAR will be effected by one RCC. There will be RCC in Guinea controlled by the Marine Nationale, RCC in Sierra Leone controlled by the Navy and RCC in Liberia controlled by the Coast Guard. These three different organizations from the member States will be

- responsible in conducting the SAR operation in the region.

- Each RCC will be responsible for preparing a comprehensive plan for the conduct of SAR in its Maritime SAR region. The plan must cover the whole SRR and be based on the agreements between the three member States and also the providers of other facilities within the States. The RCC/RSC will have direct link with each other and also with MRU Headquarters in Freetown. The communication link as explained in para.(5.2) stressed the needs for common communication system in the region. The RCCs should be located at a strategic position within its area of responsibility. Moreover they should cover the whole area.

6.3 Search And Rescue Organization and Agencies.

- The SAR organization under the Mano River Union set-up will be under the following as shown in the diagram of the MRU organization. The primary authority will be vested on the Governments of the member States and it will be incorporated into the framework of the MRU within its Headquarters in Freetown; where the Headquarters of the Union is located. As explained in para.(6.2), the MRCCs will be in Conakry, Freetown and Monrovia which are the Capitals and the main sea ports of each country.

- In addition to these separate MRCCs established in the member countries, there are also many Government departments that can render valuable aid to SAR operations. Some of these are mentioned below and should be included as additional SAR resources:

- (Meteorological) department for Meteorological

information and communication lines.

-Marine and fisheries departments which will include vessels and crews merchant ship reporting system.

-Health departments, which include State municipal or provincial police forces.

-Civil aviation administrations which provide air traffic services, personnel and the condition of the aircraft.

-Customs and port authorities will provide additional facilities especially in terms of vessels and personnel.

The use of these facilities will reduce the cost of SAR operations considerably. However, the most important thing here is that there should be a strong cordial relationship between the SAR organizations and the providers of the facilities.

Each RCC and RSC must have available up to date information relating to its area, including details of available rescue units and coast watching units; resources, such as transportation facilities and fuel supplies; means of communication, including names, cables and telex address, telephone and telex numbers of shipping agents, Consular authorities, international organization and other agencies who may be able to assist in obtaining vital information on vessels; identities of maritime mobile services, and other radio stations, and other information.

Each RCC and RSC should have ready access to all appropriate information concerning the vessels within its

area which may be able to provide assistance to vessels or persons in distress at sea. Each must have detailed plans or instructions for the conduct of search and rescue operations in its area. These could contain details concerning action to be taken by the those engaged in SAR operations in the area.

6.4 Level of Coverage.

At each of the RCC stations, it is necessary to have fast patrol boats and if possible at least a helicopter in a state of readiness. Again if available, it should be kept on standby at one hour readiness during the daylight and if more than one helicopter, the time of readiness should be reduced to fifteen minutes during the day thirty minutes at night. The whole area should be covered by small boats and offshore lifeboats that should be able to reach the casualties up to 30-40 miles offshore.

In performing SAR operation, one would like to know the size of the actual area to be covered which may have various consequences such as the track spacing and the size of the target.

The coverage factor therefore is a function of sweep width and track spacing. It can be seen in ANNEX III from different search patterns that if we vary track spacing it will affect the amount of area which is to be searched other variables remaining constant. Track spacing directly influences target detectability since any target will have size and shape characteristics which affects detection.

CHAPTER VII

7. Communications, Coast Radio Stations and Satellites.

7.1 SAR Communications.

For any organized SAR system there must, first of all, be one or more centres to which distress can be reported or request for assistance can be directed, and the ways and means to reach these centres must be known by all concerned, including the public. Such a centre will be called RCC/RSC and, the communication need for such a centre are as follows:

7.1.1. The means to receive reports of distress etc. for RCC means that there has to be communication with likely sources of such reports, such as air Traffic Control (ATC) which is clearly pronounced in all the MRU States, maritime radio stations, other rescue centres and organizations, military and civilian surveillance activities and various local authorities. If some ships and fishing vessels operating in the area are equipped with emergency beacon transmitters, the RCC will also need communication with appropriate SAR Satellite readout stations and any other direction finding station.

7.1.2. Good communications with other rescue centres are needed for coordination, exchange of information and assignment of tasks. Communications to the bases and/or parent organizations of SAR action units and other resources such as ships near the distress area, special rescue ships, police or military forces and voluntary relief and rescue organizations. This also includes

communications with IMO organization keeping track of ship positions.

7.1.3. Communication with the assigned SAR action units during the operations may be direct or indirect e.g., through na ATC or through the on scene commander (OSC). For major emergencies an on scene commander is normally appointed by the responsible RCC to organize and coordinate the activities on the spot. The responsible RCC needs the possible and preferably direct communications with the osc where he is located.

7.1.4. For the receipt, medical care, feeding and transportation of survivors, who may be wounded or in bad condition, the RCC needs communications with local authorities, hospitals, transportation and relief organizations, air and land transportation services. Evaluation of population is considered a matter for the local or central authorities. Depending upon the national or local organization, the RCC may get involved.

7.1.5. When an incident occurs, the public could be eager to know the outcome of the operations, in such instance communication with the press and the news media is also a clear requirement. This is important, but it must not be allowed to interfere with the primary purpose of SAR.

7.1.6. Public communications system in some countries may be very advanced in all respect but still it is quite ironical to rely solely on it. Some are extensively built out and offer a good number of services such as automatic telephone services. In some areas it may not be so advanced, but mostly it will provide all the connections and services needed for SAR purpose except communications

to mobile units. There are some major problems here, in that the SAR organizations, or any other organization who needs the public communication services, are not in control of the traffic and the congestions that may block our accesses. To overcome this, alternative accesses must be provided. Public communication however is just one aspect of SAR communications. The three remaining others are:

- Dedicated Circuits

- HF Radio (including MF and LF radio) and VHF/UHF radio

- Satellite communications.

7.1.7. Dedicated Circuits:

The system known as dedicated or point to point circuits constitute the most important category of SAR communications. The dedicated circuits may be routed in the same public network, it may also be routed in the military network or established communications solely for SAR purposes. The major point is that these circuits are not accessible by the public or other users and they are not switched through the normal exchanges, so they are not subject to blocking by congestion overloads. We would always access to the particular user at the other end and if we receive a call on this circuits we know from where it comes and act accordingly. For communications to and from mobile units and for alternative communications in the case of interruptions in the public network and the dedicated circuits routed through this, there are in practice only three different means of communications available-namely HF radio, VHF/UHF radio and Satellite communications. The choice however in many cases can be restricted by the equipment in the mobil units.

7.1.3. Satellite communications:

If a satellite with free satellite channels is available, this can certainly provide the most versatile and flexible means of communications. The primary problems rest with the responsible mobility of the ground terminals. Communications through synchronous satellites are completely independent of distances within the area and also of separation by waters or mountains.

The communications are also very stable and practically independent of atmospheric or weather conditions. If an RCC is connected to a satellite ground terminal and there is one transportable/mobile terminal of the same system available, communications can quickly be established with any point or to any vehicle where mobile terminal can be brought or mounted for fixed interconnections as alternatives as alternatives to public network communications. There is a natural distinction between operational and administrative communications. The operational circuits are those which gives us direct connections with our sources and operational units while the administrative circuits are used for the daily functions and administrative tasks.

7.2 Establishment of Coastal Radio Stations and alert posts:

Considering the total maritime region of MRU States, the coverage as explained in para. (6.4) will also depend on the effective use of Coastal radio stations and alert posts. This will have to be looked into and and possible areas of location to be identified. In doing these, several points will have to be taken into account:

7.2.1. The traffic density of the area which include the movement of vessels and accessibility.

7.2.2. The distance from the nearest RCC/RSC. This is very important because having several radio stations and alert posts distributed evenly along the whole coast will definitely reduce the number of casualty and eventually increase the alertness at any one time.

7.2.3. Communication problems will be solved especially in-between maritime rescue regions. Alert posts or coastal radio stations situated at the boundary of MSRR can easily communicate between the SAR regions. Therefore it will be necessary to make use of all the Naval observation posts in Guinea as mentioned in Chapter III para. 3.2.

In addition to the Coastal radio stations in Freetown, more alert posts should be established between Pointe Sallatouk on the northern border and River Manna on the southern border. The same should be done for Liberia starting from the Sierra Leone border to Riviere Cavally which is the end of the SAR region of Liberia.

7.3 Common International SAR Frequencies between the RCC/RSC and Emergencies.

The quantity and quality of information that can be sent by communication systems depends on the range, environment and propagation effects of the frequencies used and also the noise level in stations both on earth and in space. The choice of frequency is therefore a primary decision in design of any system. For more reliability, it is very necessary for RCCs/RSCs to be linked with each other and

have common frequencies to communicate with. However, for an organization like MRU, it is important to have the International frequencies common to maritime world so that any one in trouble while in MRU SAR region, knows where to contact for assistance. Since MRU SAR region is going to be divided into three separate SAR regions with three RCCs in each country, working under the same regional organization, it is vitally important to have common international frequencies. This will serve as means of contacting other distress vessels at sea.

7.3.1. Considerations should be given to the following international or distress or emergency frequencies:

- 500 KHz -International

- 2182 KHz-International voice distress, safety and calling.

- 121.5 MHz International voice aeronautical emergency and ELT.

- 156.8 MHz (Channel 16)-VHF FM International voice distress and international voice safety and calling.

7.3.2. SAR Dedicated frequencies are also international frequencies that could be without interference during SAR operations. Some of these are mentioned below:

- 3023.5 KHz - International voice SAR on scene

- 5680 KHz -International voice SAR on scene

- 123.1 MHz -International voice SAR on scene

- 1556.3 MHz (Ch 6)-VHF FM merchant ship and Coast Guard

All of these are international frequencies which can be adopted among the RCCs in the region and be made known to vessels using the route. Any other special frequencies to be used can be determined by the staff of MRU SAR Headquarters in Freetown.

7.3.3. SAR co-ordinating communications:

For the co-ordination and the control of Search And Rescue operations, rescue centres require communications with the ship in distress as well as with units participating in the operation. The methods and the modes of communication- (Satellite, terrestrial, voice, telex, telefax) used will be governed by the capabilities available onboard the ship in distress as well as onboard the assisting units. Where some or all are equipped with satellite terminals, the advantage of INMARSAT system for rapid, reliable communications including receipt of marine safety information can be realized.

A reliable interlinking of RCCs is important for global distress system in which a distress message may be received by RCC so many miles away as it happened recently-as reported in the news paper titled THE SEA No.87 under the article caption "Two maydays might have been hoaxes". The reliability of message sent is very important for the unit which needs assistance especially if the nearest RCC is not the best suited to provide the necessary assistance. Prompt relay of the message to the appropriate RCC is essential and any communication means whether landlines, terrestrial radio networks or satellite links could be used in such circumstances. To increase the speed and reliability of RCC-to-RCC, communications some RCCs have the capability of communicating via INMARSAT

system, using ship earth stations. The INMARSAT system brings to ships at sea the type and quality of modern communications which are available in the office ashore.

7.4 Global Maritime Distress and Safety System (GMDSS).

The present Maritime distress and safety system as defined in the international Convention for the safety of life at sea 1974 (the 1974 SOLAS Convention) is based on the requirements that certain classes of ships on when at sea, keep continuous radio watch on the international distress frequencies assigned in accordance with the international Telecommunication Union (ITU) radio regulations and also the acts of the World Administrative Radio Conference (WARC) which was held in Geneva 1979. These treaties will allow the GMDSS to be implemented through IMO. It will use both existing and new technology to improve speed and reliability of distress communications. Both satellite and radio communications will be used for ship-to-shore, ship-to-ship and RCC-to-RCC alerting.

Some of the systems included in the features are:
Digital Selecting Calling (DSC) and Narrow Band Direct Printing (NBDP). Some alerting signals in the GMDSS frequencies are such that the shore facilities providing these future service are scheduled to have 24-hour guards and direct connection to the RCC area:

- Satellite EPIRB signals, 406.025 MHz and 1.61125 GHz
- Satellite ship Earth station signals, 1.6 GHz band
- Digital Selective Calling, 2, 4, 6, 12, 17 and 156 MHz (FM) band.
- Navigation, Meteorology and urgent information broadcasting shore-to-ship on 518 KHz, using NBDP

telephone equipment.

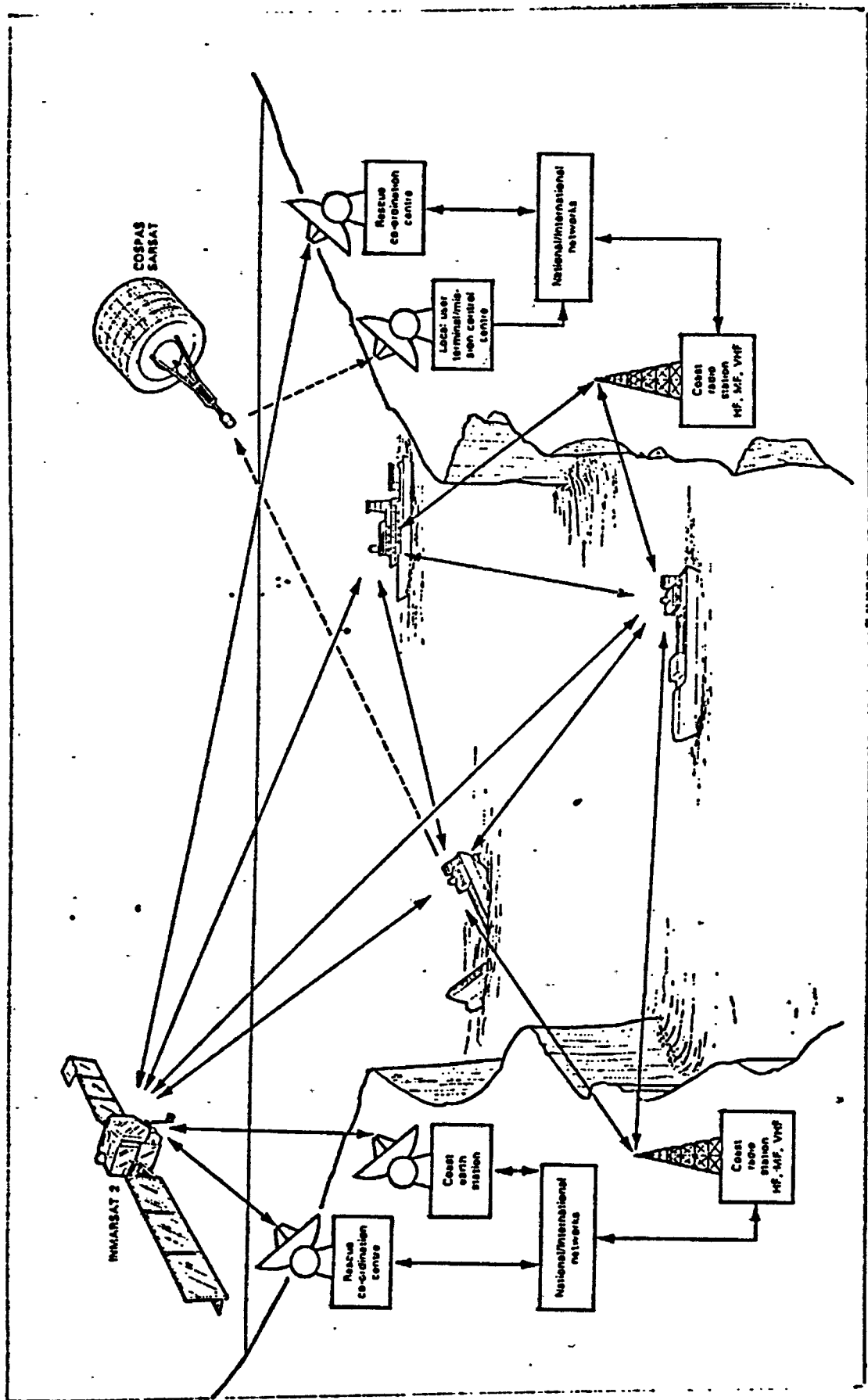
It is anticipated that GMDSS will be implemented in 1992 with additional seven years transitional period that means by 1999, all ships should be fitted with GMDSS equipment. Fig.1 shows complete concept of the Global system and how it works. It clearly shows the links between the INMARSAT, COSPAS-SARSAT, Coast Earth stations and RCCs.

However, it should be very clear that INMARSAT and the COSPAS SARSAT are two different system and in no one time that all these systems will be utilized at the same time.

The IMO has developed a new GMDSS to ensure a combination of safety and efficiency. Consequently, it is a largely automated system and will require ships to carry an range of equipment capable of simple operation. IMO approached this task by defining communications functions which needed to be performed by all ships and then specifying what equipment would meet those functional requirements in defined ocean areas of the world. All ships shall be capable of performing communications functions for the following:

Distress alerting- ship-to-shore Signal for locating
shore-to-ship, and ship-to-ship- Marine safety information
Search and rescue co-ordination- General radiocommunication
On-scene communications - Bridge-to-bridge communications

The ocean areas of the world have been divided into four different operational sea areas - Sea Areas A1, A2, A3 and A4 but we will be using only Areas A1 and A2 in MRU States.



General concept of the global system

Fig. 1

7.5 The COSPAS-SARSAT AND LOCAL USE OF TERMINALS (LUT)

Cospas-sarsat is an international satellite-based search and rescue system which was established in 1979 by Canada, France, the USA and USSR. The principle is based on the detection of distress beacons by four polar orbiting satellites. It is capable of locating an activated beacon to within 2km and was credited with saving a thousand lives in the first six years of operation. It was governed by a Memorandum of understanding of October 1984 until the International organization Cospas-sarsat programme Agreement was signed in INMARSAT's London headquarters.

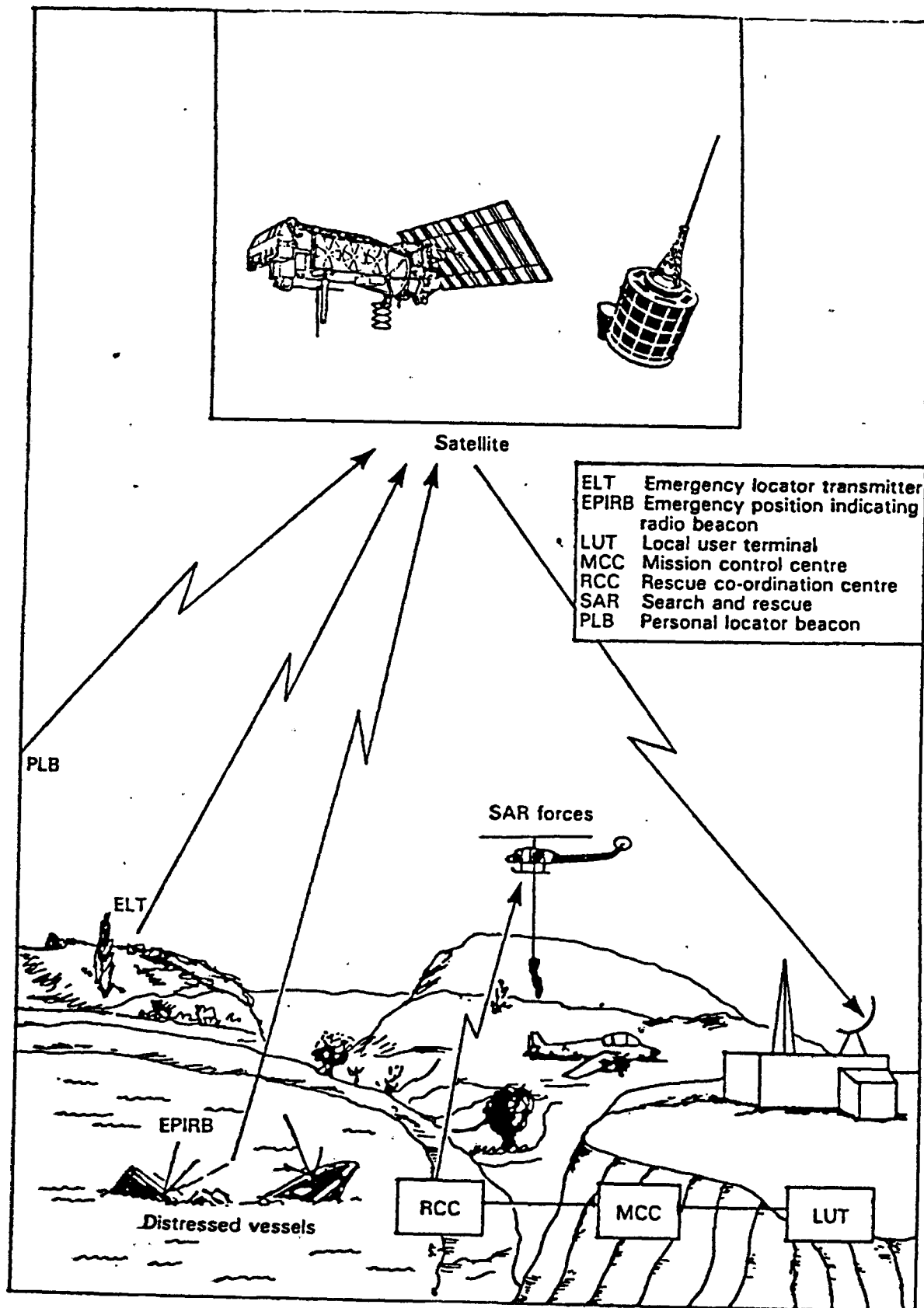
The Cospas-sarsat is designed to locate distress beacons transmitting on the frequencies 121.5 MHz and 406 MHz. The information stored in 406 MHz is not only relayed in real time but also time-tagged and stored for dumping as each LUT comes into view. This frequency therefore provides a global service with maximum detection time of about one and half hours. All satellite downlinks operate at 1544.5 MHz.

Distress signals which are picked by the satellites are relayed to local User Terminals for processing to determine beacon location. The information is passed to a Mission Control Centre (MCC) to alert the SAR authorities.

Mission Control Centres have been established in each country operating at least one LUT to disseminate information to appropriate Rescue Coordination Centres. Towards the end of 1988, there were 15 LUTs already existing in seven countries: Toulouse (France), Tromsø (Norway), Ottawa, Goose Bay, Edmonton and Churchill (Canada), Kodiak, San Francisco and St Louis (USA), Moscow, Arkangelsk,

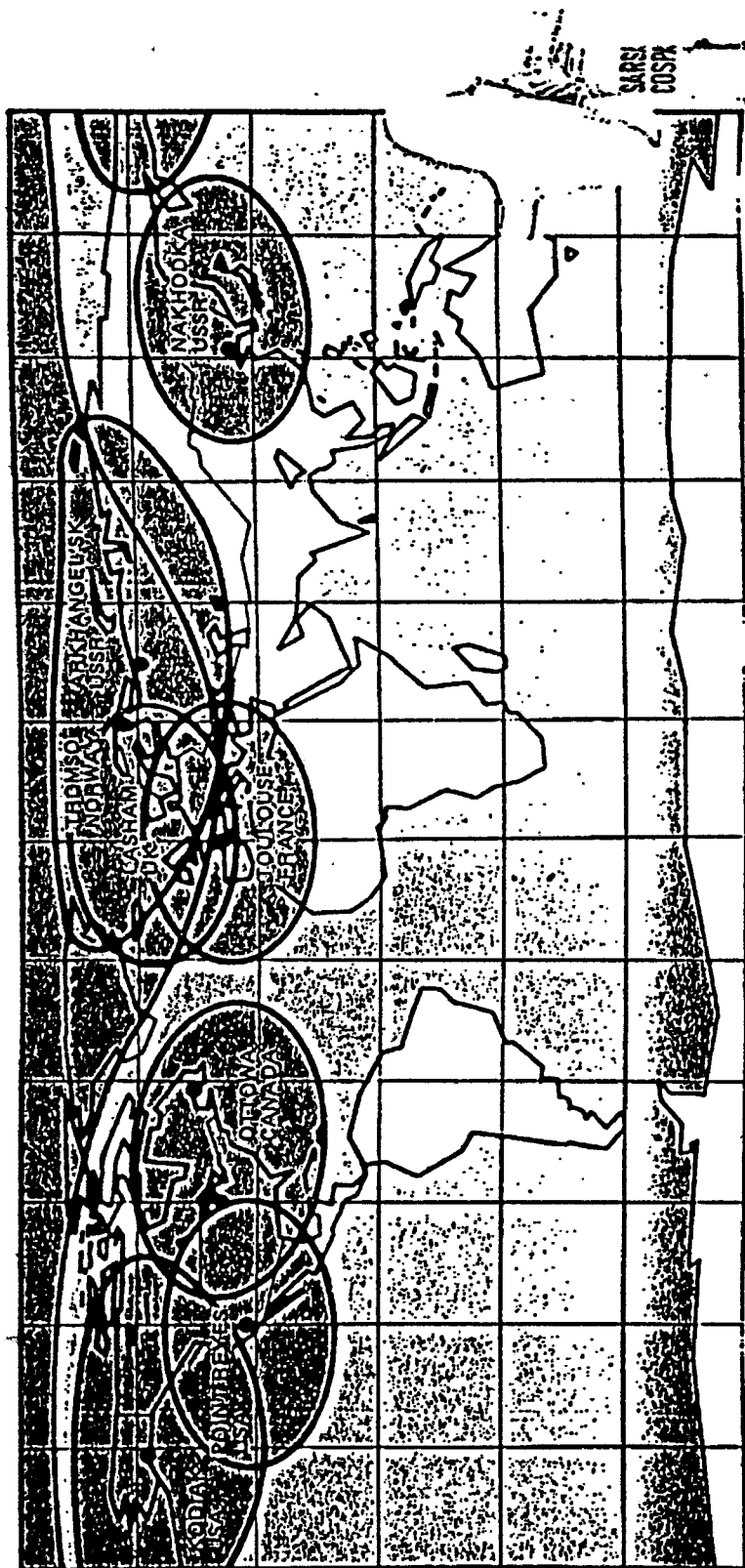
Novosibirsk and Vladivostok (USSR) Bangalore (India to be commissioned 1989), and Sao Paulo (Brazil). In addition to the four principal parties, Norway, the UK, India, Brazil, Sweden, Denmark, Italy, Japan and Chile are Cospas-sarsat participants.

Fig.3 shows the LUT realtime coverage. It can be seen from this that MRU States are not within the coverage area but it is possible to make use of the nearest LUT stations such as Toulouse in France when the satellite is moving from north to south or we can make use of the LUT at Ottawa in Canada while moving from south to the north. For this to be materialized, we have to make an agreement with both France and Canada in order to use their LUT stations. This however, may bring some financial involvement in which we have to pay a certain percentage of the running costs of the LUT stations. The other alternative is to have our own LUT station which may serve the whole of West Africa and ask the neighbouring countries to contribute towards the running cost. The advantages and disadvantages of having our own LUT station will have to be looked into and serious considerations be given to it.



Basic concept of Cospas-Sarsat system

Fig.2



LUT realtime coverage

Fig. 3

~~7.6 Link Between the RCCs and the Aeronautical Emergency frequencies.~~

Experience has shown that for speed and reliability, it is very important for the RCCs and Aeronautical emergency frequencies to be linked. If there is an incident in which we need the assistance of helicopters or otherwise, it will be easier if there is a communication link between the RCCs and ARCCs. In the Mano River Union States, we can make use of the ARCCs in Robertsfield in Monrovia, Control Tower in Lungi or Control in Conakry. Any of these will serve the purpose when required. It is dangerous to rely only on one ARCC because if there is any problem in that area such as the present crisis in Liberia it will be difficult to operate.

This link again is subject various conditions because it may be that in most cases the whole thing may be a failure especially if there has not been previous exercises between the RCCs and the aeronautical positions.

If we really want the link to work accurately, we must adopt a common system of general exercise to make sure that we are all aware of the need of having a common communicational link. Moreover, all the helicopters operating within the region on commercial bases should be forced to adopt the common linkage with the RCCs at all the times. Most of the helicopter crashes and failure to recover them is due to the absence of this procedure.

8.1.1. Evaluating Survivability.

When evaluating rescue response, survival time of personnel is the foremost consideration. The SAR Mission Coordinator should consider injuries or other medical conditions that may require special rescue response, such as the need for quick recovery or specialized rescue equipment.

Some of the factors to be considered are the number of survivors and the conditions in which they are. If their conditions are not known, it is necessary to assume the need for urgent medical attention. On the contrary, if their conditions are known, a detailed description of injuries should be obtained.

8.1.2. Environmental Factors.

There are many factors when considering the environment and these include:

2.1. Nature of the environment such as desert, arctic, ocean or swamp.

2.2. Location of survivors within the environment particularly survivors trapped in hazardous areas.

2.3. Weather conditions and potential effect on the rescue operations and life expectancy. When the weather is very severe, the problem of rescuing increases; The other very important factor is the time of the day particularly the effect of darkness on rescue attempt. This will be very pronounced in areas where the development is very slow and most of the facilities for detecting survivors at sea are not available.

2.4. Environmental constraints on rescue units used,
such as drift and availability of vehicles
and the landing or hoisting area.

Selection of rescue method usually depends on the environment on scene and survivor number and condition, sometimes this is left to the discretion of the on scene commander or SRU. However, the SAR Mission Coordinator (SMC) usually develops a rescue plan, and coordinate its execution in needed. The whole SAR planning and operation depend on the above mentioned factors including the selection of rescue facilities, special medical attentions and proper use of the rescue plan.

8.2. Awareness and Initial Action.

The awareness stage of any SAR system includes receiving and recording of information, maintaining the incident data and processing them on the incident processing form. When the SAR system becomes aware of an emergency or potential emergency, the information collected and the initial action taken are critical to SAR success. Information must be gathered and evaluated to determine the nature of distress, the appropriate emergency phase classification, and what action should be taken.

When the information is first received by the SAR system, this initiates an awareness stage. Normally persons or craft in distress may report the problem they are in and the required assistance or it may be that somebody observes the incident reports. It may also be that an incident or uncertainty may exist due to lack of communication from the overdue vessels or non arrival of

relatives or friends. In many cases, vessels may encounter problems at sea which may hamper their return, or people may be in trouble and not able to communicate back. If this happens, the relatives, friends or observers will bring this to the notice of the available SAR organization. If the SAR facility receiving the information is an operational facility, and the situation justifies, the facility then takes an immediate action to respond to the incident and report to RCC simultaneously. It is very necessary that the receiving and the recording of information should not delay other SAR response. If communication is established with a person or craft in distress, it should be maintained at all times. They should be advised of action taken. During this crucial stage, shifting of communication should be avoided. When a frequency shift is necessary, positive communication should be established on the second frequency before leaving the first. Incidents reported by telephone should be recorded in case additional information is needed later.

The incident data should be collected from the reporting source, with the most important information gathered first in case communication is lost. While engaged with this information gathering and the need for an immediate response is needed, SRU should be dispatched.

In completing the incident data, the following information is desirable:

6.2.1. Type of incident and the nature of the emergency:

This is very important because knowing the incident, the type of RU to be dispatched could be determined. Planning and action depends on establishing as accurately as

possible, the location of the incident. The person accepting the information should verify the location as well. The way the location given was determined, should be known. If it is a known position, reference marks and proper description of reference object(s) present should be given. The time at which the incident took place, or when the person or the craft was last seen or known to be in a verifiable location, affects search planning, especially datum computation.

6.2.2. Incident Processing forms:

RCCs and RSCs should complete information processing forms for each reported incident to ensure that important information is not overlooked. The form is a checklist of essential information needed and action to be taken, based on the reported type of incident, and should be filled in the SAR case folder.

Initial Action stage on the other hand is the period in which the SAR system begins response, although some activities such as evaluation, may begin during the proceeding awareness stage and continue through planning and operational stages until the case is over. Initial action may include SMC designation, incident evaluation, emergency phase classification, SAR facilities alert, and communications searches.

6.3 Allocation of SRUs along the Coasts.

In allocating SRUs along the whole Coastal region of MRU States, the following factors are to be taken into consideration:

8.3.1 Vessel Traffic Density

If we consider the whole Coast, there are, however, sectors of the economy which give cause for hope. For example, Guinea has strengthened its shipping activities considerably, as evident in the performance of the Port Autonome de Conakry. Between 1983 and 1987, the volume of containers handled reached a record of 415 per cent. In 1989 alone 605 ships of all categories berthed at the port; meanwhile, according to the head of the marketing division, all of the port operations have been computerised, and it is fast becoming one of the busiest ports in the region.

With this data on Guinea, one would expect a better allocation of SRU closer to Conakry, Freetown and Monrovia. The other additional factor that affects the allocation is the amount of people in one particular area along the Coast; which as stated earlier, in Chapter I (1.3) contributes immensely towards the considerations of this factor.

8.4 Helicopter Rescue Operations and Medical care.

The general principle applied to all rescue attempts whether at sea or on land, large or small, is that the optimum amount of assistance should be provided to ensure the best chance of success. On major rescues, such as a serious maritime incident, there is a need to apply and coordinate the maximum amount of effort at the earliest opportunity to try to prevent further escalation before the vessel sinks, so that the chances of 100% success are that much higher. It may therefore be desirable to utilize all forms of rescue, in a co-ordinated manner, rather than rely on a single method of

evacuation. Poor weather, rough seas or darkness may actually rule out evacuation by one or more means such as ship to ship transfer; moreover, the survivors who have taken to lifeboats may be free from the sinking vessels but still need to be rescued from their potentially serious situation. With this in mind, I would like to discuss the relevance of helicopters as part of the rescue team, in incident involving high sided vessels.

Helicopters may provide the quickest form of assistance when recovery and transport to a medical facility is needed. Normally the SMC will select, based on the knowledge and the local capabilities, a suitable medical facility to receive injured survivors. But in most cases when an incident occurs at a far distance, the safety of survivors, depends on the availability of helicopters to rescue them, and also the medical attendance given to them. During the rescue operation the personnel onboard ships should be careful for the static electricity which could be caused by the strobe. The Pilot should earth it either on the sea or on the deck before handling it.

6.4.1 Aircraft Capabilities:

Helicopters fly at approximately 120 knots or 2nm per minute, so that if employed along the Coastal areas of MRU States, they are able to transit easily and perform the task very easily. For winching operations from ships, the length of rescue hoist cable is not a critical factor and all modern SAR helicopters operate with very long winch cables. Speed of cable operation is important so that accurate winching can take place over heaving decks to avoid premature lifting of survivors. All military helicopters have winches capable of coping with the heave

of most large vessels in all but the most severe sea states. These are the type of helicopters we are going to utilize.

Automatic flight control systems incorporating radar and auto-hoover facilities may assist helicopters in approaching the vessels in poor weather or night, but are not able to cope with the movement of large vessels and therefore hovering would be manually controlled by the pilot under the directions of the winch operator.

8.4.2 A Gathering of forces:

The RCC will decide the level of response to each incident. In order to accurately assess the seriousness of the situation, they will require two vital pieces of information. Firstly, an accurate position, particularly if the weather is poor with reduced visibility. Helicopter navigation equipment works in latitude and longitude, so ideally this should be given and cross-checked with a range and bearing from a known mark; secondly, an accurate figure of the numbers to be rescued is also essential.

In winching operations, every helicopter pilot knows that quick and efficient winching demands accurate flying and good organization of the casualties onboard. Winching is relatively a slow process and to winch two survivors at a time, will have a maximum effect on an aircraft load (up to 20). On the other hand, a vessel without power will almost certainly be drifting downwind in an uncontrolled manner, not only changing its axis relative to the wind, but also rolling and pitching in an unpredictable way. Winching from a drifting ship is therefore more hazardous than from a ship maintaining steerage or even at anchor.

6.4.3 Transfer of Passengers:

Once an aircraft is full, it must transfer its survivors either to the nearest shore or to another vessel. The distance from shore or the close availability of ships which can accept helicopter landings will have a significant effect on the length of time needed to evacuate a ship. Under ideal conditions, I would say that the quickest and most preferable means, would be evacuation by helicopters which are able to land on the casualty and also on the nearby vessel and able to rescue the survivor. The least suitable method of evacuation must be the ditching of the passengers into the liferafts, to be rescued by small ships, helicopter or perhaps hovercrafts whilst others are slowly winched directly aboard helicopters from a limited deck area..

6.4.4 Coordination of Effort:

As stated earlier, an on scene commander must be put in control of the rescue operation. This is essential if the rescue is to succeed without further disaster occurring. He must allocate the rescue priorities, whether it is a clearance for an attempt at a ship to ship transfer, or if that is not possible, tell the surface and airborne units to rescue the people in the liferafts or those left on deck. The "ANTRIM PRINCESS" incident demonstrated that uncoordinated effort can lead to further disaster. During this incident, an attempt was made to fire a line to the casualty vessel whilst winching was taking place. The line did not reach the Antrim Princess but caught the helicopter hovering over the stern deck and became

entangled in the rotors. The helicopter however, made a safe landing on the nearest shore but 250 feet of lines was wound around the tail rotor and more a predictable result should have been a crashed helicopter on the deck.

8.5 Probability of detection (POD) of distress.

Probability of detection (POD) can be explained as the probability in which the search object will be detected provided that the object is in the area searched. It is considered to be the function of coverage and the total number of searches to be carried out in an area. This will clearly describe the effectiveness of the multiple searches. In conducting any searches in a particular area, the SMC may specify the probability of detection (POD) and determine the coverage factor (C). This coverage factor is determined with an assumption that search patterns will be executed precisely, sweep width is constant through out the search, and the search object is in the search area.

Considering an area that has already been searched, several times with all the appropriate corrections made for drift, the main coverage factor is therefore obtained by averaging the individual search coverage factors. This is then used with the appropriate search curve as shown in the Annex to determine the cumulative probability of detection (POD). If we need to extend search to a sixth or subsequent search, the fifth search curve from the diagram in the Annex should be used. It is the duty of SMC to calculate a cumulative (POD) at the end of each search. This will help the SMC to assume that a high cumulative (POD) for successive searches of an area without locating the target may indicate that the target was not in or has drifted out of the search area and coverage. For further

searches which involve multiple resources, an overall coverage factor is calculated and this coverage factor is used with the first search curve in the Annex to determine the (POD) for the total area searched. If the search is unsuccessful, the search area should be expanded by using the search radius safety factors. The (POD) of that particular search is determined as before.

The (POD) of the victims along the coast of MRU States will be very difficult because of several reasons as follows:

- The effect of tide currents and winds are different from one local area to the other.

- The SMCs would have to know all of these places and apply accurate calculation method as soon as the incident occurs and with strong belief of probability of detecting the distress in such places.

- The SAR organization or SRUs should be more professional in conducting their job and avoid the myth of traditional belief of super natural powers in certain areas of the sea which makes it very difficult for the distress to be located. The data have to be accurately calculated after taking into account the effect of wind, current and leeway on the object at sea.

- Moreover, we should also consider the type of equipment we have for detection; a man in the water may not be easily detected due to the poor state of equipment. Or in the case of rainy season, the erosion brings a lot of mud from the land, which makes the coastal waters very dirty, extending to quite a considerable distance away from the coast. In

actual fact, it is not easy to distinguish a man from a log.

Finally, most helicopter pilots are not at all that trained for SAR purposes in the sub-region, so as they fly over, it is difficult for them to do the search as well. However, with time and training, most of these difficulties will be overcome.

8.6 Public Relations and Documentation.

Public relations and documentation play a vital role in accomplishing SAR mission. The policy adopted in SAR is to inform the public about the SAR system, and the action taken within the limits of security. When an incident occurs, the early release of information should be made periodically in order to keep the public informed on the progress. The final release should be made to summarize the entire mission, when it is concluded.

There should be strong cooperation with news media, all information concerning a SAR mission should be released to all interested media simultaneously. Only specific requested information should be provided to individuals. However, if similar requests are received before the information is provided, then each reporter who has placed a request for the same information should be advised that the same request has been received. On the other hand, if a request for similar information from not more than three reporters is received, the information should be provided simultaneously to each.

If the request received for similar information is more than three, then the request media should be advised that

--the information will be provided to all of the them at the same time.

--There is a proverb which says a man cannot be an island to live all alone and succeed. Applying this to SAR organization to live and succeed in its operations, it will need the assistance from the public. By making requests through the news media, the organization will no doubt gather adequate information within a short period of time. Some of this should relate to sighting and unusual occurrences.

--The documentation aspect of SAR operations involve keeping records on all SAR missions such as logs, forms, folders, charts and reports. We should bear in mind that no one SAR operation is similar to the other, therefore each one is handled differently. For this reason, there is a file on every SAR case with logs and diaries which provide the written records of SAR activities.

--In order to enable identification of the nature of the case, the craft involved and where the incident takes place, each SAR case is normally assigned a number and title as soon as the SAR system is notified of the case. It is the responsibility of the area SAR coordinator to determine which numbering system to be adopted by the subordinate SAR coordinators. Proper documentation is very important not only in the SAR operations but in proper record keeping in most organizations. The case narrative log for example is opened for every SAR case and filed in the SAR case folder. In case of any required reference or accident, the documents on SAR operations can always be referred to. There are so many other logs kept on SAR documentation such as SAR operation log, case narrative

log,RCC diary and information case log.All these logs,forms and diaries are for proper documentation.

8.7 SAR MISSION CONCLUSION.

The final stage of any SAR mission is known as SAR mission conclusion.This can be termed successful provided that the search objects are located and recovered or unsuccessful if the search objects are not located and the SAR mission is suspended.

The idea of suspending a SAR mission is a very difficult one,because each SAR case should be considered on its own circumstances and a great care is to be taken not to suspend the search prematurely.Before even suspending a SAR case,it is very necessary to make a thorough review,taking into account several factors such as the probability of the object surviving after the incident,the probability that the victim was within the calculated search area,the quality of the search effort which is very important in convincing aspect from the view point of the relatives and the consensus of several search planners.It is advisable to record the reasons of suspending the search.

Notifying the relatives on the suspension of a search is always a hard task;this should be made one day before the actual suspension of the search by SMC to the relatives of the distress or missing persons.The relatives will easily be willing to accept the decision provided that they have been allowed to follow the progress of the search.It is important that the SMC maintain daily contact with the relatives to provide information and keep them in touch

with the future plan; providing access to SMC headquarters, if possible enable the relatives to see the search effort been undertaken by the organization. Having been physically present, if the SAR mission is suspended, the relatives will accept it with courage and great respect for the SAR organization.

The final mission conclusion step however, is documentation. This is an official record used for statistical analysis, system feedback, improvement and for private and judicial purpose. With the documentation also, at the headquarters, mistakes can always be recognised and corrected.

6.6 Training and Seminars.

In order to reach the highest level of competence and perform the necessary tasks of saving lives and properties at sea, the head of SAR organization will establish training programmes for the SAR personnel. These should comprise of formal training which in fact is the application of SAR procedures, techniques and equipment through lectures and practical demonstrations. Some times, it is necessary to conduct an applied training which entails assisting and observing the actual training. Depending on the situation, the third type of training known as synthetic training may also be adopted. This type of training is purely participation in actual SAR operations which they have been taught.

Due to the fact that MRU SAR organization will be on the initial stage of formation, most of the training will be of the combination of the three with more emphasis on formal and applied which will be given a strong foundation to the personnel.

One important area that the training should cover is the first aid. This should consist of formal instructions and demonstrations and comprehensive exercises given by a doctor. Considering the proposed composition of MRU SAR organization, it is evident that there are medical facilities in each of the three countries. In Sierra Leone for example, the Army Medical Services (AMS) should be made use of and also the appropriate training aids should be utilized. The personnel should be trained in the use of all the equipment for removing survivors from the water. The training should also include fundamental first aid as mentioned above with emphasis on revival of the partially-drowned and treatment for shock, prolonged immersion, burns and hypothermia (this is possible only if the victim stays in the water for a very long time).

In the past, there have been a lot of seminars such as the Global seminars on search and rescue in Leningrad USSR, sub-regional seminar and workshop on maritime search and rescue held in Lagos, Nigeria 16-20 of May, 1988 and so many more under the auspices of IMO. It is through these seminars that we develop better understanding and improve our capabilities. When MRU SAR organization is established, follow up seminars will be arranged within the member States which will be extended to other States in the region with IMO as a participating group to share their experience with us. It will also be easier to have common exercises so as to see our mistakes which will serve as the starting point of training.

There are two Maritime Training schools in the sub-region: Marshall in Monrovia and Siaka Stevens Training school in Freetown. With adequate facilities and experienced

--instructors, basic knowledge of SAR operation can be
--taught. For further advanced studies on the subject, it is
--possible for each of the three countries to send their
--personnel to U.S. Coast Guard school, York Town Virginia
--or other places as well where the topic will be taught in
--detail. But until then, we must make use of the our own
--facilities and perform what is practical on actual
--location which will be very familiar to us.

--8.9 Crewing of rescue units-qualification.

--The success of any SAR operation depends as I have
--mentioned before on the knowledge and the experience of
--those performing the operations. In the case of MRU SAR
--organization, it will be necessary for rescue units to come
--directly from the armed forces since the voluntary
--organizations are very few in this region. More over, the
--Navy or Coast Guard are far more experienced than any
--other organization in the area. Therefore, the crew should
--come directly from there with few experienced personnel
--from the civilian ports.

~~8.10~~ USE OF COMPUTER IN SAR CALCULATIONS

In the past, when an incident occurred, the personnel at the rescue co-ordination centres had a lot of problems in calculating the data resulting in a specific area where to carry out the SAR operation. This was a difficult task because all the calculations were done manually.

Time is the main element in SAR success, and a person or object in the water has several elements influencing it. From the time an incident occurs, wind, current and other phenomena will be acting on it, making it very difficult for the rescue units to go out and locate the distressed immediately. The success therefore depends on the calculation done for the probable area of location after considering all the factors that affect the distressed while in the water.

In most of the RCCs nowadays, the calculations are done by computers by using a very simple basic programme. Below is an example showing how such a programme can be used to calculate the total probable error starting from an initial position error. By applying simple formula on the information obtained from different sources, we will come out with the desired search radius and also the optimum search area. Knowing all these factors, the rescue unit can proceed straight to the location. This result can be compared with the manual calculation shown in Annex III. Some of the basic formulae used in the calculations are shown below:

Total Probable Error (E) = $\text{Sqr } D_e^2 + X^2 + Y^2$
and all the others can be calculated in the same way.

```

10 CLS:KEY OFF:'clear the screen
15 DE=64.2
20 PRINT "Initial Position Error (X)":PRINT
30 PRINT "1. Navigational Fix Error (FIXe) ";
40 INPUT FX :PRINT
50 PRINT "2. Navigational DR Error (DRe) ";
60 INPUT DR:PRINT
70 X=FX+DR
80 PRINT "3. Initial Position Error (X) ";X
90 PRINT:PRINT
100 PRINT "S R U Error (Y)":PRINT
110 PRINT "1. Navigational Fix Error (FIXe) ";
120 INPUT FX1:PRINT
130 PRINT "2. Navigational DR Error (DRe) ";
140 INPUT DR1:PRINT
150 Y=FX1+DR1
160 PRINT "3. Initial Position Error (Y) ";Y
170 PRINT:PRINT
180 PRINT "Total Probable Error (E) ";
190 E=SQR(DE^2+X^2+Y^2)
200 PRINT USING "####.#";E
210 LOCATE 22,30:PRINT "Press any key to continue..."
220 AS=INKEY$:IF AS="" THEN 220
230 CLS
240 PRINT "Safety Factor (fs) [1.1; 1.6; 2.0; 2.3; 2.5] ";
250 INPUT FS:PRINT
260 PRINT "Desired Search Radius (R) "
270 R=E*FS :PRINT
280 PRINT "1. Search Radius ";R:PRINT
290 RO=INT (R):IF RO<R THEN RO=RO+1:PRINT
300 PRINT "2. Rounded Search Radius (Ro) ";
310 PRINT RO:PRINT
320 PRINT :PRINT
330 PRINT "Optimum Search Area (A)":PRINT

```

```

--340 PRINT "1.   Square ( $A = 4 \times Ro^2$ )           ";
--350 A=4*RO^2
--360 PRINT A:PRINT
--370 PRINT "2.   Circle ( $A = 3.14 \times Ro^2$ )       ";
--380 A=3.4*RO^2
--390 PRINT A
--400 LOCATE 22,15:PRINT "Do you want to make other
--calculation (Y/N)? 410 A$=INKEY$
--420 IF A$="y" OR A$="Y" THEN RUN
--430 IF A$="n" OR A$="N" THEN 450 ELSE 410
--450 CLS:END

```

--With this programme, we can calculate all the necessary information we required. Some of these are shown in the print out as shown below. It can be seen that by putting in the navigational Fix Error (FIXe) and navigational DR Error, we can easily get the position Error (X) which is the sum of the two.

PRINT OUT OF THE BASIC COMPUTER CALCULATION PROGRAMME.

Initial Position Error (X)

| | |
|----------------------------------|--------|
| 1. Navigational Fix Error (FIXe) | ? 2 |
| 2. Navigational DR Error (DRe) | ? 27.6 |
| 3. Initial Position Error (X) | 29.6 |

SRU Error (Y)

| | |
|----------------------------------|-------|
| 1. Navigational Fix Error (FIXe) | ? 1.0 |
| 2. Navigational DR Error (DRe) | ? 0 |
| 3. Initial Position Error (Y) | ? 1.0 |

| | |
|---------------------------------|-------------|
| Total Probable Error (E) | 70.7 |
|---------------------------------|-------------|

Press any key to continue...

Safety Factor (fs) [1.1; 1.6; 2.0; 2.3; 2.5] ? 1.6

Desired Search Radius (R)

| | |
|------------------------------------|----------|
| 1. Search Radius ($E * fs$) | 113.1235 |
| 2. Rounded Search Radius (R_o) | 114 |

Optimum Search Area (A)

| | |
|----------------------------------|---------|
| 1. Square ($A = 4 * R_o^2$) | 51984 |
| 2. Circle ($A = 3.14 * R_o^2$) | 44186.4 |

Do you want other calculation (Y/N) ?

If the answer is yes, then calculation continues if no then you quits the calculations.

CHAPTER IX

9. SUMMARY AND CONCLUSION.

9.1 SUMMARY

In order to have our SAR organization established in the Mano River Union States, the author first of all considers several factors which will help the establishment. Looking into the geographical location of the sub-region, the nature of the weather conditions especially during the rainy seasons, ethnic and economical links, there is enough evidence and requirement for the SAR organization in the sub-region. At the beginning of the project, the question was to carry out such establishment which has never existed in the region before; and what form should it take? This of course is where the thought of regional cooperation came in as required by the UN, IMO and many other international organizations.

Mano River Union is one of such organizations in the sub-region that links the three neighbouring countries- Sierra Leone, Liberia and Guinea. From the survey of the present SAR resources in each country, it is clear that none of the three States is capable of establishing an effective SAR organization unless co-operating with another State and that is why MRU is very suitable for the purpose. The whole project is divided into two parts:

Part I: This part deals with the general overview of the sub-region, which is divided into three chapters; which are as follows:- Chapter I; the region, its location, the people, economics and the

politics. Chapter II; the weather conditions in all forms, the type of weather found in the sub-region and its effect on SAR operations.

Chapter III; which is the final Chapter in this part of the project, deals with the total maritime SAR region, the area of responsibility, the available resources and the needs for improvement through regional cooperation and also the additional requirement for the SAR establishment.

Part II; of the project deals with recommendations on SAR establishment in the sub-region. This part is also divided into six different chapters starting from:

Chapter IV; the formation of the actual authorities of MRU SAR organization, the location of the Headquarters and the composition of the staff from the three member countries. It also deals with the legal aspect of SAR operations and how to carry it out in relation to another countries SAR region.

Chapter V on the other hand, covers problems of SAR establishment in developing countries, how to make an agreement and solutions towards the establishment of SAR. One area that is strongly emphasised in this Chapter, is the movement of the rescue Units in each others SAR region which will facilitate the SAR operations. Chapter VI is purely on delimitation, establishment of RCC/RSC and SAR organizations. This Chapter measures the area of responsibility for each State and gives correct coordinates and boundaries and also the level of coverage.

Chapter VII is on all aspects of SAR communications, coastal radio stations and satellites. It also mentions common international SAR frequencies for easier communication not only for the members but also for all

those plying the route along the coast of MRU States. GMDSS, COSPAS-SARSAT and the principle of Local Use of Terminals are also discussed in details. In addition, a close look is made into the possibility of using LUTs in the sub-region either from France or Canada or to have our own LUT station in the sub-region.

Chapter VIII is one of the most important Chapters in the project which deals with the actual rescue planning and operations, the relationship between the SAR authorities and the relatives of distress person(s), probability of detecting distress, and the training aspect of SAR which gives better performance and positive results in most SAR operations which extend to capability and the knowledge of the people conducting the operations. If the personnel conducting the SAR operations are not properly trained, the success of detecting the distress is very marginal. This is where the staffing of the SAR crew becomes very important.

Chapter IX is the final Chapter in this project and is self explanatory; it deals with only the summary of the whole project and making conclusions. In addition to the nine Chapters, there are two Annexes and abbreviations. Annex I illustrates the climatological conditions in the sub-region including the flow of current and wind covering the whole year while Annex II gives details on reported cases of drowning and sea accidents from the police records in the three countries for seven year period starting from 1983 to 1990. ANNEX III gives the probability of detection graph, search patterns and effort allocation worksheet and temperature graph. Finally abbreviations which are shortened forms of words used in the project are also given.

--9.2 CONCLUSIONS AND RECOMMENDATIONS.

In making conclusions of this project--"Establishment of Maritime Search And Rescue Organization in Mano River Union States", I would like to add some personal recommendations which in my opinion should help the implementation.

--9.2.1 A Maritime Search And Rescue (MSAR) organization should be established in the Mano River Union States under the auspices of the Mano River Union.

9.2.2 The authorities of this MRU SAR organization be created;and the Governments of the three member countries to be such authorities.

9.2.3 The Headquarters of the MSAR organization to be in Freetown and to be within the framework of MRU organization.

--9.2.4 The staff of the organization to be drawn from all the three member countries and work directly under the Secretary General of Mano River Union.

--9.2.5 The organization to make use of the two Maritime Training Schools in the sub-region for training the crews of the rescue boats.These two Schools are: Siaka Stevens Marine School, Freetown Sierra Leone, and Marshall Marine Training School,Monrovia,Liberia

--9.2.6 RCC/RSC to be established in each country under the control of Sierra Leone Navy,Coast Guard in Liberia and Marine Nationale in Guinea.

- 9.2.7 Coastal Radio Stations and observation posts to be established along the whole coastal region and also establish a link with the nearest Coast Earth Stations (CES) either in France or United Kingdom.
- 9.2.8 MSAR organization to make use of the MRU communication school in Freetown to train its personnel in communications especially in the use of international communication frequencies.
- 9.2.9 The locations and agreed frequencies of all RCC/RSC and observation posts to be made known internationally and also to every one plying the routes in this sub-region.
- 9.2.10 With the advice of the authorities of MSAR organization, the MRU Secretariate is to approach the Governments of Canada and France for the use of their LUT Stations when the satellites are either north or south bound covering our own sub-region.
- 9.2.11 The organization to make plans for future establishment of our own LUT stations in the sub-region which may be extended to other States in Africa.
- 9.2.12 The Governments of the member States as a matter of priority, approach a number of friendly

developed nations and international organizations

through MRU for technical and financial assistance in establishing the Maritime Search And Rescue (MSAR) organization in the sub-region in keeping to the ideas of regional cooperation.

9.2.13 All the special SAR agencies within the sub-region are to be informed on the establishment and the role they will play when required in assisting SAR operation. It is important to note that these agents are not limited to ship owners alone but may include every individual that may contribute in rescuing distress at sea.

9.2.14 The aims and objectives of the Maritime search and rescue organization shall be: to rescue all distress person(s) and properties within the MRU States, to have free access to each others SAR region and strengthen the regional cooperation among the member States.

9.2.15 Finally, as soon as the MSAR organization is established, the Secretary General of IMO should be informed by MRU organization.

~~9.3~~ UTILIZATION PLAN OF PRESENT SAR RESOURCES

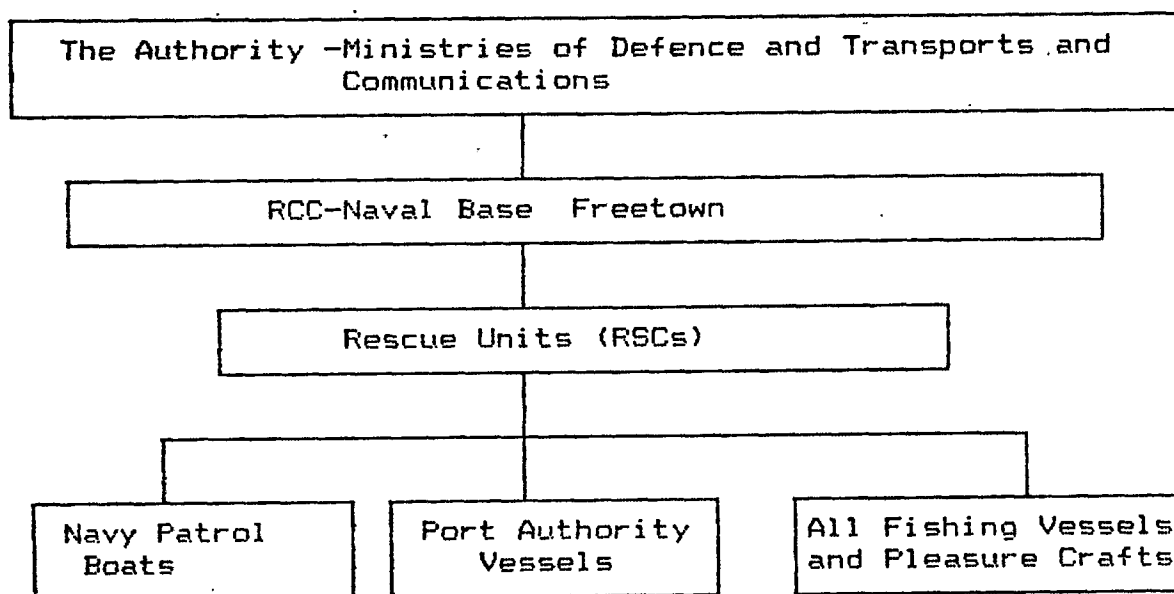
The summary, conclusion and recommendations made so far are based on the availability of funds to implement them. The actual implementation of this project can only be possible and effective provided there are enough funds. However, we cannot say that if the funds are not available to carry out the actual implementation of the project, that we should perform the SAR operations as required; then we are not doing what is expected of us in saving lives and properties of our people.

With regards to this, it is very necessary to make use of the present resources in each country to carry out the operations. In order to accomplish this, it is necessary to make a very simple plan that will take the following format:

9.3.1 A simple SAR organization to be formed in each country to handle present SAR problems until funds are available for the final implementation of the project.

Such a basic organization should make use of all the present available resources including equipment and personnel and the formation should look as shown below.

In order to make use of the present SAR in the MRU States pending the availability of funds to implement this project, a simple SAR organization is drawn below for Sierra Leone which is applicable to the other two States with slight modifications depending on the maritime set up in those countries.



All the operations should be under the Navy and in addition to the above organization, Customs, Police, Airforce and Fire Brigade should be involved when necessary and they should be made to understand that their cooperation is highly needed. It is also very important to involve some voluntary organizations in some areas especially in the villages along the coast.

- Any incident at sea shall be reported directly to RCC in
- Freetown through any available means including Marine
- communications. The RCC in Freetown shall be operational
- for 24 hours period and there shall be a standby rescue
- unit available all the time. The commercial helicopters
- operating in the area shall be informed about their
- assistance when required.

- As I mentioned above, even though this plan is made for
- Sierra Leone, the same could be done in Guinea and Liberia.
- In addition to the formation of these basic RCCs or RSCs,
- there should be observation and alerting posts along the
- whole coast. Moreover, the local fishermen should be
- educated how to report SAR cases to RCC and also render
- services to those in need of help at sea.

The RCC/RSC established in Conakry -Guinea should take the
- same format and be directly under the control of the
- Marine Nationale. The rescue units should also use the
- present available resources mentioned in Chapter III.

- A similar plan could have been drawn up for Liberia to
- carry out the basic search and rescue operation. But we
- have seen in the present Liberian crisis that one of the
- Coast Guard Patrol boats was taken over by the rebel
- Forces opposed to the Liberian Government. This boat has
- been used to bombard the City of Monrovia instead of
- saving the people from the war zone areas. With such
- developing situations in that country it is very difficult
- to say what type of basic SAR organization is suitable for
- the people until conditions are favourable again

-9.4 PRESENT POLITICAL SITUATION IN THE REGION

The worsening situation in Liberia has perhaps created problems for the other neighbouring countries- Sierra Leone, Guinea and Ivory Coast. At this moment, many people would like to ask questions relating to Mano River Union such as what impact has the Liberian crisis had so far on Mano River Union and the neighbouring countries.

As I mentioned before, the MRU is three sided:

Liberia, Sierra Leone and Guinea; and with the present situation in Liberia, the MRU is seriously dislodged. Liberia which is a founder member cannot now participate effectively until the bloody war which has wrecked the country is brought to halt. The organization is bound to suffer, and especially the refugee question appears to be causing some concern regionally as the MRU States of Guinea and Sierra Leone are harbouring over 200,000 refugees.

The crisis which was considered to be an internal problem of Liberia, has escalated so much that it is now beyond the control of the MRU States. Another larger regional organization known as Economic Committee of West Africa States (ECOWAS) with its headquarters in Lome, Togo is now working on possible solutions of the crisis. One of the positive steps taken by ECOWAS is to organise a peace keeping force now present in Liberia composing of soldiers drawn from Nigeria, Ghana, Guinea and Sierra Leone. The main task of the peace keeping force is to enforce cease fire and create a clear atmosphere for interim government which is now formed by the Head of States of ECOWAS member countries and to look into the affairs of Liberian people until a proper Democratic Government is established.

Quite recently, developments in Liberia deteriorated so badly that on 9th of September Samuel Kayon Doe was captured by the troops of one Prince Yormie Johnson, one of the rebel factions fighting in Liberia. During the struggle of President Doe's capture, fifteen of the peace keeping forces lost their lives. The late president was injured on both legs and his death was announced on the 10th of September.

As stated in Chapter I, para. 1.5, another chapter is yet to be opened for the political structure of the country. However, I believe that with an appropriate plan of action re-establishing peace and security, and the creation of the necessary conditions for normal Liberia, the MRU would come back to life; then and only then implementation of this project will take a proper footing. That is something I am very optimistic of the future.

ANNEX I

REPORTED CASES OF DROWNING AND ACCIDENTS ALONG THE COASTS OF MRU STATES FROM 1983 TO 1990.

| S/N | DATE | TIME | PARTICULARS | REMARKS/Investigator |
|------------|-------------|-------------|--|--|
| 1. | 18/83 | 0814 | Tombo Beach Drowning | Investigated by D/Cons.1294 Bangur F.A.(SLP). |
| 2. | 13.12.83 | 1325 | Tombo sea Drowning | Case reported by Malikie Kanu No.8 Lower Savage Square |
| 3. | 25.12.83 | 1945 | Lumbley Beach Drowning | D/Cpl.986 Kamara, A.M. |
| 4. | 2.4.84 | 1040 | At sea off Cape Drowning | D.P.C.2215 Sesay S. |
| 4. | 25.8.84 | 0746 | Juba Bridge Lumley Drowning | D.P.C. 797 Sanpha K. |
| 5. | 3.9.84 | 0815 | Cline Town Drowning | D.P.C. 3912 Gbani J.E |
| 6. | 24.9.86 | 0850 | Panguma Saw Mill compound Drowning | D.P.C.814 Chaywai L. |

| | | | | |
|-----|----------|------|--|----------------------------|
| 7. | 12.11.86 | 1204 | 3, Brook Street, Freetown, Drowning | D.P.C. 2426 Koroma A.C. |
| 8. | 12.11.86 | 1210 | Drowning of Ibrahim Sowe Mabela Wharf | D.P.C. 2378 Yayah A. |
| 9. | 20.12.86 | ---- | Drowning of Jibao Lasayo Aberdeen Bridge | D.P.C. 1296 Sanpha K. |
| 10. | 14.12.86 | --- | Drowning of James Jones Circular Rd. and Jacob Conteh 34, Hill Street at Goderich. | D.C.P. 3109 Williams |
| 11. | 26.9.87 | ---- | Drowning of Alfred Coker of Gbendembu village at Sussex Beach. | D.C.P. 2262 Bangali |
| 12. | 27.12.86 | --- | Drowning of Edward Decker at New Town Tokey Beach | D.C.P. 3109 Williams |
| 13. | 22.11.89 | | Drowning of unknown body at Cockle Bay Wharf | D/Cpl. 1009 Lahai |
| 14. | 1.1.90 | 1550 | Drowning of Victor S. 36, S.W/Loo. Freetown | D/Sgt. Stanley |

| | | |
|------------|--|---------------------|
| 15. 1.1.90 | Drowning of Christian Pessima of 152, King George Avenue, Kissy Dockyard, Freetown. | D/Cpl.1009 Lahai |
|------------|--|---------------------|

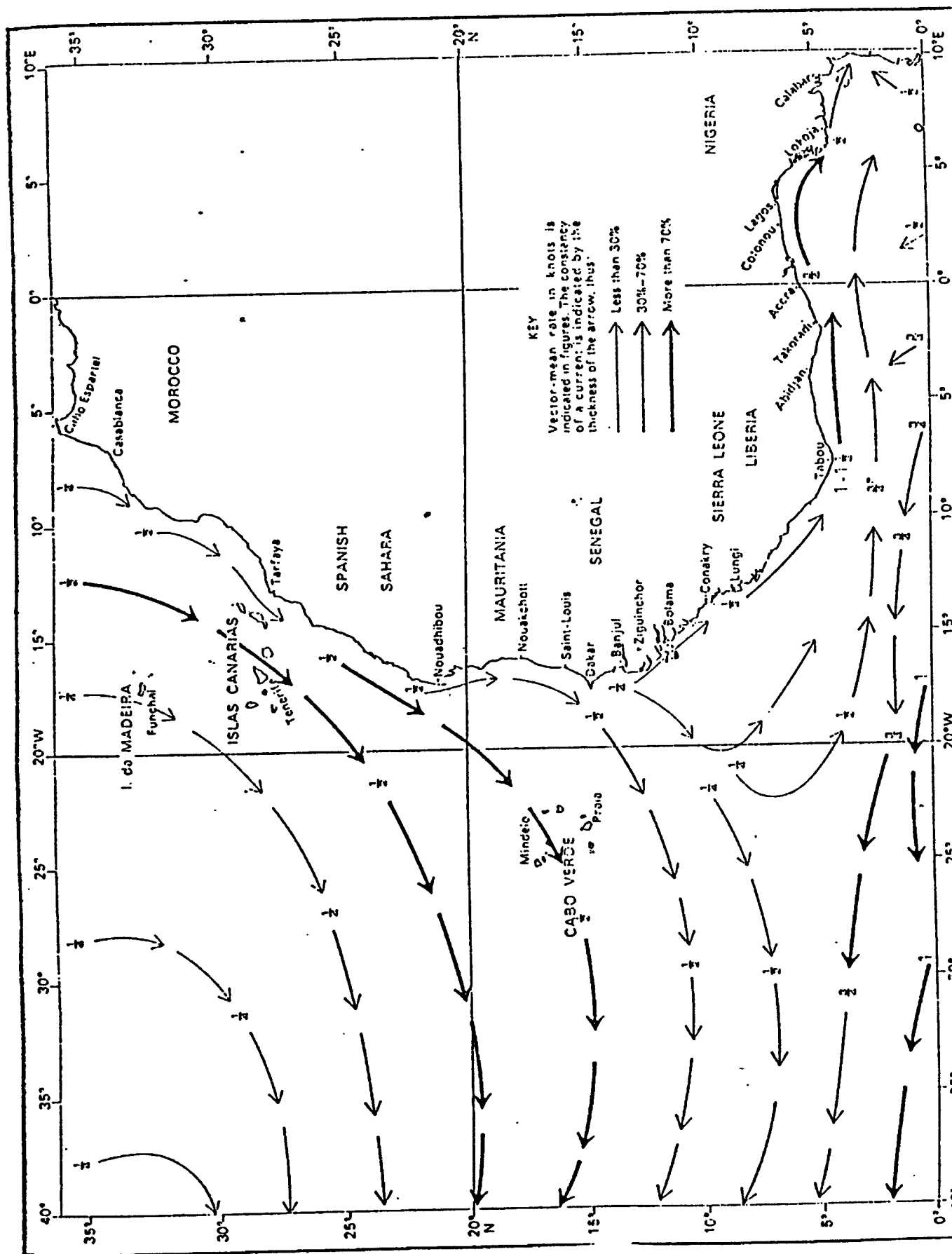
Below also are some other accidents and drowning cases
that occurred along the coast and in the Cities during this
same period both in Guinea, Sierra Leone and Liberia.

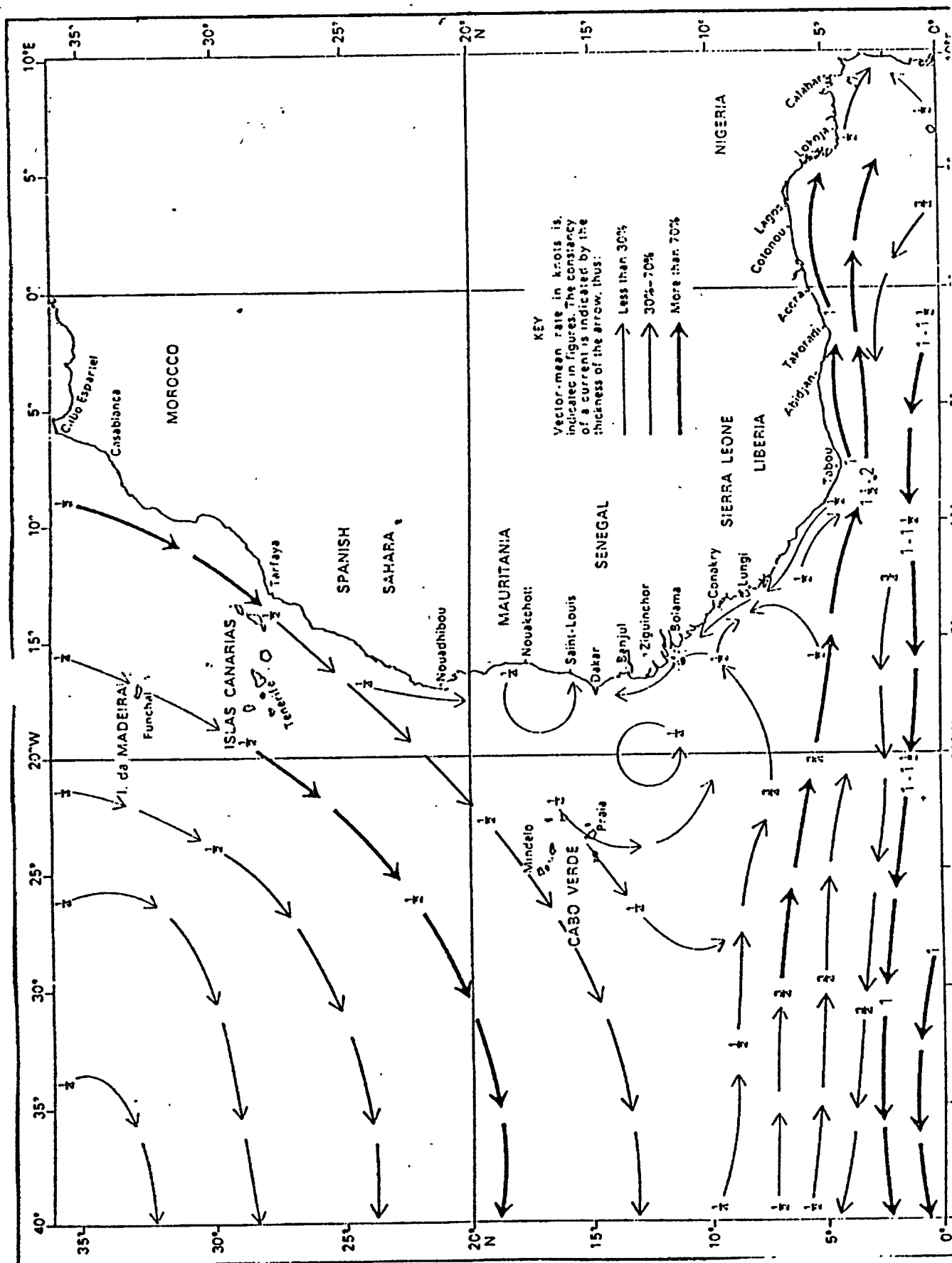
| S/No | DATE | PARTICULARS OF ACCIDENTS. | REMARKS |
|-------|---------|--|---|
| ----- | | | |
| 1. | 27.1.83 | Canoe accident at sea by cement Factory in Freetown involving two persons-Sesay and Isbawo. | Rescued by Marine Boat. |
| ----- | | | |
| 2. | 3.3.83 | Accident involving canoe and Fishing vessel in Freetown. | Both died by drown- ing. |
| ----- | | | |
| 3. | 23.6.83 | Accident involving Ferry Kailondo and canoe with four persons onboard. | Three were rescued and one Osman Sesay died by drowning |
| ----- | | | |
| 4. | 12.8.84 | Sea accident involving No personal | |
| | | RSLMF Naval Boat and Texaco Tug in Freetown | injuries but damage on Patrol Boat. |

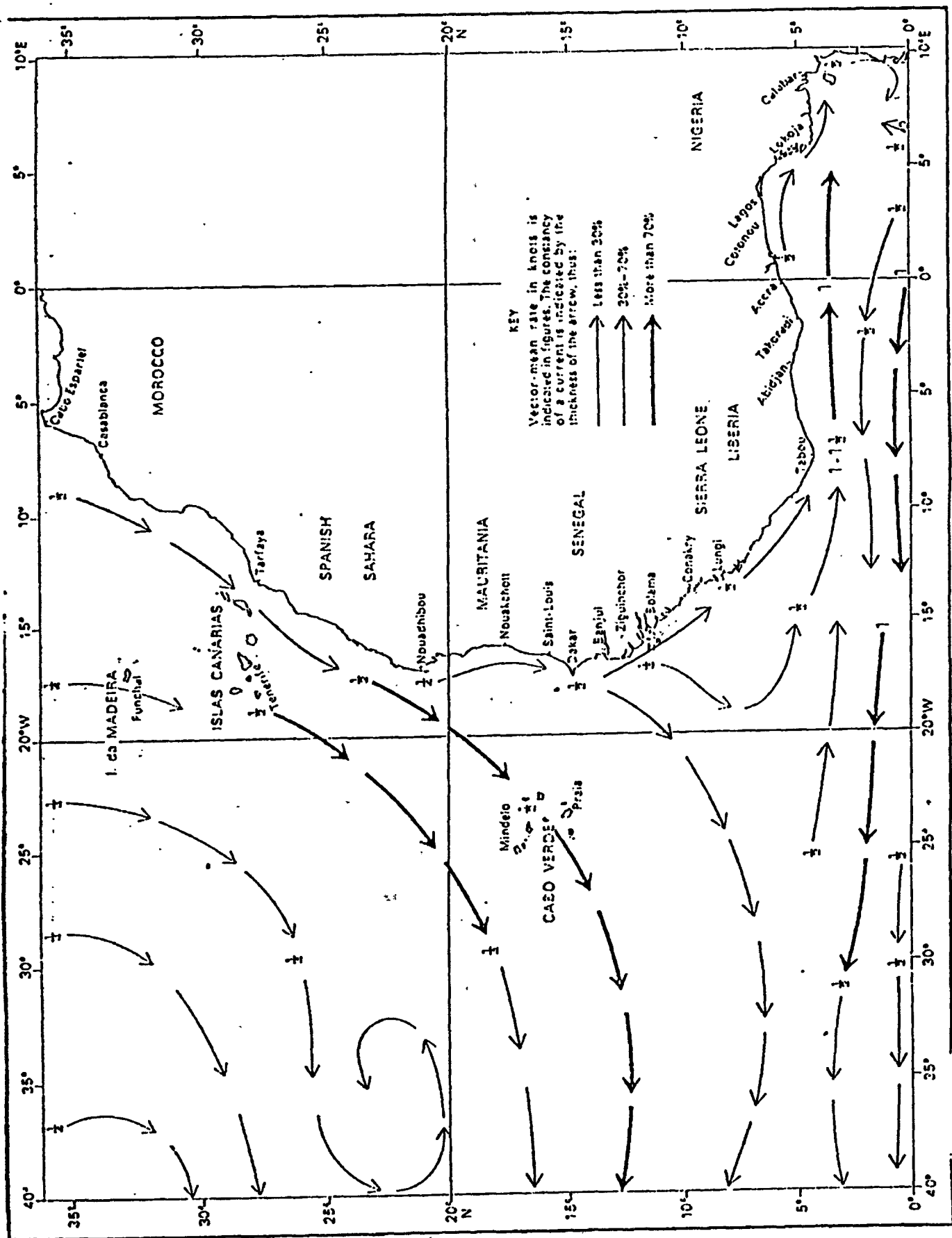
-
5. 14.1.85 Sea accident involving Fishing vessel with canoe This happened in Guinea.
-
6. 13.5.86 Tragic incident of Soviet Sailor The sailor onboard Soviet Fishing Vessel CTP 8223. the sailor was Mr. A Timofeev, a crew onboard. fell overboard and died by drowning.
-
7. 8.8.88 Crucial accident at the Port of Conakry-Guinea a man was accidentally crushed between some containers and the vessel and dropped into the sea the vessel was M.V. FAITH. The body was later discovered at mid-stream.
-
8. 21.8.89 Sea accident involving two Fishing Vessels at Sulima Sierra Leone/Liberia Border many of the sailors died. The cause of the accident was lack of ROR knowledge.
-
9. Jan.90 Shooting and killing of Korean Fishing Boat Captain by Guinea Security. The Vessel Pukiyan 3 and the body were rescued by the author and brought to Freetown.

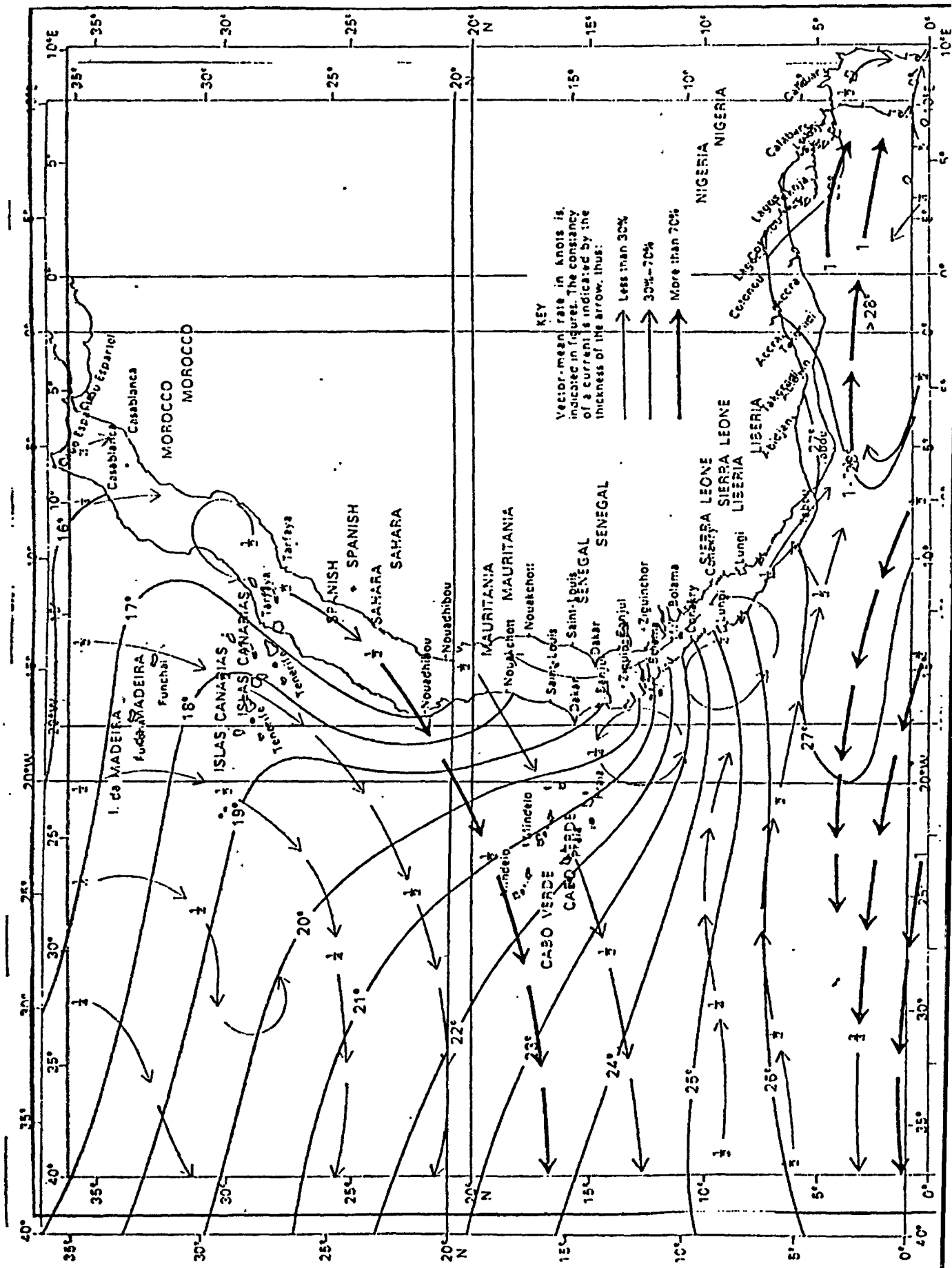
ANNEX II

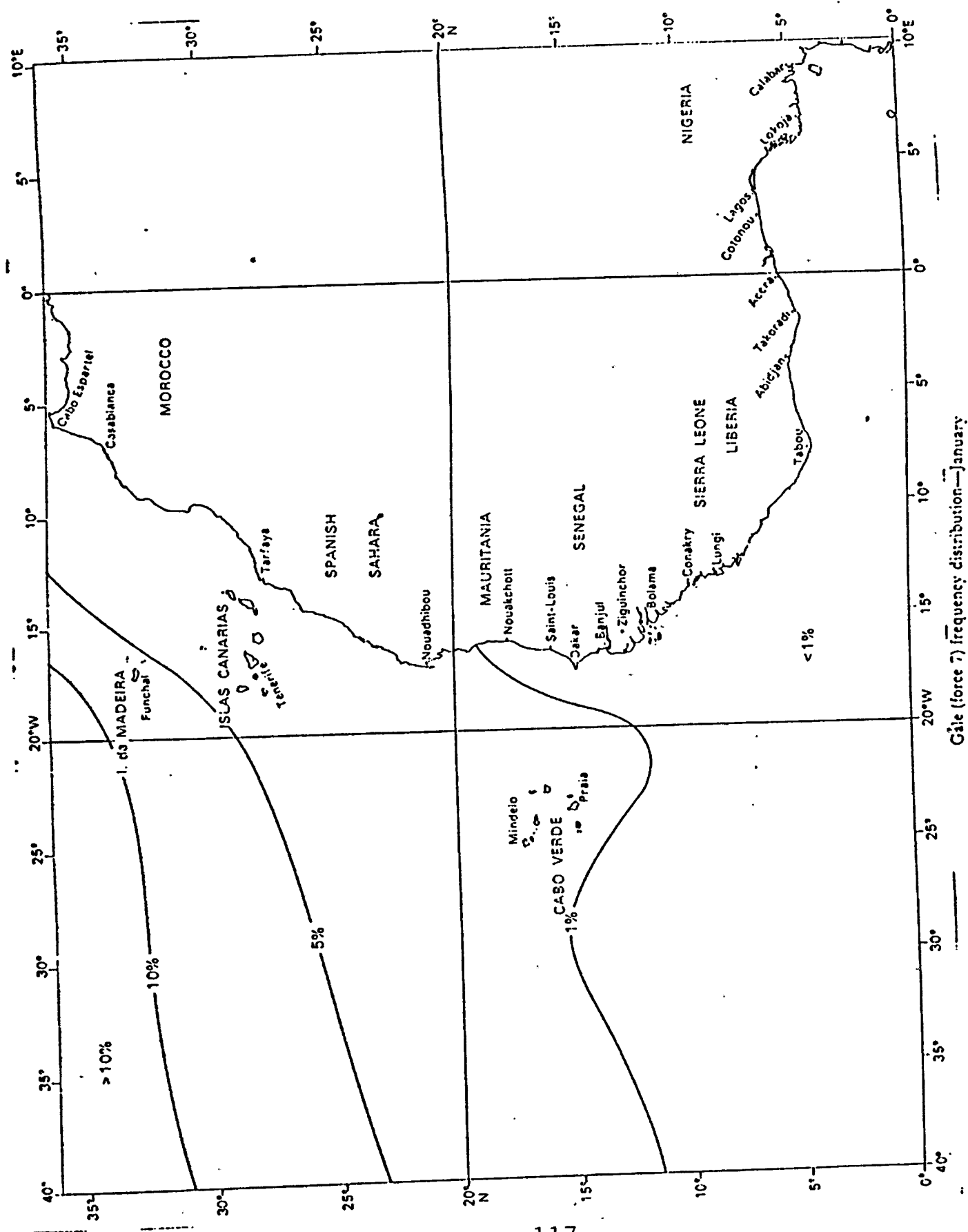
**CLIMATICAL CONDITIONS IN
THE SUB-REGION.**



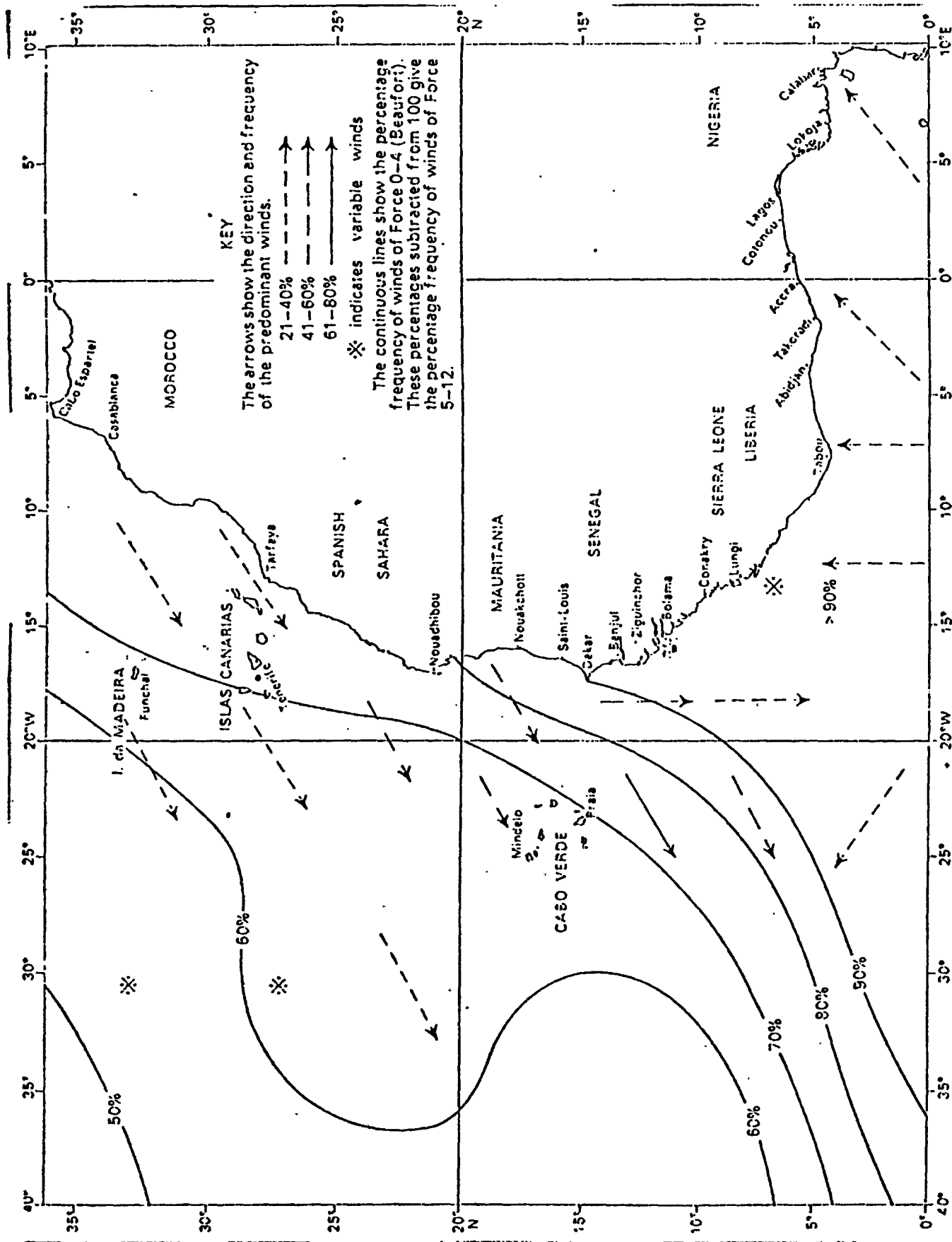


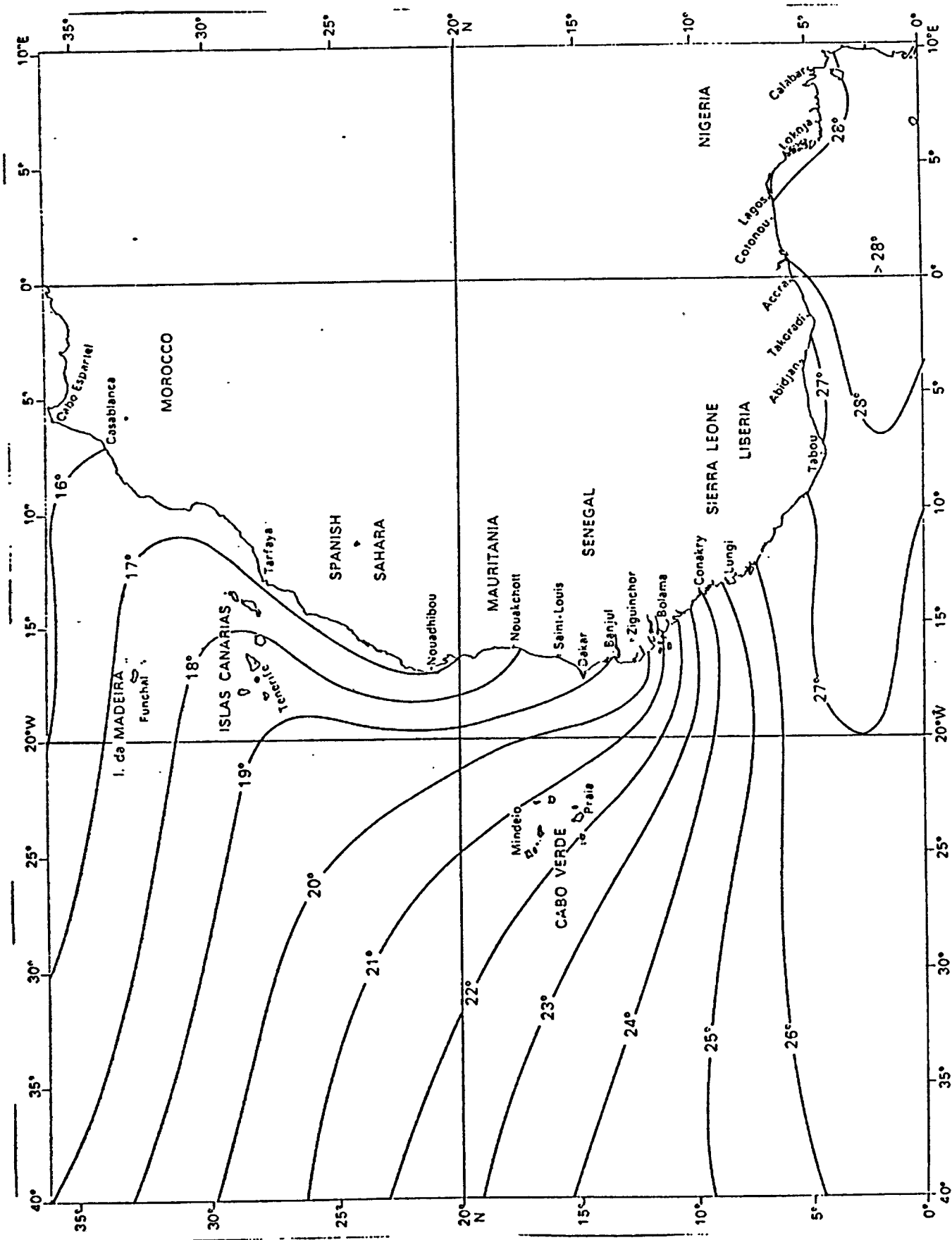






Gale (force 7) frequency distribution—January

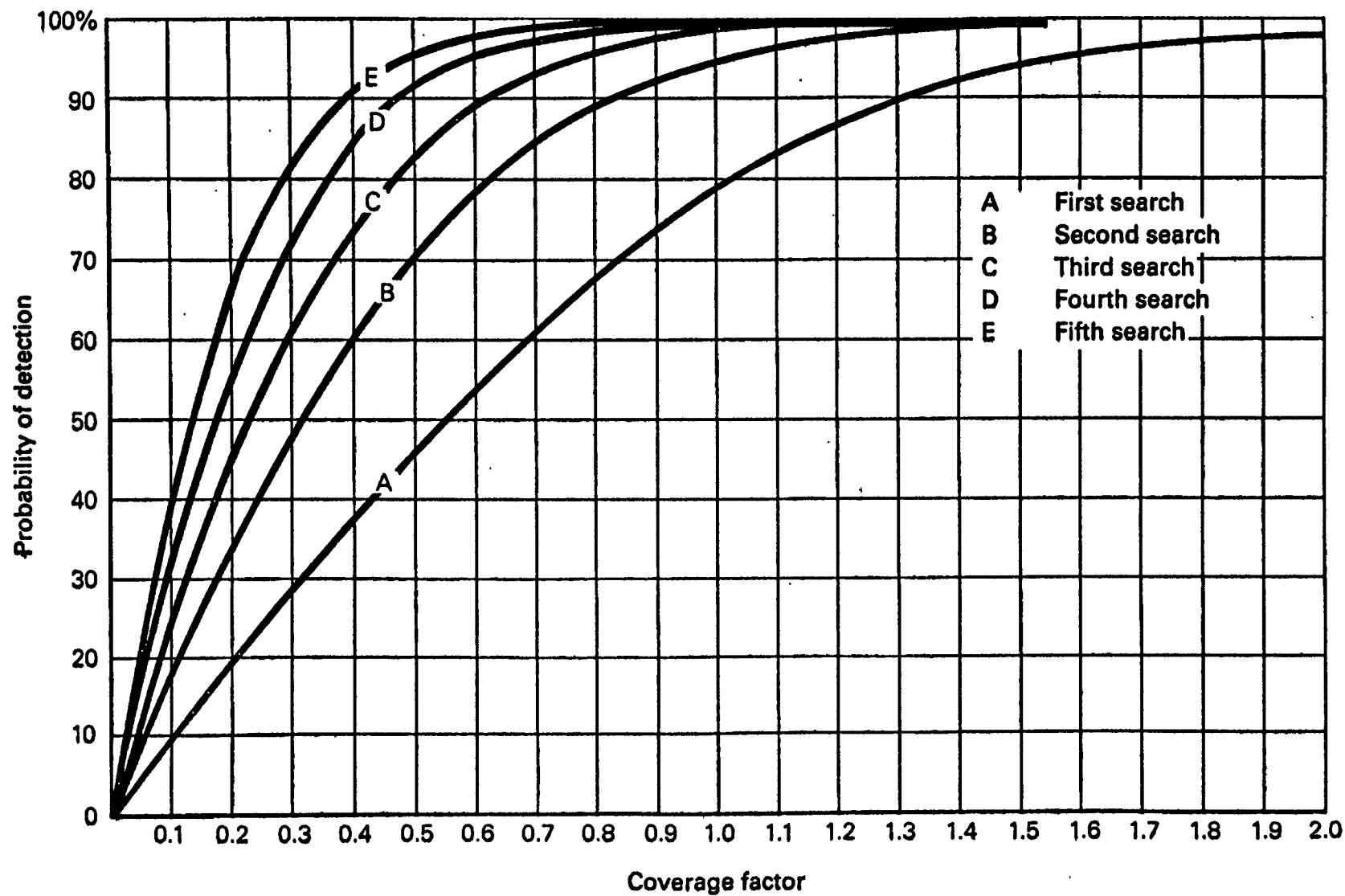


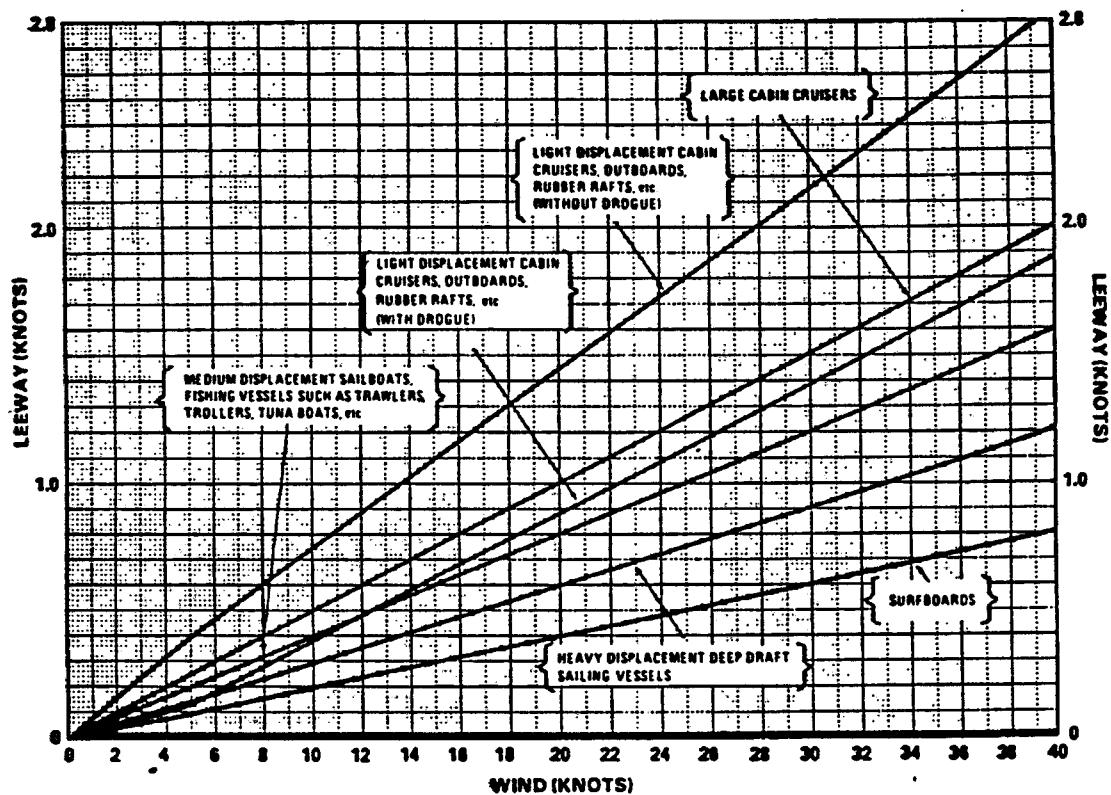


ANNEX III

**Probability of detection Graph
Search Area worksheet and
effort allocation worksheet.**

Probability of detection





SAR STAGE EVALUATION

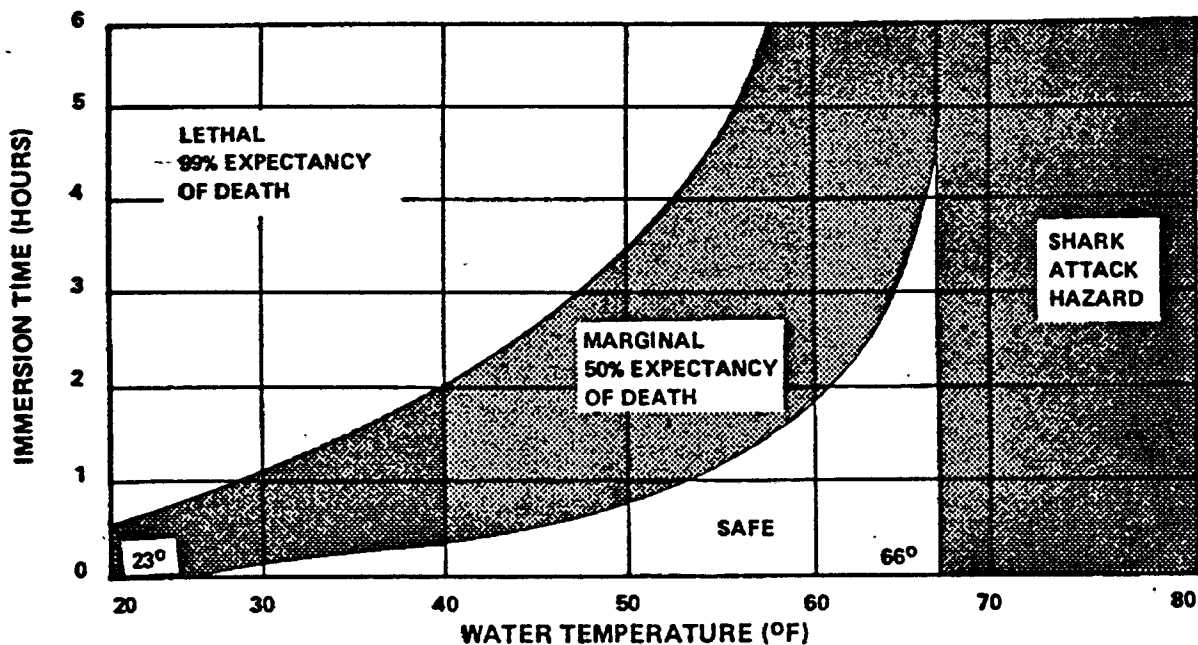
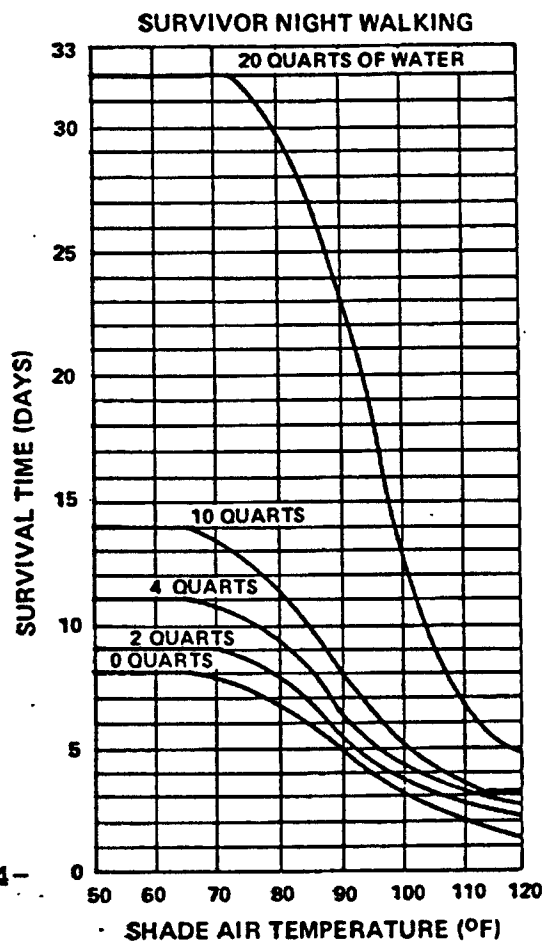
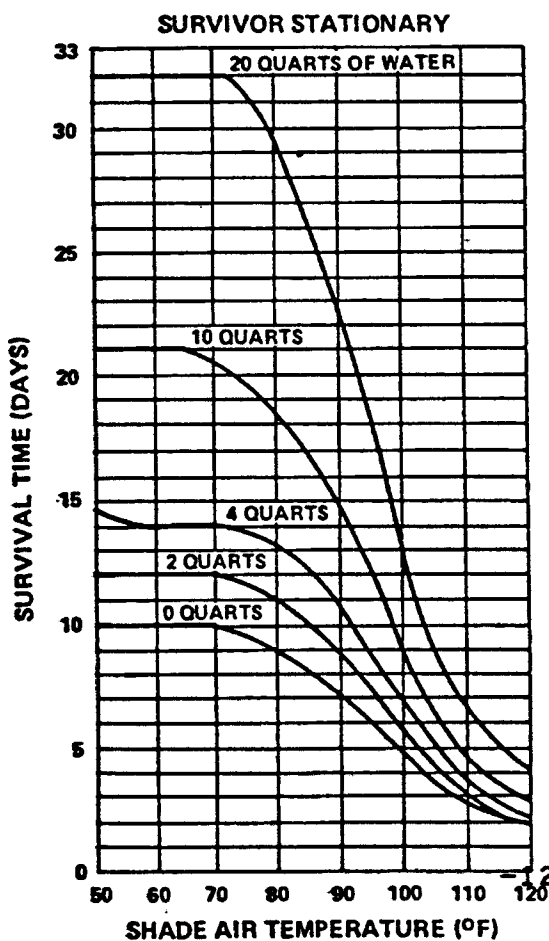
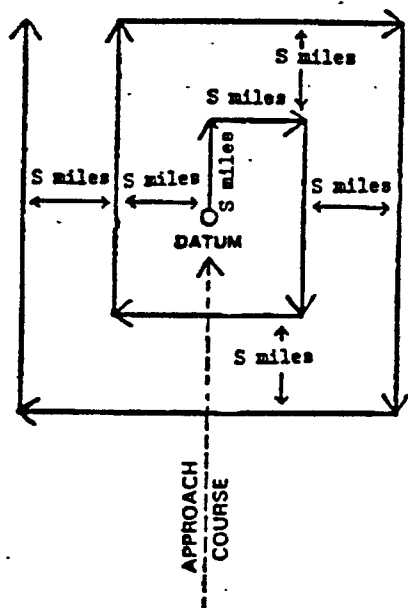


Figure 1-3. Water Chill Without Antiexposure Suit



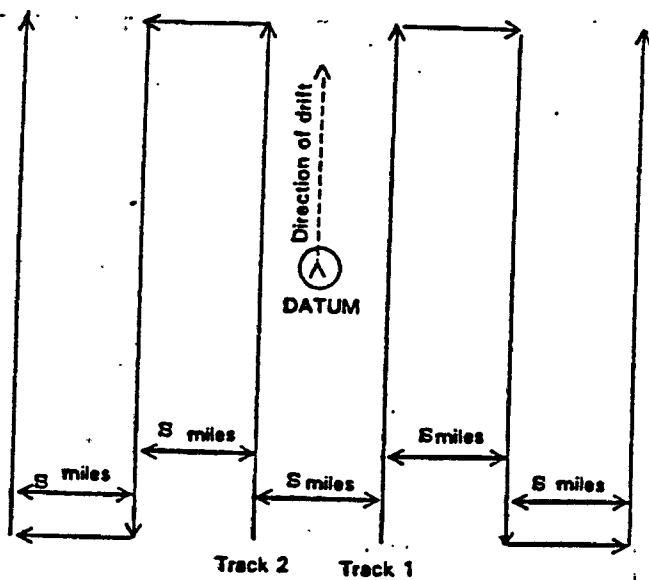
PATTERN 1

Expanding square search — 1 ship



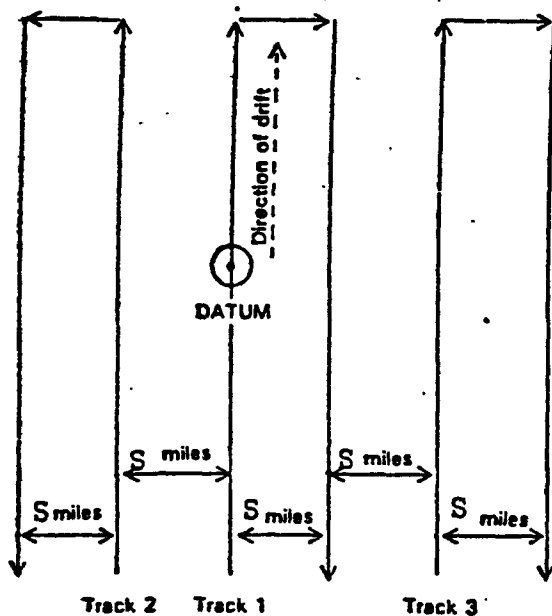
PATTERN 2

Parallel track search — 2 ships



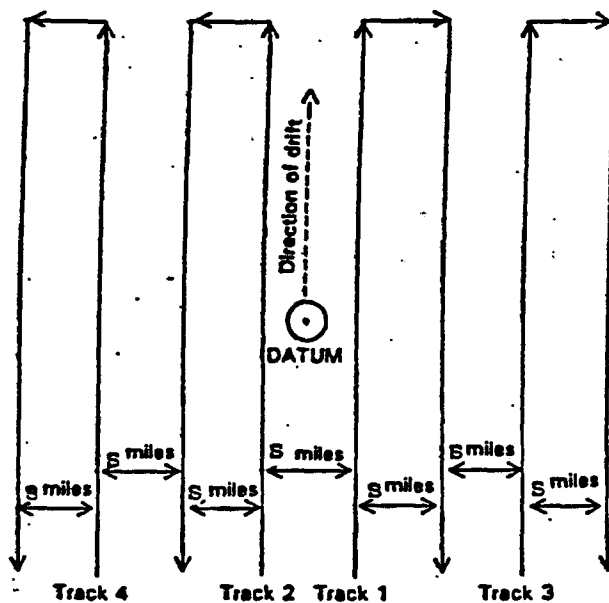
PATTERN 3

Parallel track search — 3 ships



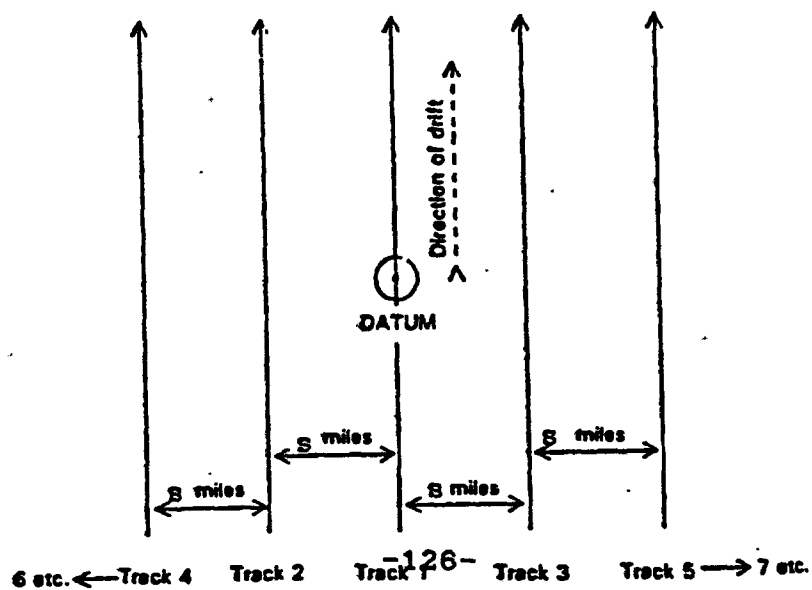
PATTERN 4

Parallel track search — 4 ships



PATTERN 5

Parallel track search — 5 or more ships



SEARCH AREA WORKSHEET

I. Initial Position Error (X)

1. Navigational Fix Error (FIX_e)
Based on _____
2. Navigational DR Error (DR_e)
(if applicable) _____
3. Initial Position Error (X)
(X = FIX_e + DR_e) _____

NM

NM

NM

II. SRU Error (Y)

1. Navigational Fix Error (FIX_e)
Based on _____
2. Navigational DR Error (DR_e)
(if applicable) _____
3. Initial Position Error (Y)
(Y = FIX_e + DR_e) _____

NM

NM

NM

III. Total Probable Error (E)

$$1. E = \sqrt{D_e^2 + X^2 + Y^2} = \sqrt{\quad + \quad + \quad}$$

$$E = \sqrt{\quad}$$

NM

IV. Safety Factor (f_s)

1.1 1.6 2.0 2.3 2.5

circle one

V. Desired Search Radius (R)

1. Search Radius (R = E x f_s) _____

NM

2. Rounded Search Radius (R_o) _____

NM

(round up to next highest whole mile)

VI. Optimum Search Area (A)

1. Square (A = 4 x R_o²) _____

SQ NM

2. Circle (A = 3.14 x R_o²) _____

SQ NM

3. Rectangle (A = L x W) _____

SQ NM

L = length of side

W = width of side

DATUM COMPUTATION WORKSHEET

Case Title _____ Planner's Name _____ Date _____

Aerospace Drift (D_a)

N/A if there was no glide or bailout.

1. Time
2. Latitude
3. Longitude
4. Total aerospace vector from aerospace bailout or glide worksheets

_____ Z _____
 _____ N/S
 _____ W/E
 _____ °T
 _____ NM

Position Where Surface Drift Will Start

Surface position from aerospace worksheets. Last known position/incident position. Previous datum (non-minimax). dmin and dmax positions.

Minimum *Maximum*

TARGET(S) _____

1. Time
 If LKP/IP, use incident time; if dmin/dmax position or previous datum, use last datum time. For most first searches you only need righthand column. However, in overdue cases, you may need minimum and maximum time of drift. If so, use column headings.

_____ Z _____ _____ Z _____

2. Latitude
3. Longitude

_____ N/S _____ N/S
 _____ W/E _____ W/E

Datum Time

1. Commence search time/mid-search time (circle).
2. Drift interval
 Subtract start time from datum time.

_____ Z _____
 _____ HRS _____ HRS

SEARCH AREA WORKSHEET

MRCC Controller Training

Initial Position Error (X)

1. Navigational Fix Error (FIX_e)
Based on CELESTIAL 2.0 NM
2. Navigational DR Error (DR_e)
(if applicable) 27.6 NM
3. Initial Position Error (X)
($X = FIX_e + DR_e$) 29.6 NM

SRU Error (Y)

1. Navigational Fix Error (FIX_e)
Based on LORAN C 1.0 NM
2. Navigational DR Error (DR_e)
(if applicable) NA NM
3. Initial Position Error (Y)
($Y = FIX_e + DR_e$) 1.0 NM

Total Probable Error (E)

$$1. E = \sqrt{D_e^2 + X^2 + Y^2} = \sqrt{64.2^2 + 29.6^2 + 1^2}$$

$$E = \sqrt{4998.8}$$

70.7 NM

Safety Factor (f_s)

1.1 (1.6) 2.0 2.3 2.5
circle one

Desired Search Radius (R)

1. Search Radius ($r = E \times f_s$) 113.1 NM
2. Rounded Search Radius (R_0)
(round up to next highest whole mile) 114 NM

Optimum Search Area (A)

1. Square ($A = 4 \times R_0^2$) 51984 SQNM
2. Circle ($A = 3.14 \times R_0^2$) NA SQNM
3. Rectangle ($A = L \times W$)
L = length of side
W = width of side NA SQNM

ANNEX IV.

The Founders of Mano River Union:

Siaka P. Stevens of Sierra Leone

William Tolbert of Liberia and

Ahmed Sekou Toure of Guinea.

The present Leaders are:

Dr.Major General Joseph Saidu Momoh of Sierra Leone

General Lansana Conte of Guinea and

General Samuel K.Doe of Liberia.

The leadership of Liberia as at now is a questionable one because of the present crisis in the country.Now that President Doe is dead,it is difficult to tell who is going to be the future leader of that country since the war is still going on.

Sierra Leone

Guinea

NEW ENTENTE CORDIALE

After years of uncertainty, relations between Sierra Leone and Guinea seem to have taken a turn for the better with Sekou Toure's state visit to Freetown

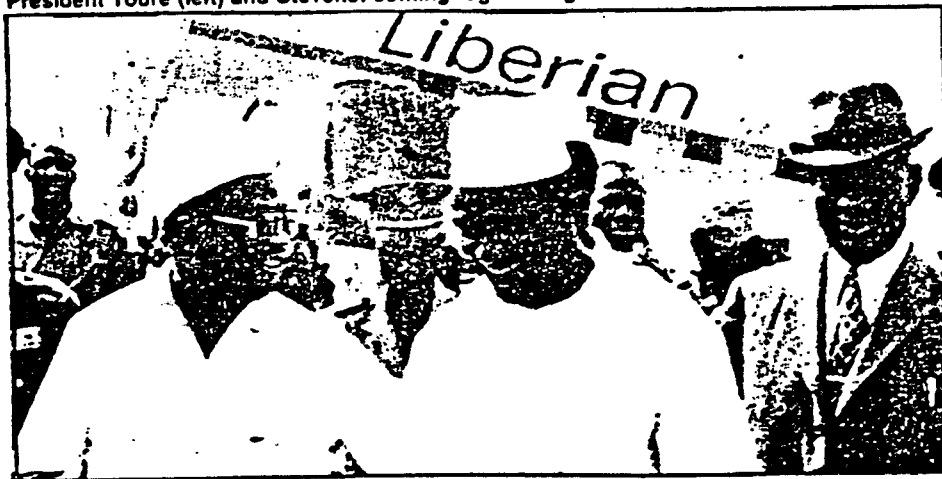
CONSIDERING the tumultuous turn-out and lavish welcome accorded Guinean President Ahmed Sekou Toure during his first state visit to Sierra Leone, the four-day sojourn was at least on the surface a big success. Apart from Toure's new liberal policy, the visit clearly indicated that relations between Guinea and Sierra Leone, after years of uncertainty, are now gradually becoming more cordial.

To show the new spirit of friendship, there was a special investiture ceremony at which Toure was decorated with Sierra Leone's highest award, Grand Comman-

der of the Republic of Sierra Leone. However, in terms of bilateral co-operation, not much emerged from the joint communique, although "the two leaders further recognised the fact that there was considerable room for co-operation between Sierra Leone and Guinea, and they underlined the need for such co-operation".

At the moment there are more Guineans living in Sierra Leone than any other foreign nationals. That the visit actually took place was in itself a success. On four previous occasions arrangements for state visits to Sierra Leone by Toure

President Toure (left) and Stevens: coming together again?



MRU HEADS IN TETE-A-TETE



President J.S. Momoh



President Lansana
Conte



Liberia's President
Samuel K. Doe

PRESIDENT J.S. Momoh On Monday left Freetown for Conakry, Republic of Guinea, onboard a special Guinean flight for consultations with President Lansana Conte.

On Tuesday, the President Momoh and two Heads of State President Lansana Conte on the invasion and armed attack on Nimba County, North-Eastern Liberia by dissidents.

President Doe, pointed out that this was the fourth of such attempts by dissidents to in-

Contd. on Back Page

--List of Abbreviations

| | |
|---------------|---|
| A | Search Area |
| A/C | AirCRAFT |
| AFTN | Aeronautical Field Telecommunication Network |
| AM | Amplitude Modulation |
| ARTCC | Air Route Traffic Control Centre |
| ASW | Average Surface Winds |
| ATC | Air Traffic Control |
| ATCC | Air Traffic Control Centre |
| BC | Bottom Current |
| C | Coverage Factor |
| CAP | Civil Aviation Patrol |
| CASP | Computer Aided Search Planning |
| CASPER | Contact Area Position Report |
| CF | Drift Error Confidence Factor |
| CHOP | Change Operational Control |
| Cm | Mean Coverage Factor |
| COMCEN | Communications Centre |
| COSPAS | Cosmicheskaya Sistyema Poiska Avarisynych |
| CPR | Cardiopulmonary Resuscitation |
| CRS | Coastal Radio Station |
| CS | Coordinating Surface Search |
| CW | Carrier Wave |
| D | Total Drift |
| d | Surface drift |
| DSC | Digital Selective Calling |
| de | Individual Drift Error |
| demax | Maximum Drift Error |
| demin | Minimum Drift Error |
| DMB | Datum Marker Buoy |
| DRe | Dead Reckoning Error |

| | |
|----------|---|
| E | Total Probable Error |
| ELT | Emergency Locator Transmitter |
| EMS | Emergency Medical Service |
| Ff | Fatigue Correction Factor |
| F/V | Fishing Vessel |
| GMDSS | Global Maritime Distress Safety System |
| ICAO | International Civil Aviation Organization |
| IMO | International Maritime Organization |
| INMARSAT | International Maritime Satellite |
| ITU | International Telecommunication Union |
| LUT | Local User Terminal |
| LW | Leeway |
| MCC | Mission Control Centre |
| MF | Medium Frequency |
| MOA | Military Operation Area |
| MRU | Mano River Union |
| MRU | Mountain Rescue Unit |
| NBDP | Narrow Band Direct Printing |
| NM | Nautical Mile |
| NWS | National Weather Service |
| OSC | On Scene Commander |
| POB | Persons On Board |
| POD | Probability Of Detection |
| RC | River Current |
| RCC | Rescue Coordination Centre |
| RDF | Radio Direction Finder |
| RSC | Rescue Sub-Centre |
| RSLMF | Republic Of Sierra Leone Military Forces |
| RSLNW | Republic Of Sierra Leone Naval Wing |
| SAR | Search And Rescue |
| SC | Sea Current |
| SITREP | Situation Report |
| SMC | SAR Mission Coordinator |
| SOLAS | Safety Of Life At Sea |

| | |
|-------|------------------------|
| - SRU | Search And Rescue Unit |
| - T | Trackline Pattern |
| - TC | Tidal Current |
| - TD | Total Drift |
| - USB | Upper Side Band |
| - Y | SRU Error |
| - Z | Effort |
| - Zt | Total Effort Available |

BIBLIOGRAPHY AND REFERENCES

Most of the materials in the preparation of this Project came from various sources such as Mano River Union reports, Documents from IMO Maritime Safety Sub-Committee on Life-Saving, Search And Rescue and so many other reports pertaining to the subject.

The World Maritime University Library was also a good source of information. Some other materials were collected during the field trips. Much other information came from personal experience gained from the SAR course I attended with the Coast Guard at Governors Island New York 1986 and also the experience gained practically between 1980 to 1989 as Commanding Officer of Patrol Boats. Other reference materials were provided by resident and visiting Professors and Lecturers and also from the handouts.

The following are some of the references from which most of the information has been taken for the preparation of this Project:

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